Final
Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada

Volume 1
Appendices A-F

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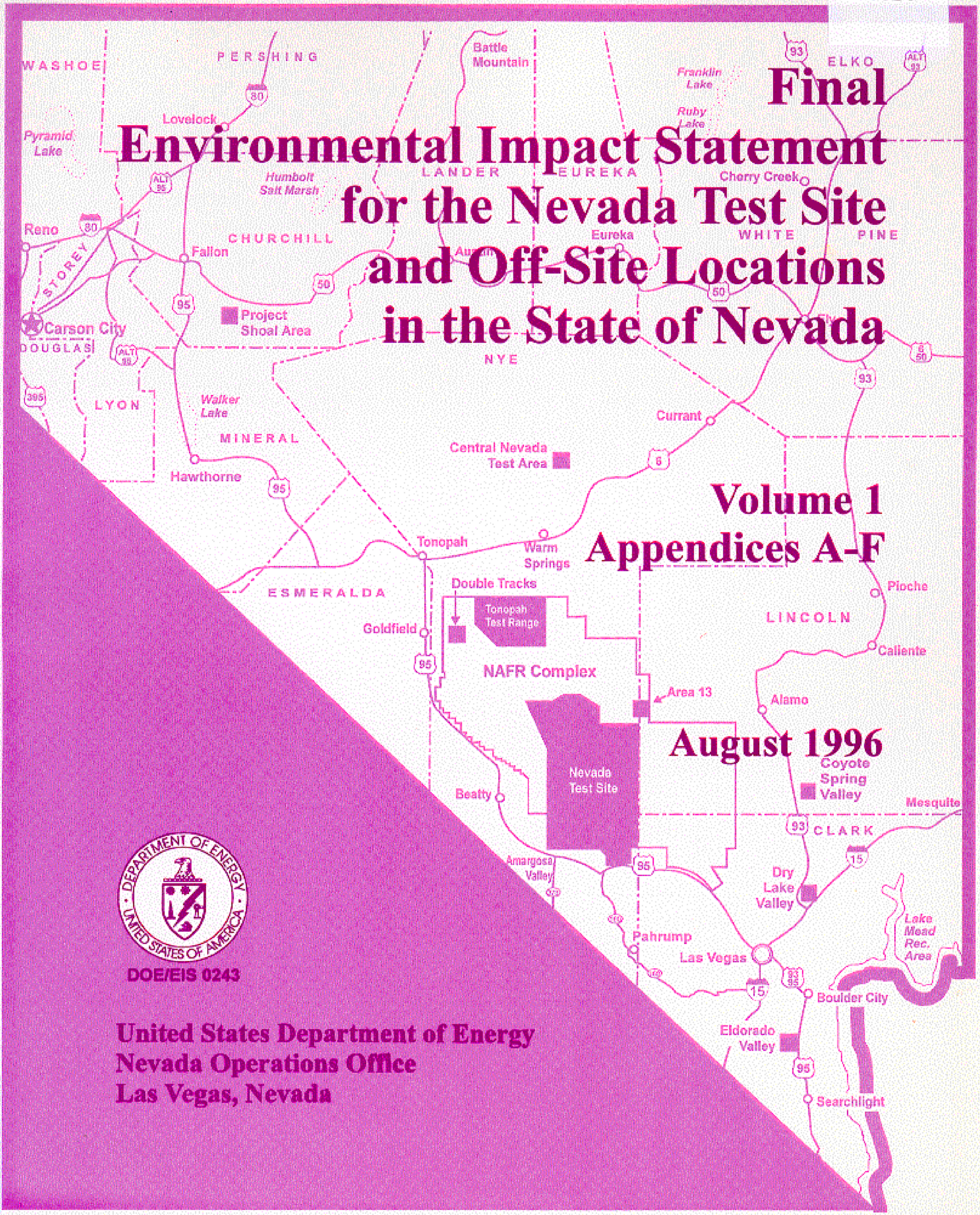

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United States Department of Energy
Nevada Operations Office
Las Vegas, Nevada

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Environmental Impact Statement

for
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Appendix A

DESCRIPTION OF PROJECTS AND ACTIVITIES

APPENDIX A
DESCRIPTION OF PROJECTS AND ACTIVITIES

Appendix A contains the description of the existing and potential projects, future work activities, and services associated with the five Nevada Test Site (NTS) mission programs: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. A description of NTS site-support activities is provided in Section A.6. Table A-4, located at the end of this appendix, presents the resource demands and requirements of the component projects and anticipated activities of mission programs at the NTS. These data were the basis of detailed environmental analyses described in Chapter 5. The back portion of Table A-4 outlines the primary assumptions used to develop the results presented in Table A-4. The assumptions are presented by resource type, (e.g., expenditures) and by mission program for each alternative and general assumption. Projects included in each of the alternatives are described within the mission program summaries in Appendix A. Within each section, the existing and potential future projects, activities and services associated with each alternative are described. Appendix A provides information on current projects and activities, as well as information on those projects, activities and services that could occur over the next 10 years. The purpose of this appendix is to:

- Present information used to evaluate the alternatives proposed in the NTS Environmental Impact Statement (EIS)
- Provide descriptions of the projects, activities, and services discussed in the main chapters of the NTS EIS.

A.1 Defense Program

Among the major responsibilities of the U.S. Department of Energy (DOE) at the NTS and the Tonopah Test Range is the continued stewardship of the nation's nuclear weapons stockpile. The NTS must also maintain a nuclear weapons testing capability. Other Tonopah Test Range Defense Program responsibilities are described in Section A.1.1.4.

A.1.1 Alternative 1

Under Alternative 1, Defense Program operations would continue under the ongoing nuclear test moratorium and negotiation of the Comprehensive Test Ban Treaty. Two scenarios could occur under this alternative. In one scenario, the President would not direct any nuclear yield testing, and the DOE's nuclear-testing-related activities would be limited to maintaining readiness to conduct tests. This scenario emphasizes NTS science-based stockpile stewardship experiments and operations. The other scenario (which the DOE believes unlikely but consistent with the site's historical mission) includes a contingent possibility that the President, through an end of the moratorium or through the "supreme national interest" clause of a test ban treaty, would direct the DOE to conduct one or more nuclear-yield tests in order to achieve a high level of confidence in the safety and reliability of the weapon type in question. One or more nuclear-yield tests could be conducted as directed by the President. The activities associated with this alternative are also presented below.

A.1.1.1 Stockpile Stewardship. Stockpile stewardship includes nuclear weapons testing and science-based weapons experimentation and ensures the safety, reliability, and performance of the nation's nuclear stockpile. The research and development of the technologies required for stockpile management are included under stockpile stewardship. The DOE Nevada Operations Office (DOE/NV) also maintains the capability of locating, retrieving, and destroying damaged nuclear weapons. Descriptions of stockpile stewardship activities addressed in the NTS EIS are provided below. These activities are related to science-based experiments which will be conducted in emplacement holes depicted in Figure A-1.

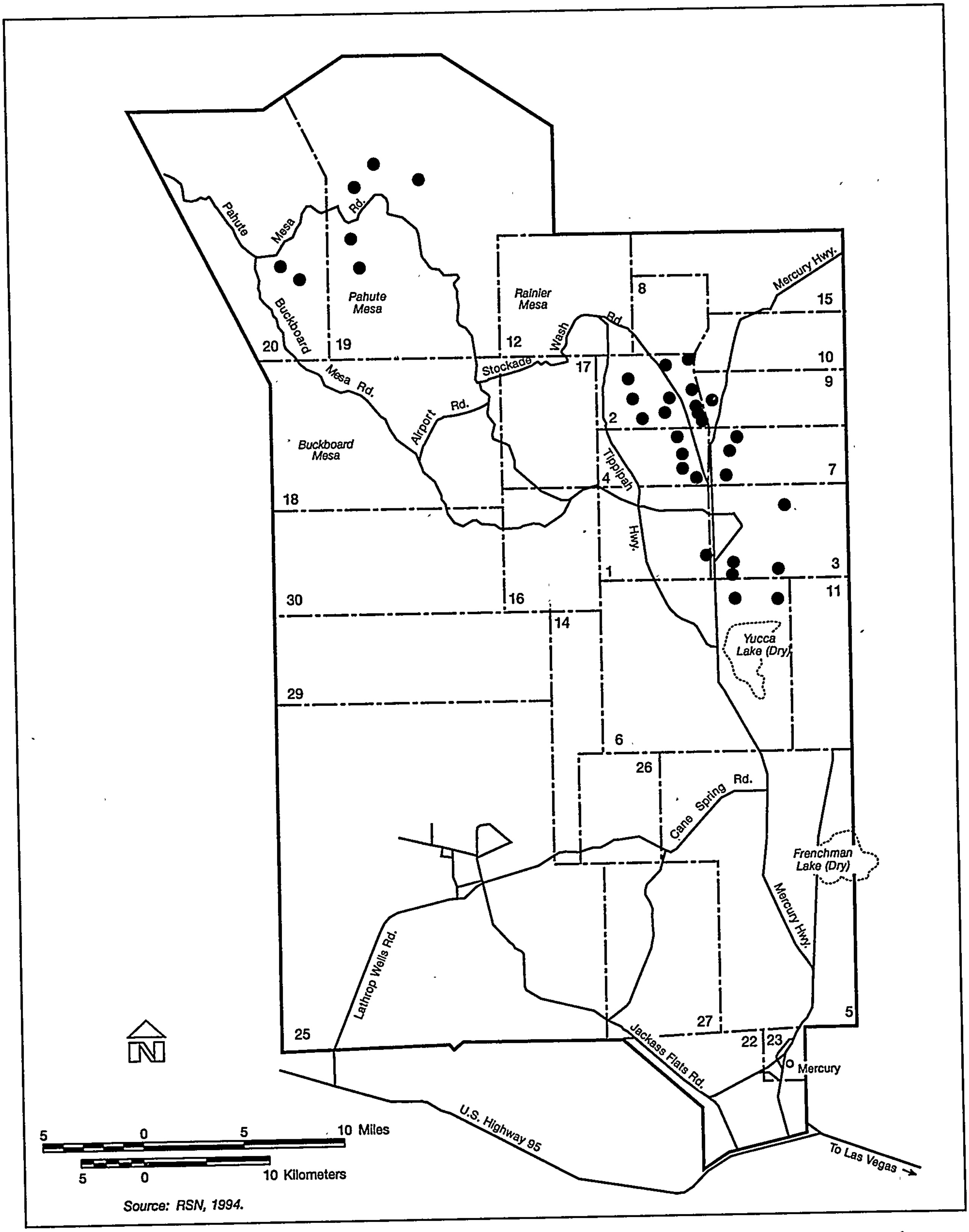

Figure A-1. Location of stockpile stewardship emplacement on the NTS

A.1.1.1.1 Nuclear Test Readiness—As required by Presidential directive, the DOE will maintain the readiness and capability to conduct nuclear tests within 2 to 3 years if directed by the President. With respect to the NTS under Alternative 1, this directive means that Defense Program efforts would continue to maintain the required infrastructure and critical personnel necessary to meet this requirement. The DOE will maintain personnel skills through the conduct of dynamic experiments, (including subcritical experiments, involving special nuclear material) hydrodynamic tests, and exercises. The few capabilities essential for nuclear testing not used during the experimental program will be exercised periodically to maintain the relevant skill bases. Laboratory personnel will maintain the necessary technical competency by performing selected nuclear explosive operations at the Device Assembly Facility. These operations have been analyzed in the Device Assembly Facility Environmental Assessment. The necessary infrastructure, including facilities, will be maintained in compliance with all regulatory, safety, and programmatic requirements.

A.1.1.1.2 Underground Nuclear Weapons Testing—Since 1963, the United States has conducted all of its nuclear weapons tests underground in accordance with the terms of the Limited Test Ban Treaty. Hence, complete containment of all nuclear weapons tests is a dominant consideration in nuclear test operations.

Various methods are used for emplacing nuclear test devices so that the ensuing explosion is contained. The most common method is to emplace a test device at the bottom of a vertically drilled hole. Another method is to emplace a test device within a tunnel that has been mined horizontally to a location that is sufficiently deep to provide containment.

Emplacement of a test device in a drill hole or tunnel is not accomplished until the containment design has been reviewed by the Containment Evaluation Panel. The Containment Evaluation Panel is composed of individuals who have extensive experience in nuclear testing and associated phenomenology. The Containment Evaluation Panel assists the Manager, DOE/NV, in the review of proposed nuclear tests to ensure that each containment design is one that will provide reasonable assurance of satisfactory containment of radioactivity[1] or release radioactivity only under controlled conditions in compliance with all treaty constraints and under health and safety guidelines established by the Secretary of Energy.

Panel membership include scientists and engineers from the Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratories, the Defense Nuclear Agency, the U.S. Geological Survey, the Desert Research Institute, and up to four independent consultants. The Panel examines each factor that might contribute to the unwanted escape of radionuclides into the atmosphere during or after the detonation. Such reviews consider in detail the device yield, depth of burial, geology, hydrology, characteristics of the soil and rock, location of the emplacement site (including the proximity to and the success of previous test locations), closure methods, stemming design, and drilling and construction history.

A detailed description of the steps associated with nuclear weapons tests in vertical drill holes is provided below.

<u>TESTS IN VERTICAL DRILL HOLES</u>—Tests in vertical drill holes are of two types: smaller-yield devices in relatively shallow holes in the Yucca Flat area (Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10) and higher-yield devices in deeper holes on Pahute Mesa (Areas 18, 19, and 20). Tests at the Yucca Flat and Pahute Mesa event sites have the same general requirements, but differ in the magnitude of the operations. Deeper-hole operations disturb a larger area, require more on-site equipment, and have a higher requirement for electrical power and utilities. The distance from the core of the infrastructure is also a factor; Pahute Mesa operations are 48 to 81 kilometers (km) (30 to 50 miles [mi]) farther away than Yucca Flat.

[1] Satisfactory containment, as defined by the Manager, DOE/NV, will result in no measurable radioactivity off site by normal monitoring equipment and no unanticipated release of radioactivity on site.

The following description of a vertical drill-hole test breaks down the operation into seven individual steps:

Step 1. Site Selection and Drilling. There are two subsets of site selection as it applies to nuclear tests, namely: selection of an existing drill hole for a specific event (Figure A-1), and selection of a new drill site from the Nuclear Test Zone (Figure 3-3) for a specific event because the stockpile does not contain a suitable site. The goal of siting is to optimize the various parameters so that operational feasibility and successful containment of yields of interest to device designers can be attained at a suitably low cost.

Many factors are considered. Some of these are: (1) scheduling of field resources; (2) event schedules; (3) shock sensitivity of a given experiment and possible interactions with other experiments; (4) depth range required for a suitable device emplacement; (5) geologic structure; (6) geologic material properties; (7) depth of standing water; (8) potential drilling problems; (9) adjacent expended sites, craters, chimneys, subsurface collapses; (10) adjacent open emplacement holes or unplugged post-shot or exploratory holes; and (11) non-test program constraints such as groundwater concerns, roads, and power lines (Olsen, 1993).

When drilling is required after a test location is chosen by the sponsoring national laboratory, a drilling program outlining the requirements of the specific hole is completed. The event site is surveyed, staked, and checked for cultural and biological resources. When all environmental clearances are completed, the site is graded and leveled, and a drilling-fluid sump is constructed to contain drilling fluid and cuttings. A drill rig, usually with its own power and utilities, is moved onto the site. Water is brought in by truck, or piped in, and mixed with drilling compounds to fill the sump. The hole is then drilled using standard NTS big-hole drilling techniques. A normal hole is from 1 to 3 meters (m) (48 to 120 inches [in.]) diameter and from 213 to 762 meters (m) (600 to 2,500 feet [ft]) deep. During drilling, samples of drill cuttings are collected at 3-m (10-ft) intervals, and rock cores are taken as required. After drilling is complete, geophysical logs are run into the hole to evaluate the condition of the hole and gain a more thorough understanding of the geology. The drill site is then secured by filling the sump and installing specially designed covers over the hole.

Step 2. Event-Site Engineering and Construction. When a hole is selected as a location for a nuclear test, the area around the hole is surveyed and staked according to the criteria set forth by the sponsoring national laboratory. The cultural and biological surveys are then rerun to determine if the status of the area has changed. The hole is also uncovered, and selected geophysical logs are refed in the hole to reconfirm its condition.

Once it is assured that the environmental clearances are complete, an area is cleared and leveled for the surface ground-zero equipment; another area close by the selected site is cleared and leveled for the recording trailer park. This is a typical earthmoving operation; native materials are used to top the pads or, if active material is unstable, decomposed granite fill is used. The on-site construction is temporary and is abandoned after the event is complete. Concrete pads are poured around the surface ground-zero to provide a stable platform for downhole operations and to provide a base for the assembly towers. Equipment is moved in to emplace the nuclear device in the hole, record the data produced, and provide radiological and seismic monitoring of the site. An extensive grounding system is used to establish baseline instrumentation grounds, which might include a pit containing salt water. The equipment to be left in position during the explosion is protected with an aluminum-foil hexcell-shaped shock-mounting material or dense foam. A circle of radiation detectors is placed back from the surface ground-zero to detect and assess any releases from the experiment. Finally, a perimeter fence is erected, and access is controlled both into and out of the event site.

Step 3. Device Delivery and Assembly. For safety reasons, the nuclear device is delivered to the NTS unassembled. The device is assembled and inserted into a container at the Device Assembly Facility in Area 6 or in the Area 27 Assembly/Staging Facilities. The Device Assembly Facility is discussed at the end of this section. The device, now encased in the container, is delivered to the event site accompanied by armored convoy. It is then attached to the diagnostics canister in preparation for emplacement into the hole. Checks are run, and alignment is assured. Heavy security is maintained during all operations that involve the nuclear device.

Step 4. Diagnostic Assembly. A diagnostic canister is assembled off site and transported to the test site. A typical diagnostic canister might be 2 m (8 ft) in diameter and 30 m (120 ft) long and contain all the instrumentation required to receive data at the time of the explosion (real time). The diagnostic canister might contain lead and other materials as shielding for the detectors. Upon arrival at the event site, the diagnostic canister is installed in the assembly tower to be mated with the device on site. Instrumentation cables are connected to the experiments and the recording trailer park. Slack in the cables allows the diagnostic canister to be lowered into the hole.

Step 5. Emplacement of the Experiment. The nuclear explosive and special measurement devices are moved to the hole and lowered to the detonation position; all required diagnostic materials and instrumentation cables are also lowered into the hole at this time. Downhole operations are conducted according to a defined checklist and are monitored by independent inspectors. The whole assembly is placed on a set of fracture-safe beams that span the opening. Any auxiliary equipment is then lowered into the hole, and the area is secured. Emplacement equipment is removed from the area, and test runs are conducted on the downhole experiment.

The hole is stemmed to prevent radioactive materials from escaping during or after the experiment. Stemming materials used to backfill the hole are generally placed in alternating layers, according to the containment specification. Alternate layers of 1-centimeter (cm) (3/8–in.) pea gravel are combined with fine material to provide a barrier equal to or better than the undisturbed material. Sand, gypsum, grout, cold tar, or epoxy plugs are also placed in the hole to provide impenetrable zones. In these zones, the instrument cables are sealed to prevent a radioactive gas path to the surface. Once completed, the area is cleared of unnecessary equipment. A report is compiled for the Containment Evaluation Panel to show that the as-built condition reflects the containment design plan.

Step 6. Test Execution. After the Containment Evaluation Panel accepts the as-built design of containment and all preliminary tests are successful, the nuclear device is ready for detonation. Security operations begin two days before the test to assure that all nonevent-related personnel are evacuated prior to the test for security and personal safety. The explosive is armed. Radiation monitors are activated, and aircraft with tracking capability circle the site in case gas and debris unexpectedly vent to the surface. Weather forecasts and fallout pattern predictions are reviewed. Then, detonation occurs.

When an underground nuclear device is detonated, the energy release almost instantaneously produces extremely high temperatures and pressure that vaporizes the nuclear device and the surrounding rock. Within a fraction of a second after detonation, a generally spherical cavity is formed at the emplacement position. As the hot gases cool, a lining of molten rock puddles at the cavity bottom.

After a period of minutes to hours, as the gases in the cavity cool, the pressure subsides and the weight of the overburden causes the cavity roof to collapse, producing a vertical, rubble-filled column known as a rubble chimney.

The rubble chimney commonly extends to the ground surface, forming a subsidence crater. Numerous subsidence craters are present at the test site (see Plate 7, Volume 2). Subsidence craters generally are bowl-shaped depressions with a diameter ranging from about 60 to 600 m (200 to 2,000 ft) and a depth ranging from a few meters up to 60 m (200 ft), depending on the depth of burial and the explosive energy yield. Some deeply buried explosions of low yield form cavities that do not collapse to the surface and, consequently, do not create subsidence craters. Past underground nuclear tests in Yucca Flat and on Pahute Mesa have fractured the ground surface above the explosions, causing displacement of the surface along preexisting faults adjacent to explosion sites.

After the test is conducted, the event site remains secure until it can be assured that the event has been contained. After a suitable time, a reentry crew is dispatched to the site. Data are retrieved, and the condition of equipment is noted. After all is assured to be secure, normal NTS operations resume. The event site is roped off, outlining an exclusion zone where there is danger of potential cratering.

Step 7. Post-shot Operations. After the temperature of the cavity has cooled, a post-shot hole is usually drilled into the point of the explosion in order to retrieve samples of the debris. These samples are highly radioactive, but provide important information on the test. The post-shot hole is as small in diameter as possible and is drilled at an angle to allow the drill rig to be positioned safely away from surface ground-zero. After drilling and sampling operations are complete, the drill rig and tools are decontaminated. Residual radiation is cleaned up at the site, and the hole is plugged back to the surface. This generally completes the event operation, and the site is turned back to the DOE.

A.1.1.1.3 Science-Based Stockpile Stewardship—Projects and activities associated with science-based stockpile stewardship include experiments that will provide essential data for the modeling of the performance, safety, and maintenance of the enduring stockpile. Examples of such types of projects are described below.

DEVICE ASSEMBLY FACILITY—The Device Assembly Facility is a multistructure facility in which nuclear devices and high explosives can be assembled, disassembled or modified, staged, and component tested. Nuclear devices and high-explosive activities might also include maintenance, repair, retrofit, and surveillance. This facility contains approximately 9,290 square meters (m^2) (100,000 square feet [ft^2]) of floor space within a 29-acre (1,263,240 ft^2) high-security area. Construction is primarily of heavy steel-reinforced concrete. The facility is earth-covered with a minimum of 2 m (5 ft) of compacted earth overlay, leaving only one exterior wall.

There are individual underground structures separated by earthfill, and they are considered as separate buildings within the Device Assembly Facility. These separate buildings are connected by a common corridor. Single- and two-story sections exist within the Device Assembly Facility, with ceiling heights up to 9 m (30 ft). Second-story sections are used primarily for security forces and for additional mechanical and electrical equipment space. The entire facility is provided with an automatic fire suppression system and, in areas where a nuclear device may be present, quick-response on-off sprinkler heads are also installed.

Assembly operations at the Device Assembly Facility are carried out in the five assembly cells, three assembly bays, and four high bays. High explosives and special nuclear materials enter through the doors on the southeast side of the complex and are staged in bunkers. The materials are transferred to assembly cells where the components are assembled to the point that the device is no longer exposed. Completion of assembly includes mechanical and electrical measurements, radiography, radiation checks, alignment, and installation of other components. Radiographic operations are conducted on the component or assembly in the radiography bays and occasionally in the assembly cells or bays. In the final step, the assembly is configured for shipment to the event location.

To provide further detail of the Device Assembly Facility, the description is divided into assembly cells, assembly bays, high bays, and other facilities as follows:

Assembly Cells—The assembly cells are 10 m (34 ft) diameter work areas that include composite roofs designed to expand upward in the unlikely event of a high-explosive detonation and to collapse into the cell where the detonation occurred. The collapsed, composite roof material provides a filtration system that reduces the dispersion of aerosolized special nuclear materials by over 99.5 percent and, at the same time, absorbs the energy of an explosive blast to prevent propagation of the explosion into other structures within the facility. Decontamination facilities with tank storage are located in close proximity to the assembly cells. The assembly cells have 30 cm (12 in.) thick concrete walls and a roof structure overlain with 8 m (25 ft) of graded gravel. Each cell has an air-locked access vestibule equipped with double sets of blast doors that are interlocked so that one door must be closed before the other can be opened. The concrete structure, composite roof, and interlocking blast doors within the assembly cells reduce the potential environmental impacts that could occur during an accident and reduce exposure to workers not located in the immediate vicinity of an accident.

Assembly Bays—The assembly bays have concrete walls with separate personnel- and equipment-access air locks and interlocking blast doors to reduce potential environmental impacts and impacts to workers outside the bay. Nuclear devices containing insensitive high explosives as the only main charge explosive are assembled in assembly bays. Activities conducted in assembly bays involve the assembly of secondary components. Uncased explosives other than insensitive high explosives can be handled in these bays if no special nuclear materials are present.

High Bays—Four high bays to support test operations are similar to the assembly bays in structure and function, except that no equipment airlock is provided. Nuclear device operations conducted in assembly bays may also be conducted in high bays. Two of the four high bays allow the device transportation vehicle to be backed in for loading and unloading.

Other Facilities—Other facilities located at the Device Assembly Facility include the following:

- Bunkers are used for staging high explosives and special nuclear material components prior to assembly
- Mechanical and electrical support areas include plant mechanical systems, diesel-powered electrical generators, an uninterruptible battery power supply station, and transformers
- Administrative offices are located on the first floor of the Device Assembly Facility. Each corridor is provided with independent heating, cooling, and ventilation systems
- Radiography procedures are conducted in one of two buildings that have air-locked access corridors, blast doors, and support facilities comprised of a control room, service area, dark room, and radiography room
- Security is provided by an entry guard station that controls traffic ingress and egress to the complex. Two hardened guard towers constructed of reinforced concrete provide for exterior security and surveillance.

AREA 27 COMPLEX—The Area 27 complex is comprised of the 5100 complex (Able Site) and the 5300 complex (Baker Site). The complex has been the primary facility for the assembly of nuclear device test assemblies for the nuclear test program. In addition, the Area 27 complex is the alternate assembly facility to the Device Assembly Facility. A number of these facilities have been and will continue to be used in support of high-explosive device assembly for the Big Explosives Experimental Facility and other programmatic activities requiring the use of the Area 27 complex. These ongoing testing activities involve the use of high explosives and/or special nuclear materials separately or in combination.

Each complex consists of several buildings, storage bunkers, and other structures used for storing, staging, assembly and disassembly, handling, evaluation, and nondestructive testing of nuclear assemblies, nuclear explosive-like assemblies, high-explosive devices, critical assemblies, and special nuclear materials. Most of the facilities at each site were constructed in the 1960s for use in the nuclear test program; missions have been successfully accomplished in these facilities without any accidents involving high explosives or special nuclear materials.

The adequacy of safety of the Area 27 complex has been demonstrated over the years by a number of safety analyses, safety evaluations, hazards analysis, and nuclear devices safety studies of the dominant accidents and management controls. The management of safety has also been re-evaluated and includes reviews of safety design features, administrative controls, procedures, and documents used by the DOE/NV, Lawrence Livermore

National Laboratory, and Los Alamos National Laboratory.

In general, the complex will house kilogram (kg) quantities of special nuclear materials and up to several thousand-pound quantities of various types of high explosives. Specific reviews and evaluations are performed, as required, to establish or revise individual quantity limits for specific buildings, bunkers, and structures. Special nuclear materials limits are established based upon dispersal consequences and nuclear criticality considerations (such as form, geometry, shape, moderation, and reflection).

The primary assembly buildings (5100, 5180, and 5310) are of conventional construction, but modified in some cases for security purposes. These buildings contain assembly bays (both normal and high) for the assembly and staging of components and assemblies; restrooms; offices; lower floors for radiographic equipment; cranes and hoists for the movement of components; and resilient and conductive flooring to reduce the risk and probability of high-explosive detonation.

Security for the Able and Baker sites is provided by double security fencing, intrusion detecting, hardened guard towers, double tumbler locking systems for buildings, surveillance television, and other security systems. All exit doors are equipped with emergency (panic) hardware or safe havens that cannot be opened from the outside.

The buildings are supported by standard utilities (water and electric) and ventilation. Class II, Division 2, Group G electrical fixtures are provided in the operating bays. Certain buildings contain tritium monitoring systems with local alarms. Lightning protection is provided for all buildings. Fire protection is provided by installed sprinkler systems and wall-mounted fire extinguishers.

A.1.1.1.4 Dynamic Experiments and Hydrodynamic Tests—Dynamic experiments provide information regarding changes in materials under conditions caused by the detonation of high explosives. Dynamic experiments are conducted in order to gain information on the physical properties and dynamic behavior of materials used in high explosives and nuclear weapons, including changes caused by aging. Dynamic experiments may include the use of special nuclear material; however, those that are to be conducted are designed to remain subcritical. These experiments are called "subcritical experiments", i.e., no self-sustaining fission chain reaction will occur.

Operations at the NTS have historically included tests or experiments that, though involving both high explosives and special nuclear materials, were intended to produce no nuclear yield or negligible nuclear energy release. These tests or experiments frequently remained subcritical. They were often performed as dedicated stand-alone experiments. Nuclear explosion did not take place, therefore, the environmental impacts of these experiments were principally due to dispersal of special nuclear materials such as plutonium, and other materials, by the detonation of high explosives. These tests or experiments were performed through the 1950s, 1960s, 1970s, and into the 1980s. Some of the earlier subcritical experiments were conducted on the surface while others were conducted underground in shafts, shallow boreholes or tunnels. Future subcritical experiments would be dynamic experiments with special nuclear materials performed to answer crucial questions concerning safety and reliability of the stockpile. Approximately 10 dynamic experiments (including subcritical experiments) or hydrodynamic tests would be conducted annually at the Lyner Complex.

Hydrodynamic tests are dynamic, integrated systems tests of mock-up nuclear packages 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 weapons primary assembly (using simulated materials for the fissile materials in an actual weapon) and to evaluate the effects of aging on the nuclear weapons remaining in the stockpile.

For the purpose of impact analysis only, it is assumed that under Alternative 1, a total of 1,100 dynamic experiments or hydrodynamic tests would be performed within the 10-year timeframe (1996 to 2005) of the NTS EIS. Examples of science-based stewardship facilities and projects are described below.

LYNER COMPLEX—Lyner was originally designed as a site to test low-yield nuclear devices. Since the moratorium on nuclear testing began, it has been converted to the testing of conventional high explosives, as well as dynamic experiments, subcritical experiments and hydrodynamic tests. The Lyner Complex consists of a mined shaft (U-1a), a drilled hole (U-1g), a connecting mined tunnel, and surface facilities located west of the Mercury Highway in Yucca Flat. The surface facilities include a trailer park for diagnostics and a work area around the mined shaft built with transportable structures.

The Lyner Complex will be used by the National Laboratories to conduct the program of dynamic experiments and hydrodynamic tests. The U-1a shaft is 293 m (961 ft) deep, with access via a man-rated hoist. Secondary access through the drilled hole at U-1g is gained by using an emergency cage powered by a separate hoist. The U-1g drill hole also provides access for the firing and diagnostic cables. The cables and other utilities are grouted into the annulus of the 122-cm (48-in.) access casing and the 274-cm (108-in.) diameter hole. An independent ventilation system at the U-1g drill hole provides a second supply of downhole air, thus supplementing the U-1a supply and acting as a dual system in the case of an accident.

The connecting main drift is mined 335 m (1,100 ft) due north to the U-1g drill hole from the U-1a shaft. Tunnel support is provided by rock bolts, wire mesh, and shotcrete. Secondary containment for experiments is located in the main drift, along with distribution of utilities. Secondary containment assures a safe condition in the event of failure of the primary containment in the side drifts. Primary containment is provided by closing the side drifts with grouts and steel containment doors. Secondary containment is achieved by massive grout plugs keyed to the rock with gas-tight steel doors within the plugs.

Explosive events are placed in side drifts mined perpendicular to the main drift. Multiple tests could be fielded by the complex without changes to the main drift. The experiment drifts would be mined to suit the requirements of the experiment assigned. One experimental drift has been completed and successfully expended for the demonstration experiment.

Site development includes a 3-acre recording trailer park by the U-1g hole and a 17-acre pad that contains the construction support buildings at the U-1a shaft location. Downhole support equipment includes data gathering, emergency refuge chambers, distribution conduits for air and utilities, and a freight and passenger landing at the hoist. Electrical power and water are supplied from the NTS. The Lyner site is connected to the control point by a fiber-optic cable link. An emergency evacuation system is installed with self-contained power and a dedicated hoist mechanism at the U-1g hole. The U-1g hole provides emergency access to the complex and a backup access should an accident close the U-1a shaft.

Further details regarding activities conducted in the Lyner Complex are addressed in a classified appendix to the NTS EIS. However, environmental impacts of activities conducted at the Lyner Complex are included in the analysis in Chapter 5 of the NTS EIS.

BIG EXPLOSIVES EXPERIMENTAL FACILITY—The Big Explosives Experimental Facility is located in north-central Area 4. The site contains seven underground structures previously associated with atmospheric testing, one set of unidentified stanchions that might have been associated with atmospheric testing, the Bare Reactor Experiment Nevada Tower foundations and stanchions and the Japanese Village complex, the U-4ad drill hole and drill sump, the U-4af exclusion zone, and a white silicified volcanic core reduction flake. These structures were abandoned when nuclear testing went underground. Two of the buried structures, bunkers 4-300 and 4-480, have been modified to accommodate modern hydrodiagnostic equipment to serve as a hydrodynamic test facility for detonations of very large conventional high-explosive charges and devices. The electrical, lighting, and ventilation systems of the bunkers have been replaced or upgraded, optical ports and electronic control conduits have been added, the area surrounding the bunkers has been graded, and earthen berms have been added to improve blast protection, shield from X-radiation, and provide a downrange projectile stop. The intent of the modifications was to provide all of the sophisticated diagnostics capability of Lawrence Livermore National Laboratory's Site 300 Hydrotesting Facility for experiments containing more than the currently available 277-kilogram (kg) (500-pound [lb]) high-explosive weight limit.

Bunker 4-480 was modified to house up to five nitrogen or helium gas-driven rotating-mirror framing cameras, laser-illuminated image-converter cameras, continuous-rotating-mirror framing cameras, rotating-mirror streaking cameras, and/or infrared imaging cameras in various combinations. It is equipped with 5 camera stands and 5 corresponding optical ports with access to the 20 m x 20 m (66 ft x 66 ft) area gravel firing pad.

Bunker 4-300 contains three rooms: the control room, the laser room, and the utility room. The control and utility rooms were modified to house the diagnostic and firing control electronics, digitizers, electronic recording equipment, and other electronic equipment necessary for hydrodynamic tests. The laser room was modified to accommodate a pulsed Ruby laser for image-converter camera illumination and a neodumium laser for multibeam Fabry-Perot velocimetry, as well as the Fabry-Perot analyzer table.

Three large (3m [10 ft] diameter and 6m [20 ft] long) steel cylinders were placed outside the bunkers near the firing pad to house 2.3-MeV Febetron flash X-ray sources for high-energy X-ray radiography. Hycam recorders and video monitors were also placed around the firing area to monitor the aboveground activity and experimental performance of the test devices.

The structural soundness of the modified bunkers for expanded operations and the potential environmental impacts of blast, noise, and dust uplift due to hydrodynamic tests were investigated in the five experiments of the Popover test series conducted between March 1995 and August 1995. The tests consisted of detonations of successively larger amounts of spherical charges of conventional trinitrotoluene explosive beginning at 232 kg (512 lb) and ending with 3,538 kg (7,800 lb). The noise, acceleration, strain, overpressure, dust uplift, and area contamination were monitored in order to validate predictive models of shock, blast, noise, and gas product dispersion and to certify the safety of the manned operation of Bunker 4-300 during hydrodynamic tests. The bunkers were found to meet all required safety criteria, and a committee of senior scientists and engineers was chartered to evaluate the test results and recommended the facility for expanded operations.

The high-explosive weight limit for safe, manned operations at the Big Explosives Experimental Facility is based on the following facility design criteria: 454 kg (1,000 lb) of conventional high explosives detonated 5 m (15 ft) from the Bunker 4-480 outer wall or 2,268 kg (5,000 lb) of conventional high explosives detonated 8.3 m (27 ft) from the Bunker 4-480 outer wall. Based on the results of the Popover test series, the relationship between conventional high-explosive charge mass and safe detonation distance was determined to conform to these two criteria. For experiments involving larger or smaller charge masses than previously tested or involving charge configurations different from those previously tested, the safe operating distance(s) of the charge(s) will be determined using these criteria and standard engineering practice. In this way, arbitrarily large conventional high-explosive charge masses in practically any configuration can be safely detonated as long as the equivalent impact of the detonation on the facility in terms of overpressure, blast, shock, and noise is less than or equal to the facility design criteria.

Under this alternative approximately 100 hydrodynamic tests or dynamic experiments would be conducted annually at the Big Explosives Experimental Facility. No experiment performed at the Big Explosives Experimental Facility will contain special nuclear materials. A synopsis of current Big Explosives Experimental Facility projects and activities follows.

Shaped-charge Scaling Project— The purpose is to develop and test large shaped-charge technology, originated within the DOE weapons laboratories, for broad counterproliferation applications. The project includes scaling the existing technology to larger sizes; developing, testing, modifying, and characterizing the performance of the large charges; and applying the scaled shaped-charges to a variety of counterproliferation missions to test effectiveness against various targets. Typical experiments involve up to 3,600 kg (8,000 lb) or more of conventional high explosives in a variety of configurations.

Other High-Explosive Experiments—This includes potential projects with the goal of developing, improving testing and deploying advances in conventional munitions technology or their applications. Examples include the development of advanced conventional weapons, including shaped charges, explosively formed projectiles, propellant-driven devices, explosive munitions, pyrotechnics and other conventional weapons technologies, applications of these technologies to hard target and/or buried structure defeat, counterproliferation, and armor defeat. Typical experiments involve 3,600 kg (8,000 lb) or more of conventional high explosives in a variety of configurations.

A.1.1.2 Stockpile Management. Under Alternative 1, no stockpile management activities would be conducted at the NTS.

A.1.1.3 Nuclear Emergency Response. The DOE/NV Emergency Management Program is administered by the DOE/NV Emergency Management and Nonproliferation Division. The program receives significant support from the U.S. Environmental Protection Agency (EPA) Environmental Monitoring and Support Laboratory, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratories, U.S. Department of Defense (DoD) explosive ordnance demolition experts, and the DOE/NV contractors. The program is comprised of a number of separate, but related, emergency response programs, including 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. Program activities are based at facilities in Las Vegas, Nevada; Santa Barbara, California; Andrews Air Force Base near Washington, DC; and the NTS. These activities are individually summarized below.

A.1.1.3.1 Nuclear Emergency Search Team— DOE Order 5530.2, issued September 20, 1991, requires the Manager, DOE/NV, to maintain an operational team of specialists and equipment for response to threats involving nuclear explosives, illegal use of nuclear materials, and weapons of mass destruction. The Nuclear Emergency Search Team, comprised of members from the DOE, other federal agencies, the nuclear weapon design laboratories, and the DOE/NV contractors, is prepared to provide technical assistance to the Federal Bureau of Investigation, designated by law as the lead agency for response to terrorist acts in the United States. Since 1975, when the team was formed, significant research efforts, extensive exercises, and the DOE participation in responses to large nuclear emergencies, including the reentry of the Russian Cosmos 954 nuclear-powered satellite and the Three-Mile Island reactor accident, have contributed substantially to the development of needed response capabilities.

A.1.1.3.2 Federal Radiological Monitoring and Assessment Center—The DOE has been tasked to develop and maintain the Federal Radiological Monitoring and Assessment Center program. The DOE establishes and manages the field operations center when a major radiological emergency occurs or potentially may occur. The creation of a Federal Radiological Monitoring and Assessment Center capability is mandated by the Federal Radiological Emergency Response Plan and is assigned to the DOE/NV by the DOE Headquarters. DOE Order 5530.5, published in July 1992, specifies the purpose, organization, and responsibilities associated with the establishment of a Federal Radiological Monitoring and Assessment Center.

The Federal Radiological Monitoring and Assessment Center is responsible for acquiring, processing, and providing assessment of radiological data in the field. The Federal Radiological Monitoring and Assessment Center may be called on to support or provide follow-on support to the Nuclear Emergency Search Team. The Federal Radiological Monitoring and Assessment Center is a stand-alone organization capable of responding to any type of nuclear emergency, including nuclear weapons, transportation, or power-plant-related accidents.

A.1.1.3.3 Aerial Measuring System—The Aerial Measuring System mission is documented in DOE Order 5530.4, which defines its purpose and describes its roles and responsibilities. Primary objectives of the Aerial Measuring System are to:

- Conduct aerial surveys of the DOE facilities on a periodic basis to detect changes in conditions
- Develop remote sensing, analytical, and display technology for detection of nuclear radiation, as well as spectral characteristics in the ultraviolet, optical, and infrared spectra emitted from an environment that provides information about its condition or status
- Establish and maintain a technically competent emergency response capability, including the administrative, logistical, and technical support required in situations involving radiation, radioactive materials, or other hazardous materials.

The resources of the Aerial Measuring System are on call 24 hours a day for emergency operations.

A.1.1.3.4 Accident Response Group—The Accident Response Group, which is managed by the DOE/Albuquerque Operations Office, has a mission similar to the Federal Radiological Monitoring and Assessment Center, but focuses on accidents involving United States' nuclear weapons. The Accident Response Group deals with on-site conditions while the Federal Radiological Monitoring and Assessment Center addresses off-site measurements and assessments.

The DOE/NV, through a Memorandum of Understanding with the DOE/Albuquerque Operations Office, provides field response resources to the Albuquerque Office Accident Response Group team in support of nuclear weapons accidents, exercises, and training. The Accident Response Group is mandated by DOE Order 5530.1A, issued on September 20, 1991. It defines the purpose of the program and clarifies the responsibilities and authorities of the DOE Headquarters and the Operations Offices. The Accident Response Group resources required are normally drawn from the DOE/NV Nuclear Emergency Search Team and Aerial Measuring System programs. An Accident Response Group mission may require any of the DOE/NV major emergency management resources.

Some support requirements for this program are similar to the DOE/NV Nuclear Emergency Search Team and Aerial Measuring System programs. The use of Nuclear Emergency Search Team and Aerial Measuring System personnel, expertise, and equipment to support the Accident Response Group program eliminates the cost of duplicate services.

A.1.1.3.5 Radiological Assistance Program—The Radiological Assistance Program is prepared to furnish assistance in all types of radiological incidents. The program is mandated by DOE Order 5530.1A. Response to radiological incidents may include on- and off-site assistance when requested by other federal agencies or state, local, and tribal authorities in dealing with radiological incidents.

The DOE/NV Radiological Assistance Program provides two teams, a Radiological Assistance Team and a Radiological Cleanup Team, that can respond to radiological incidents. The Radiological Assistance Team acts to control and confine hazards resulting from incidents involving radioactive material that may pose a threat to public health and safety. The Radiological Cleanup Team may provide services for radioactive material cleanup in the event of an incident involving such materials.

A.1.1.3.6 Internal Emergency Management Program—The purpose of the Internal Emergency Management Program is to ensure capabilities exist to respond to on-site emergencies. These emergencies include unusual occurrences, such as fire, bombs or bomb threats, earthquakes, aircraft accidents, and power outages. Specific plans have been established to respond to the emergencies delineated in the current hazards assessment. The primary goals of these plans are to maximize the safety of personnel, minimize equipment and facility damage, and minimize facility downtime in the event of a major accident or emergency.

A.1.1.4 Storage and Disposition of Weapons-Usable Fissile Material. There is no activity under Alternative 1.

A.1.1.5 Large, Heavy-Industrial Facility. There is no activity under Alternative 1.

A.1.1.6 Tonopah Test Range Activities. The principal mission of the Tonopah Test Range is to provide research and development test support for the DOE-funded weapons projects. Many tests performed at the Tonopah Test Range involve aircraft and air drops; the range is capable of handling a wide variety of missions. Tests conducted vary from simple tests of hardware components and systems needing only limited support to rocket launches and air drops of test vehicles requiring full range support. A structural test of nuclear systems sometimes involves special nuclear material; however, all tests are performed on non-destructive yield assemblies only. No nuclear yield testing is conducted on the Tonopah Test Range. The principal types of tests include impact tests, passive tests, and chemical tests.

An impact testing program has been developed to test various parameters of the weapon while in flight or dropping a weapon and through the actual penetration of the ground surface. The data obtained assist in weapons development, as well as the maintenance of the nation's weapons stockpile. The weapons include conventional, nuclear, and inert projectiles. The weapons are unarmed and, for nuclear munitions, a portion of the nuclear package has been omitted. The nuclear weapons are, therefore, unable to reach criticality. Impact tests include the following:

- Air Drop Operations
- Fixed Rocket Launcher Operations
- Artillery Operations
- Cruise Missile Operations
- Compressed Air Gun (Davis Gun)
- Seismic Verifications
- Fuel Air Explosives Operations
- Hazardous Burn Test Operations
- Underground Explosives
- Open-Air Explosives
- Post-Test Procedures and Recovery Operations.

The chemical testing program involves the testing of chemical effects on stockpile weapons. The physical properties (i.e., explosive/combustible) of chemicals are tested for applicability and use in the nation's weapons stockpile. Other portions of the program test for defenses against possible hostile nations chemical warfare arsenals. Chemical tests would include testing of the following:

- Liquids (burn, explosive)
- Gas (burn, explosive)
- Particle (graphite, smoke).

The passive testing program uses high-resonance energy, lasers, and ultrasound techniques for checking the systems of the nation's conventional and nuclear weapons stockpile. Tests are also conducted on behalf of nonproliferation research to determine if other countries are using or developing nuclear capabilities. These tests would include the following:

- Telemetry, Microwave, and Photometrics Operations
- Radar Operations
- Laser Tracker
- Radiographic Operations
- Electromagnetic Radiation Test.

A.1.2 Alternative 2

No Defense Program activities would occur at the NTS under Alternative 2. DOE, Albuquerque mission related Defense Program activities at the Tonopah Test Range would be the same as those described under Alternative 1.

A.1.3 Alternative 3

Under this alternative, all NTS Defense Program activities described under Alternative 1 would continue. Many new activities would also be included under Alternative 3.

A.1.3.1 Stockpile Stewardship. Activities are essentially the same as those described under Alternative 1. However, hydrodynamic tests and dynamic experiments at the Big Explosives Experimental Facility would be expanded to include larger high-explosive charges and potentially hazardous materials. These tests are described below in Section A.1.3.1.3.

The requirements of a science-based stockpile stewardship require the design and construction of large, new pulsed-power and accelerator based simulation machines. Examples of such machines include the National Ignition Facility, the Advanced Radiation Source, Dual Axis Radiographic Hydrodynamic Test Facility, and the Advanced Hydrotest Facility. All these machines share a support infrastructure. Thus, a national test and demonstration center, based on the capabilities of these machines, is a future use of the NTS. Activities performed would be based on the capabilities of these devices, including such diverse activities as fusion research, effects testing, accelerator and pulsed power component testing and development, transmutation of elements, and basic physics research.

A.1.3.1.1 Nuclear Test Readiness—Activities would be the same as those described under Alternative 1.

A.1.3.1.2 Underground Nuclear Weapons Testing—Activities would be the same as those described under Alternative 1.

A.1.3.1.3 Science-Based Stockpile Stewardship—Under Alternative 3, the total number of dynamic experiments including subcritical experiments, and hydrodynamic tests conducted at the NTS would be the same as those identified under Alternative 1 (1,100 during the 10-year period). However, dynamic experiments and hydrodynamic tests at the Big Explosives Experimental Facility would be expanded to include larger high-explosive charges and potentially hazardous materials, such as beryllium, depleted uranium, deuterium, and tritium. Additional information on potentially hazardous materials associated with dynamic experiments and hydrodynamic tests is provided in Appendix F and classified Appendix J. Examples of experiments to be conducted at Big Explosives Experimental Facility include:

<u>SHAPED-CHARGE SCALING PROJECT</u>—The purpose is to develop large shaped-charge technology, originated within the DOE weapons laboratories, for broad counterproliferation applications. The project includes scaling the existing technology to larger sizes; developing, testing, modifying, and characterizing the performance of the large charges; and applying the scaled shaped-charges to a variety of counterproliferation missions to test effectiveness against various targets. Under Alternative 3, typical proposed experiments would involve up to 32,000 kg (70,000 lb) of conventional high explosives in a variety of configurations and the use of beryllium, depleted uranium, deuterium, and tritium.

<u>OTHER HIGH-EXPLOSIVE EXPERIMENTS</u>—In addition to activities in Alternative 1, high-explosive experiments in Alternative 3 would include the use of novel methods to initiate detonation of several elements and/or pieces and/or points of conventional high explosives with a high degree of simultaneity. Under Alternative 3, typical proposed experiments would involve 9,072 kg (20,000 lb) or more of conventional high explosives in a variety of configurations.

A.1.3.1.4 Advanced Nuclear Weapons Simulators—Enhancements to the science-based Stockpile Stewardship Program include advanced nuclear weapons simulators that are being considered for development based on new data and technologies emerging from current research. Advanced nuclear weapons simulators use state-of-the-art technologies to acquire data critical to evaluating the safety and reliability of the Nation's nuclear weapons stockpile in the absence of underground testing. The Next Generation Radiographic Facility and the Next Generation Magnetic Flux Compression Generation Facility are two examples of conceptual advanced simulator facilities that are analyzed for land-use planning purposes.

The Next Generation Radiographic Facility and the Next Generation Magnetic Flux Compression Generation Facility are proposed for the future and, at this time, neither of these facilities will be analyzed in detail in the Stockpile Stewardship and Management EIS. Therefore, no siting decision will appear in the Stockpile Stewardship and Management Programmatic EIS Record of Decision; however, the DOE believes that both facilities could be sited within the next 10 years. For this reason, both facilities are included under Alternative 3. Because the actual operation of the next Generation Radiographic Facility is beyond the timeframe covered by the NTS EIS, only the construction phase is addressed in this EIS. Both operations and construction of the Next Generation Magnetic Flux Compression Generation Facility are included.

A brief description of both conceptual facilities is provided as follows:

<u>NEXT GENERATION RADIOGRAPHIC FACILITY</u>—The Next Generation Radiographic Facility is potentially the next advanced high-explosive test facility featuring multiple-pulse and multiple-view diagnostic capability. This facility is described as the Advanced Hydrotest Facility in the Stockpile Stewardship and Management Programmatic EIS. The conceptual facility would provide advanced radiographic machine diagnostics with multiple (e.g., four to eight) views and with multiple (e.g., four to ten) pulses per view to provide weapons performance, safety and reliability information, to satisfy as necessary, certain needs of science-based stockpile stewardship and management programs. This next generation facility would incorporate all the latest diagnostics and provide for dynamic experiments with special nuclear materials as well as conventional explosives. This type of facility would respond to Stockpile Stewardship and Management Program requirements for inferring nuclear performance and safety.

This type of facility would be used for the investigation of the dynamics of metals subjected to the forces of a high-explosive detonation. It would be a permanent facility whose most prominent feature would be the use of containment spheres (firing chambers). The chambers would be used to contain conventional explosions, with the purpose of investigating the response of metals being driven by the explosive energy. Diagnostic equipment might include a state-of-the-art advanced diagnostic and detection system to characterize high-explosive explosions. Monitoring and control facilities for firing, personnel access, safety and health physics would also be included. Special nuclear materials would be involved, however, these experiments would be designed to remain subcritical i.e., no self-sustaining nuclear reaction would occur.

In addition to the containment spheres, the facility could include an open-air firing capability, shot staging areas, diagnostic support, maintenance facilities, monitoring, instrumentation and control facilities, office and administrative areas, and electrical and mechanical support shops.

<u>NEXT GENERATION MAGNETIC FLUX COMPRESSION GENERATION FACILITY</u>—The next Generation Magnetic Flux Compression Generating Facility could be designed to provide a cost-effective facility capable of supporting high energy, explosively powered experiments. This facility is described as High-Explosive Pulsed Power Facility in the Stockpile Stewardship and Management Programmatic EIS. In broadest terms, the facility could support experiments that could make 100 to 1,000 megajoules of electrical energy available to power experiments. Typical proposed experiments could involve 4,536 kg (10,000 lb) or more of conventional high explosives in a variety of configurations.

Individual experiments could involve consumable hardware, recording and diagnostic equipment, physics designers, engineers, and diagnosticians. Each individual experiment could require the assembly of custom hardware, the installation of explosive components, diagnostic, and data-recording equipment. The experiment would then be moved to the hardened firing location. The experiment would be executed, and data would be remotely recorded. Individual experiments could be fielded by a personnel team who would spend several weeks at the NTS. Several experiments could be scheduled per year.

A support team of two to four people permanently located at the NTS Next Generation Magnetic Flux Compression Generation Facility would be required to operate and maintain the buildings and equipment, coordinate NTS support and services, interface with the experimental teams that field individual experiment, and ensure safety and environmental integrity of the varied operations.

The facility could be located at the Big Explosives Experimental Facility. The existing facility may require reconfiguration and suitable office and support space is available, but may require modification. A new hardened remote structure rated at 3,000 kg (6,614 lb) to support pulsed-power equipment and explosive experiments would be required, as well as a sitewide remote control, diagnostic, and interlock system. A modest pulsed-power laboratory suitable for pretesting the equipment prior to committing that equipment to full-scale operation would be required. This would be performed largely using existing equipment. Some upgrade of the electrical utility service to the area would be required.

NATIONAL IGNITION FACILITY—The goal of the National Ignition Facility is to produce ignition and energy gain in Inertial Confinement Fusion targets and perform high-energy-density and radiation-effects experiments in support of national security and civilian objectives. The National Ignition Facility would be a key component in the DOE's science-based Stockpile Stewardship Program to ensure the safety and reliability of the Nation's remaining stockpile of nuclear weapons. The National Ignition Facility would make it possible to study, for the first time in a laboratory, radiation and plasma physics at a temperature and pressure regime similar to some aspects of nuclear weapon detonations. It would also provide a unique source for the study of the weapon effects on other systems. The weapon science information generated through the National Ignition Facility experimentation and research would be used to examine specific physical effects of changes due to aging or remanufacturing, and to improve the computer codes needed to certify the reliability of the remaining stockpile. In addition, the National Ignition Facility could provide a high-fidelity source for weapon effects studies that is beyond the capabilities of any other laboratory source.

The National Ignition Facility would also advance civilian application for inertial confinement fusion. The National Ignition Facility ignition and gain experiments would determine whether the inertial fusion approach to a fusion energy source for long-range commercial use is feasible. The National Ignition Facility would be a key research facility that would help keep the United States the leader in the development of inertial fusion energy. The National Ignition Facility would also provide important basic scientific research and technological development capabilities. National Ignition Facility experiments would duplicate conditions in the center of the sun, which would promote and expedite advancements in astrophysics, plasma physics, and other basic sciences. Other advances that might be a result from National Ignition Facility use and research include large-scale precision optics, rapid crystal growth technology, advanced X-ray lithography for integrated circuit manufacturing, advanced health care technologies, new material development, and various scientific and analytical instrumentation.

The DOE has two proposed sites for the National Ignition Facility in Nevada. One is at the NTS in Area 22, southwest of Mercury. The proximity to Mercury would be advantageous for accessibility to infrastructure support that would be needed in support of National Ignition Facility activities. This location would also be advantageous for accessibility to the facility by commercial and other nondefense personnel that would require clearance prior to access of the forward areas of the NTS. All work that presents the potential for exposure or contamination would receive special consideration and planning, including, but not limited to, dry-run practices, condition monitoring experiments, and personnel protective equipment upgrade analysis. Existing equipment, such as anticontamination clothing and personnel protective equipment, would be available for use at the National Ignition Facility. This type of reusable equipment would be decontaminated on site at the laundering and cleaning facilities available at the NTS.

Located on an 80-acre site in the city of North Las Vegas, Nevada, the North Las Vegas Facility supports DOE/NV Operations Office and Lawrence Livermore National Laboratory, Los Alamos

National Laboratory, and Sandia National Laboratories weapons test programs and is considered an adjunct to the NTS. The facility supports test pre-staging activities and fabrication, assembly, and testing of field diagnostic systems that collect data from the NTS weapons testing activities. This facility is being considered as an alternative location for the National Ignition Facility.

Construction of the National Ignition Facility would occur on a 45-acre parcel of previously undisturbed land. Five new buildings would be constructed on this site. An underground water pipe line would likely be built to supply the National Ignition Facility. The design and construction of a storm drain system would depend on the specific layout of the facility and its proximity to existing roads and structures.

Sanitary wastewater would be treated using a sewage lagoon system dedicated to the National Ignition Facility. Nonhazardous solid waste would be handled on site in designated landfill areas. Hazardous wastes (liquid and solid) would be sent off site to permitted treatment, storage, and disposal facilities outside Nevada. Solid radioactive wastes could be disposed of at the NTS. Plans are under way for a low-level liquid waste treatment facility at the NTS. Current plans are to permit mixed solid waste disposal units at the NTS for wastes that meet Resource Conservation and Recovery Act land disposal restriction requirements. Low-level mixed liquid wastes could be stored at the Area 5 Radioactive Waste Management Site until an on-site treatment facility was available. If such a facility is not developed, low-level mixed liquid waste would be shipped to off-site facilities with appropriate treatment and disposal capabilities.

The North Las Vegas Facility has adequate site infrastructure to support the proposed National Ignition Facility without major modifications. About 3 million L/yr (0.8 million gal/yr) of water would be required for construction. The total raw water supply required for the National Ignition Facility operations would be about 153 million L/yr (40 million gal/yr), of which 18 million L/yr (4.8 million gal/yr) would be for domestic use. The water required for National Ignition Facility operations would be equivalent to an increase of 220 percent over the current usage of 69 million L/yr (18 million gal/yr). Sanitary wastewater volume is estimated to be 72.55 million L/yr (17.7 million gal/yr). Water supply and sanitary wastewater treatment are provided by the city of North Las Vegas. Current water and wastewater utility capacity would be adequate to meet the additional requirements for the proposed National Ignition Facility.

A.1.3.2 Stockpile Management. Stockpile management is the hands-on, day-to-day functions and operations involved in maintaining the enduring nuclear weapons stockpile. This includes assembly, disassembly, modification, and maintenance of nuclear weapons; quality assurance testing of weapons components; and the interim storage of nuclear weapons and components. Currently, the vast majority of this work is conducted at the Pantex Plant near Amarillo, Texas. Under Alternative 3, activities associated with stockpile management could be undertaken.

A.1.3.2.1 Construction of a Stockpile Management Complex—Under Alternative 3, Pantex stockpile management operations could be transferred to the NTS. Therefore, this alternative includes the construction of a full-scale stockpile management complex at the NTS. Relocation of Pantex operations to the NTS would require the construction of approximately 30,379 m² (327,000 ft²) of new facilities centered around the Device Assembly Facility in Area 6. These facilities would be necessary to perform the following operations:

- Disassembly of nuclear weapons
- Modification and maintenance and surveillance of nuclear weapons
- Quality assurance testing of weapons components
- Assembly of nuclear weapons
- Storage of strategic reserves of special nuclear material.

A.1.3.3 Nuclear Emergency Response. Activities would be the same as those described under Alternative 1.

A.1.3.4 Storage and Disposition of Weapons-Usable Fissile Materials. The DOE is responsible for management, storage, and disposition of weapons-usable fissile materials from the nation's nuclear weapons dismantlement and weapons production processes. Weapons-usable fissile materials include plutonium, highly enriched uranium, and other materials. These materials are currently stored at eight DOE sites across the nation: Pantex, Hanford, Idaho National Engineering Laboratory, Rocky Flats Plant, Savannah River Site, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Oak Ridge Reservation.

The DOE is in the process of preparing a Programmatic EIS to evaluate alternatives for long-term storage of all weapons-usable fissile materials and disposition of surplus weapons-usable fissile materials. Five sites, including the NTS, are under consideration for a consolidated long-term storage site. This Programmatic EIS is expected to be completed in 1996.

A.1.3.4.1 Storage of Weapons-Usable Fissile Materials—The NTS can develop the capability of storing weapons-usable fissile material that results from the output of the disassembly process. Two options have been investigated. One option involves the construction of either a new plutonium storage facility, or a new plutonium storage facility and a highly enriched uranium storage facility depending on the programmatic storage alternative selected. These facilities are proposed to be located in Area 6 near the Device Assembly Facility. This capability may limit other uses of the facility, but is a viable option. The changes required would be internal, with no major modifications to the building. The other option is to utilize one of the horizontal event tunnels as the monitored storage site. P-Tunnel has been proposed as a potential site. Other tunnels are available, however they would require extensive modification. The selected tunnel would have a new drift driven off the existing main access drift and would be dedicated to the storage of the device pits and/or other special nuclear material. An automatic retrieval system would be installed to be able to call the stored material up for periodic checking. The total operation would be conducted underground, minimizing security and safety issues. Little modifications would be needed to secure the P-Tunnel portal area. It is unlikely that previously undisturbed land would need to be used for the construction of security fences or any other security structures or facilities. P-Tunnel is 40 km (25 mi) from the proposed site slated for disassembly, so a transportation system would be required. The road and security infrastructure is in place and would require only some upgrade and maintenance. If a tunnel other than P-Tunnel were designated, the tunnel would require extensive upgrades to meet standards of safety, ventilation, and access in addition to inspections to assure the safety of the in-place work.

A.1.3.4.2 Disposition of Weapons-Usable Fissile Materials—There are three main categories for disposition of plutonium each with several alternatives. There are a range of facilities that could be constructed including pit disassembly/conversion, plutonium conversion, immobilization, mixed oxide fuel fabrication, and evolutionary light water reactor. Some of these are mutually exclusive. The Record of Decision for the Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS would only select the technology not the site. The large heavy-industrial facility, described in Section A.1.3.5, is representative of impacts that might be expected if the NTS were selected for example as a site for a mixed oxide fuel fabrication facility.

A.1.3.5 Large, Heavy-Industrial Facility. Under Alternative 3, an area has been set aside to be used by industrial facilities. For this EIS a large heavy-industrial facility has been assumed to determine maximum potential impact. A land disturbance of 600 acres and employment of 4,000 individuals are assumed for this facility. Those other resources required to support such a facility (e.g., water requirements, waste management requirements, and fuel requirements) were considered in the analysis of impacts resulting from construction and operation of this facility.

A.1.3.6 Tonopah Test Range Activities. Activities would be the same as those described under Alternative 1, with the addition of several potential tests included under this alternative.

A.1.3.6.1 Potential Tests—Activities could include those described under Alternative 1. Additional tests proposed under Alternative 3 could include the following:

- Robotics (handling, application, and recovery of hazardous [chemical] material)
- Smart Transportation - Preprogrammed/Remote Control Vehicles (air and ground)
- Smoke Obscuration Operations
- Thermal Test Operation Facility
- Climatic Test Operation Facility
- Armor/Anti-Armor Tests
- Infrared Tests
- Seismic Verification Studies
- Rocket Development, Testing and Deployment.

A.1.4 Alternative 4

Under Alternative 4, the DOE would discontinue all defense-related activities at the NTS. At the Tonopah Test Range, the same passive tests identified under Alternatives 1, 2, and 3 would be conducted related to the DOE, Albuquerque mission. Seismic verification impact tests and the following proposed tests would also be conducted under Alternative 4:

- Robotics (handling, application, and recovery of hazardous chemical material)
- Smart Transportation - Preprogrammed/Remote Control Vehicles (air and ground)
- Climatic Test Operation Facility.

A.2 Waste Management Program

The primary mission of the NTS Waste Management Program is to serve as a low-level waste disposal facility in support of the DOE. The NTS provides disposal capability for NTS-generated waste and other DOE-approved waste generators. The NTS will continue to store existing transuranic and transuranic mixed waste pending the opening of the Waste Isolation Pilot Plant. Hazardous waste will be accumulated and stored at the Resource Conservation and Recovery Act Part B permitted storage facility, and the majority will be sent off site for treatment or disposal after storage. Waste explosives will be treated in the Resource Conservation and Recovery Act Part B permitted Explosive Ordnance Disposal Unit. Hazardous waste from off site will not be accepted at the NTS. Mixed waste will be stored pending characterization and disposal certification activities. Closure of inactive waste sites will take place. The NTS waste management activities are conducted in four primary areas: Areas 3, 5, 6, and 11. The remainder of this section describes the types of wastes that are managed and the performance assessments that are in progress to support the management of radioactive wastes.

There is no long-term storage or disposal of hazardous, radioactive, or mixed waste on the Tonopah Test Range. All hazardous waste are shipped off site for ultimate disposition.

WASTE TYPES—Radioactive waste is 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. Mixed waste is 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 40 CFR Part 268.

Low-level waste is defined as 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 nanocuries per gram. Low-level mixed waste is low-level waste that also includes hazardous components as identified in 40 CFR Part 261, Subparts C and D.

Transuranic waste is 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 per gram. Transuranic mixed waste is waste containing both transuranic and hazardous components, as identified in 40 CFR Part 261, Subparts C and D.

Hazardous waste is waste that is designated as hazardous by the Environmental Protection Agency or State of Nevada regulations. Hazardous waste, defined under the Resource Conservation and Recovery Act, is waste from production or operation activities that pose a potential hazard to human health or the environment when improperly treated, stored, or disposed. Hazardous wastes are identified on special EPA lists or possess at least one of the four following characteristics: (1) ignitability, (2) corrosivity, (3) reactivity, and (4) toxicity.

Radioactive waste disposal operations began at the NTS in 1961. Radioactive, mixed, hazardous, and classified waste was disposed in select pits, trenches, landfills, and greater confinement disposal boreholes on the NTS. Near-surface burial (3 to 20 m deep [10 to 60 ft]) of low-level waste and low-level mixed waste in subsidence craters, pits, and trenches has been the historical practice at the NTS.

Greater confinement burial (33 to 40 m deep [70 to 120 ft]) was adopted as a concept in 1981 by the DOE for wastes that are not appropriate for near-surface disposal due to the radioactive exposure levels from the waste. Specifically, these waste types include certain high-specific-activity low-level waste (for example, fuel rod cladings and sealed sources), transuranic waste, and some classified wastes. Projected waste volumes were obtained from various sources depending on which alternative was described. Low-level waste projections were compiled from (1) waste generator forecasts provided to the DOE/NV per requirements in the waste acceptance criteria (DOE, 1992) the 1994 Baseline Environmental Management Report (DOE, 1995a); (3) the 1994 Integrated Data Base Report (DOE, 1994); and (4) the Draft Waste Management Programmatic Environmental Impact Statement (DOE, 1995b). Projected mixed waste volumes were obtained primarily from the DOE Headquarters database for the Mixed Waste Inventory Report and Baseline Environmental Management Report.

PERFORMANCE ASSESSMENTS—Waste management activities at the NTS have completed or are in the process of completing performance assessments. The assessments are as follows:

The Area 5 Radioactive Waste Management Site Performance Assessment (Shott et al., 1995)–addresses the post-1988 waste source term for the facility and was submitted to the DOE Peer Review Panel in August 1995 for technical review and recommendation. Panel review and dialogue are now in progress. Depending on the extent of the Peer Review Panel review comments and recommendations, the Area 5 report should be published by January 1997. The Area 5 Radioactive Waste Management Site Composite Analysis will include the pre-1988 waste source-term analysis, as stated in the Implementation Plan, Defense Nuclear Facilities Safety Board Recommendation 94-2 (DOE, 1995c). Refer to Volume 1, Section 2.5.6 for more information on Performance Assessments and Composite Analyses.

Fernald Byproduct Waste Performance Assessment–Operable Unit 4 vitrified silo wastes from Fernald are being evaluated for disposal at the NTS in deeper confinement disposal configurations, under Chapter III of DOE Order 5820.2A, as a small quantity of byproduct material. The Fernald Byproduct Waste Performance Assessment is currently in progress and is scheduled for draft completion by September 1996.

Operable Unit 4 vitrified silo wastes are characterized by high-specific activity and longer-lived radionuclides (such as uranium, thorium, and their daughter products). Selection of the NTS for disposal of the Operable Unit 4 vitrified silo waste is supported by very favorable site-specific characteristics, particularly the "no groundwater pathway" conceptual model, and by very low population density. Scientists predict no movement of direct rainfall through waste cells to the deep groundwater because of the presence of thick, dry sediments and rock in combination with very low precipitation levels and high evapotranspiration rates (Shott et al., 1995). Treatability studies conducted on the vitrified waste form indicate that the vitrified waste fully satisfies NTS waste acceptance criteria and may provide a higher level of long-term protectiveness (DOE, 1993) (Battelle, 1994). Performance assessment analyses will rigorously test various disposal scenarios over a 10,000-year period. The limiting analysis for waste acceptance for disposal is expected to be the inadvertent human intruder dose assessment.

The Area 3 Radioactive Waste Management Site Performance Assessment—will address the post-1988 waste source terms for the facility and is scheduled for submittal to DOE Headquarters in March 1998.

Site-characterization of Area 3 in 1996 focuses on completion of a 152-m (500-ft) exploratory borehole beneath subsidence crater U-3bh (a reserve low-level waste cell at the Area 3 Radioactive Waste Management Site). The primary objective of the exploratory borehole in Area 3 is to characterize the physical and hydrologic properties of the chimneys and to assess the potential for downward groundwater movement and radionuclide transport. 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 23 (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. Refer to Volume 1, Section 2.5.6 for more information on Performance Assessments and Composite Analysis.

Transuranic Waste Performance Assessments—Two transuranic waste performance assessments are in review or preparation stages: (1) Greater Confinement Disposal Performance Assessment within the Area 5 Radioactive Waste Management Site and (2) Transuranic Waste in Trench T04C Performance Assessment (Area 5 Radioactive Waste Management Site). Each transuranic waste performance assessment evaluates individual transuranic source-term contributions within the Area 5 Radioactive Waste Management Site facility operation based on the containment performance objective, at a minimum. The rationale for this comparison is that the containment standard is the most limiting of the three quantitative standards given in EPA regulation 40 CFR Part 191: containment, individual protection, and groundwater, described briefly as follows (Price et al., 1993):

- The containment requirement assesses the probability of cumulative releases of radionuclides to the accessible environment over 10,000 years, considering all significant processes and events that might affect the disposal system. The accessible environment consists of any point in the subsurface that is 5 km (3 mi) beyond the waste unit and any point on the ground surface. The limit on cumulative releases depends on the initial radionuclide inventory
- Individual protection requirements are designed to protect individuals for 1,000 to 10,000 years after closure of the disposal site

(the compliance period is dependent on site-specific conditions). They place limits on the annual dose equivalent received by any member of the public as a result of the disposal system. These limits are 25 milliroentgen equivalent man (mrem) to the whole body and 75 mrem to any critical organ. All potential pathways from the disposal system to people must be considered

- Groundwater protection requirements are designed to protect specific aquifers in the vicinity of the disposal site by placing limits on concentrations of radionuclides in sources of groundwater. In addition, they place limits on the annual dose equivalent received by an individual as the result of drinking water from these specific aquifers. The regulatory period for evaluation is 1,000 or 10,000 years, depending on site-specific conditions.

In 1980, the DOE realized the need for developing a disposal configuration to manage a portion of low-level waste that is unsuitable for shallow land burial because of its high specific activity or potential for migration into biopathways. In 1981, the DOE began investigating the technology referred to as greater confinement disposal. This technology was also developed in light of the concern for inadvertent human intrusion into an abandoned disposal facility. Although the scenario for inadvertent intrusion was considered unlikely, this alternative disposal method was investigated to reduce the probability of occurrence. The DOE/NV began a project to determine the feasibility of burial at depths greater than are normally provided in shallow land burial. To begin the feasibility test, a 3 m (10 ft) diameter x 37 m (120 ft) deep borehole was drilled. Instrument lines were emplaced in the borehole, and other smaller diameter boreholes were drilled around the central waste shaft. The borehole was filled with high specific activity waste and then backfilled with 18 m (60 ft) of cover material. Short-term monitoring of this borehole appeared adequate, and the disposal method became a practiced disposal method at the Area 5 Radioactive Waste Management Site. Greater confinement borehole disposal practices have ceased due to the state of Nevada's implementation of EPA regulations with regard to Class 5 Injection Wells. Designs for disposal configurations at depths that minimize or eliminate environmental intrusion and that will not be defined as injection wells are currently under consideration.

<u>Greater Confinement Disposal Performance Assessments</u>—The performance of the Greater Confinement Disposal site, situated within the Area 5 Radioactive Waste Management Site, was compared to the containment standard for the disposal of transuranic waste given in EPA regulation 40 CFR Part 191. In 1991, the first iteration of this performance assessment was completed and is documented in three volumes of the Preliminary Performance Assessment (Price et al., 1993). Performance assessment under 40 CFR Part 191 is iterative, that is, repetitions of the analysis are conducted until compliance or noncompliance is demonstrated with adequate confidence, based on a sensitivity or uncertainty analysis. Subsequent characterization and analyses have refined the Preliminary Performance Assessment and are documented in the Second Performance Assessment Iteration (Baer et al., 1994). The final performance assessment iteration is currently in preparation and is scheduled for draft completion in March 1997; final report completion is expected in August 1997. Based on the second performance assessment iteration, the Greater Confinement Disposal Unit was in compliance with the containment standard for limits on cumulative releases of radiation to the accessible environment.

<u>Transuranic Waste in Trench TO4C Performance Assessment</u>—The performance of the transuranic waste in Trench T04C within the Area 5 Radioactive Waste Management Site was compared to the containment and individual protection requirements given in EPA regulation 40 CFR Part 191 in Fiscal Year 1995. The transuranic waste disposed in Trench T04C was received from Rocky Flats in 1986. Preliminary performance assessments documented by Price (1993) and Baer et al. (1994) indicated that this disposal method has not met the performance objectives as defined in 40 CFR Part 191. Further analysis is required to determine the appropriate action for transuranic wastes currently emplaced in trench T04C. Possible actions include closure in place if performance

objectives can be met, or retrieval and subsequent disposal in a system that meets the 40 CFR Part 191 performance objectives.

A.2.1 Alternative 1

Under Alternative 1, ongoing Waste Management Program activities at the NTS would continue at current levels. No significant new initiatives or projects are included under this alternative.

A.2.1.1 Area 3 Radioactive Waste Management Site. A portion of Area 3 is reserved as a low-level waste disposal site under regulatory provisions derived from the Atomic Energy Act. The area has been designated as the Area 3 Radioactive Waste Management Site and includes seven subsidence craters created from underground nuclear weapons tests. Bulk low-level waste is disposed of in these subsidence craters. Waste management facilities are described in the following manner. The most basic is the cell, which includes trenches, pits, and craters. These are grouped together to make up units, such as the 20 cell Mixed Waste Disposal Unit. Units are placed in Radioactive Waste Management Sites such as the ones in Areas 3 and 5. The Area 3 Radioactive Waste Management Site encompasses approximately 128 acres of land and two support buildings located within the allocated boundaries of the facility. Two craters (U-3ax and U-3bl) were combined into one disposal cell that is completely filled. Two other craters (U-3ah and U-3at) were also combined into one disposal cell that was approximately half-full at the beginning of Fiscal Year 1995. This disposal cell (U-3ah/at) has been operating as a low-level disposal unit since 1988. Three other craters (U-3bh, U-3az, and U-3bg) remain for use as future disposal cells if necessary.

The Area 3 Radioactive Waste Management Site serves the NTS and approved off-site generators as a bulk, low-level waste disposal facility. Disposal cell (U-3ah/at) has a remaining capacity of approximately $1.7x10^5$ cubic meters (m^3) ($6x10^6$ cubic feet [ft^3]). Under Alternative 1, this capacity is insufficient to handle forecasted waste volumes for the next 10 years; therefore, it is anticipated that one additional disposal cell (U-3bh/az) and no additional support facilities would need to be opened. The new disposal cell would have an estimated capacity of $2.8x10^5$ m^3 ($1x10^7$ ft^3) and would receive $9x10^4$ m^3 ($3.2x10^6$ ft^3) during the 10-year period. Under this alternative, it is projected that the Area 3 Radioactive Waste Management Site will receive approximately $2.6x10^5$ m^3 ($9.2x10^6$ ft^3) during the 10-year period defined for this EIS.

One disposal cell (U-3ax/bl) is filled to capacity and is required to be closed under Resource Conservation and Recovery Act and staté of Nevada hazardous waste regulations due to hazardous waste constituents known to be present. This disposal cell was operated according to the requirements of the Atomic Energy Act, prior to the NTS implementation of Resource Conservation Recovery Act regulations and has been declared a mixed waste disposal cell. The DOE/NV is developing a site-specific plan for closure activities at Area 3. This plan, part of the Integrated Closure Plan, describes a closure cap design that would take into consideration the climate, geology, surface water and regional hydrology, and waste forms. This project, part of the Integrated Closure Program, has investigated the most optimum design for closure cap integrity in the arid NTS environment. Closure performance standards, which are the minimum maintenance requirements for the protection of human health and the environment, are also under development. Minimization or elimination of contaminant release and compliance with the applicable regulations and DOE orders will be considered. Closure of disposal cell U-3ax/bl will occur in the near future upon state approval of the Resource Conservation and Recovery Act closure plan. Under Alternative 1, one additional disposal cell (U-3ah/at) will also be closed.

A.2.1.2 Area 5 Radioactive Waste Management Site. In 1961, an area northwest of Frenchman Lake was reserved as a low-level waste disposal site under regulatory provisions derived from the Atomic Energy Act. In 1977, the area was designated the Area 5 Radioactive Waste Management Site and began controlled waste management operations.

<u>DISPOSAL OPERATIONS</u>—Operations at the Area 5 Radioactive Waste Management Site include low-level waste and limited mixed waste disposal. The

Area 5 Radioactive Waste Management Site encompasses 732 acres of allocated land, of which 92 acres are currently being used for storage and disposal. Low-level and certain mixed wastes may be disposed via shallow land burial in pits and trenches. Trench T03U, T07C, T08C, & T09C and Pits P06U, and P05U are the landfill cells open (Fiscal Year 1995) for low-level waste disposal. Pit P03U is available for mixed waste disposal. Under this alternative, the anticipated low-level waste volume is 9.0×10^4 m³ (3.2×10^6 ft³) and the anticipated mixed waste volume is 500 m³ (18,000 ft³). The existing capacity will meet the disposal needs of low-level waste expected to be generated under this alternative. Greater confinement disposal technology would continue to be pursued for disposal of high specific activity low-level waste.

The current inventory of mixed waste disposed in Pit P03U at the Area 5 Radioactive Waste Management Site is 8,024 m³ (2.8×10^5 ft³). Pit P03U is currently operating under Resource Conservation and Recovery Act Interim status for disposal of mixed waste. This waste must meet the Resource Conservation and Recovery Act Land Disposal Restriction requirements prior to disposal. Pit P03U has 9.1×10^4 m³ (3.2×10^6 ft³) of remaining capacity available for disposal, which should meet the disposal needs of low-level mixed waste expected to be generated under this alternative. Therefore, the Mixed Waste Disposal Unit would not be expanded under Alternative 1.

The remaining capacity for the Area 5 Radioactive Waste Management Site low-level waste disposal pits and trenches is 1.1×10^6 m³ (4.0×10^6 ft³). No sanitary landfill construction or disposal activities would occur in Area 5 under this alternative.

<u>STORAGE OPERATIONS</u>—Under this alternative, the Area 5 Transuranic Waste Storage Pad and the Hazardous Waste Storage Unit would continue to be used to store waste. However, the proposed Mixed Waste Storage Pad would not be constructed, and the Hazardous Waste Storage Unit would not be expanded.

Low-level mixed waste is currently stored on the Transuranic Waste Storage Pad in accordance with requirements of the January 14, 1994, Mutual Consent Agreement between the state of Nevada and the DOE. The agreement allows for the storage of on-site generated mixed waste until it can be treated to meet the Land Disposal Restrictions for disposal. There were 76 m³ (2,698 ft³) of mixed waste stored on the Transuranic Waste Storage Pad at the beginning of Fiscal Year 1995. The Transuranic Waste Storage Pad Cover Building, Bldg. S-29, which has 1,765 m² (18,900 ft²) of usable storage space, provides protection from environmental degradation of the transuranic waste containers.

The Hazardous Waste Storage Unit is a Resource Conservation and Recovery Act-permitted facility. The Hazardous Waste Storage Unit was originally constructed as a less-than-90-day hazardous waste storage unit and consists of a 9.1 m x 30.3 m (100 x 300 ft) curbed impervious concrete pad with a cover and a maximum storage capacity of 61,625 liters (L) (16,280 gallons [gal]) of containerized waste. Hazardous waste generated on the NTS would be accepted for storage at the Hazardous Waste Storage Unit for less than one year and then shipped off site for ultimate disposition.

In Area 5, transuranic mixed waste is stored on a 2.05-ac asphalt storage pad, the Transuranic Waste Storage Pad, with a design capacity of 1,140 m³ (39,800 ft³). At the beginning of Fiscal Year 1995, there were 612 m³ (21,613 ft³) of transuranic mixed waste stored at the Area 5 Radioactive Waste Management Site. All of this waste was received from the Lawrence Livermore National Laboratory. The DOE manages the current inventory of the transuranic mixed waste in accordance with the requirements of the Settlement Agreement (June 22, 1992) between the DOE and the state of Nevada, 1992. The transuranic mixed waste would continue to be stored at the Area 5 Radioactive Waste Management Site pending development of on-site characterization capability for acceptance of the waste at a DOE-designated disposal site, when one is approved.

<u>WASTE CERTIFICATION OPERATIONS</u>—Certification activities for waste acceptance would continue under existing methods. Waste characteristics of mixed waste would be identified through generator-supplied analytical data, split

samples, and expressed acceptance of the contents of the waste package as noted in the on-site generator's report and waste manifest. No waste certification facilities would be constructed under this alternative. Waste certification activities required to meet the Waste Isolation Pilot Plant waste acceptance criteria would not be conducted, and the transuranic mixed waste would be shipped to other DOE sites for certification, handling, and disposal.

CLOSURE OPERATIONS—Area 5 currently has low-level, mixed, and classified waste disposal units filled to capacity and available for closure according to DOE and EPA regulatory requirements. Filled waste Pits P01U and P02U and Trenches T01U, T02U, T04U, T06U, and T07U contain low-level waste disposed of prior to 1987 under the requirements of the Atomic Energy Act. Because mixed waste is suspected in these landfills, the entire group would be closed in compliance with Resource Conservation and Recovery Act regulations. The greater confinement disposal boreholes, used for the disposal of highly mobile, classified, or highly radioactive waste forms, would also be closed in accordance with Resource Conservation and Recovery Act regulatory requirements. Pit P04U, opened in 1988, has received only low-level waste and needs to meet only the closure requirements of the DOE orders.

The DOE/NV is developing a site-specific design for closure of Area 5 that would take into consideration the climate, geology, surface water and regional hydrology, and waste forms. This project, the Integrated Closure Program, would investigate the most optimum design for successful closure integrity in the arid NTS environment. Closure of the existing 92-acre Area 5 facility would not occur until after the end of the active life of this area, beyond the scope of this EIS. A number of alternatives are being considered, from one large closure cap for the entire Area 5 Radioactive Waste Management Site to independent caps. Closure performance standards include minimum maintenance requirements, protection of human health and the environment, minimization or elimination of contaminant release, and compliance with the applicable federal and state regulations and DOE orders.

A.2.1.3 Area 6 Waste Management Operations. The NTS would continue to store polychlorinated biphenyl (PCB) waste, in accordance with the Toxic Substance Control Act and state of Nevada regulations. All PCB waste would continue to be disposed off site at EPA-permitted facilities.

Low-level and mixed waste effluent generated by the Nevada Environmental Management and Defense Program activities would be treated at the Liquid Waste Treatment System facilities to be located in Area 6. Initially, there would be two 1.9×10^6 L (5×10^5 gal) double-walled steel evaporation tanks for low-level wastes. However, if mixed wastes were encountered, one of the tanks would be designated as a mixed waste treatment tank. The initial phase of the site would consist of the two double-walled steel tanks, a leak detection system, yard lights, a mobile-home-type trailer to house offices and monitoring equipment, access control features, fencing, and storm water protection. If required, the facility could ultimately be expanded to handle up to1.5×10^7 L/yr (4.0×10^6 gal/yr).

The hydrocarbon landfill is a state of Nevada-permitted Class III disposal site located near the southern edge of Area 6. The landfill would continue to be used for the sole purpose of discarding hydrocarbon-burdened soil, septic sludge, and debris. Resource Conservation and Recovery Act regulated wastes are not accepted for disposal. The minimum remaining capacity of the disposal site is approximately 42,000 m^3 (1.5×10^6 ft^3). Approximately 15,290 m^3 (5.4×10^5 ft^3) of soil, sludge, and debris have been disposed of in the hydrocarbon landfill.

A.2.1.4 Area 11 Explosive Ordnance Disposal Unit. The Area 11 Explosive Ordnance Disposal Unit is a thermal treatment unit rather than a disposal unit. Explosive ordnance wastes, regulated as characteristic reactive hazardous wastes under the Resource Conservation and Recovery Act, are detonated at the Explosive Ordnance Disposal Unit. The Explosive Ordnance Disposal Unit was first used in 1965 and continues to operate as a permitted Resource Conservation and Recovery Act treatment unit. The Explosive Ordnance Disposal Unit consists of a detonation pit surrounded by an earthen pad (approximately 8 m [25 ft] x 31 m [100 ft]) and ancillary equipment, including a bunker and an electric shock box. The Explosive Ordnance Disposal Unit has a maximum operating capacity to treat 45 kg (100 lb) per hour or an annual capacity of 1,873 kg (4,100 lb). No explosive waste is received from outside Nevada. The Explosive Ordnance Disposal Unit has an unofficial buffer zone of approximately 503 acres in a circular area.

A.2.2 Alternative 2

Under this alternative, Waste Management Program activities would be shut down. After shutdown, on-site monitoring and security functions would be reduced and would become part of the sitewide monitoring activity.

A.2.2.1 Area 3 Radioactive Waste Management Site. No waste closure or disposal operations would take place. Facilities would be secured, and overall NTS monitoring would take place.

A.2.2.2 Area 5 Radioactive Waste Management Site. No waste disposal, storage, closure, or certification operations would take place. Facilities would be secured, and overall NTS monitoring would take place. No waste certification operations would take place. All activities that generate mixed waste would cease. Containerized mixed, and transuranic mixed waste would be sent to other DOE facilities for certification and treatment to meet Resource Conservation Recovery Act land disposal restriction requirements (as applicable). All operational landfill units would receive a 1.2 m (4 ft) cover of compacted native soil.

A.2.2.3 Area 6 Waste Management Operations. No waste storage or treatment operations would take place. Facilities would be secured, and overall NTS monitoring would take place.

A.2.2.4 Area 11 Explosive Ordnance Disposal Unit. No waste treatment operations would take place. Facilities would be secured, and overall NTS monitoring would take place.

A.2.3 Alternative 3

The Waste Management Program under Alternative 3 would include the activities described under Alternative 1, with an increase in scope to reflect alternatives considered in the Draft Waste Management Programmatic Environmental Impact Statement.

A.2.3.1 Area 3 Radioactive Waste Management Site. Three additional low-level waste disposal units would need to be prepared to accept a total projected bulk waste volume of $7.5x10^5$ m^3 ($2.6x10^7$ ft^3). This volume increase is due to accepting waste from more off-site generators than are currently approved, as well as accepting an increased amount of NTS-generated waste from the site environmental cleanup activities anticipated under this alternative. One additional support building would be constructed to expand the existing support Building 3-302. The expanded facility would almost double the size of Building 3-302 by providing a portable, prefabricated structure, that includes electrical and water systems. This construction project would be a short-duration low-labor task.

Bulk contaminated soils and other debris would be delivered by haulers from environmental restoration sites. These haulers would need to be surveyed and might need to be cleaned to ensure they are free from radioactive contamination prior to release from the site. Depending upon the levels of contamination encountered, there could be the need to construct a truck decontamination facility so that haulers could be cleaned prior to release from the Area 3 Radioactive Waste Management Site.

In addition to the closure activity described under Alternative 1, the additional low-level waste disposal cells (U-3bh, U-3az, and U-3bg) would become filled and would then need to be closed. Increased volumes would come from additional off-site generators (including the worst-case volume from the treatment of surplus, highly enriched uranium), as well as NTS environmental cleanup operations. The total projected volume for the 10-year consideration period to be disposed of in Area 3 is 7.5×10^5 m^3 (2.6×10^7 ft^3). This volume would be enough to completely fill the new disposal cells, in addition to the existing capacity remaining in disposal cell U-3ah/at. Even though disposal cell U-3ax/bl is declared a mixed waste disposal cell, and disposal cells U-3ah/at and U-3bh, U-3az, and U-3bg would be radioactive only disposal cells, the same or a similarly approved closure plan would be used to protect the environment by implementing the best available technology. The performance of the disposal cell U-3ax/bl closure system would be used to consider any changes that might be necessary in the closure of cell U-3ah/at.

A.2.3.2 Area 5 Radioactive Waste Management Site. Under Alternative 3, Area 5 waste management operations would be expanded and reflect the regionalized waste management concept for the DOE complex. In addition to increasing waste capacity, facilities for the on-site treatment and certification of NTS-generated or stored wastes would be constructed.

DISPOSAL OPERATIONS—Radioactive and mixed waste disposal operations would be increased to meet the demand of the additional DOE-approved generators shipping waste to the NTS. P05U, P06U, and T03U in the Area 5 Radioactive Waste Management Site would be filled to capacity. Pit P04U, was filled to capacity during 1995. Under Alternative 3, two additional low-level waste disposal cells in the Area 5 Radioactive Management Site would be opened in the next 10 years to dispose of the projected volumes of 2.5×10^5 m^3 (8.8×10^6 ft^3). Disposal capability for low-level waste inappropriate for shallow land disposal would be expanded.

Pending the approval of a modification to the Resource Conservation and Recovery Act Part B Permit application, 20 mixed waste disposal cells would be prepared to address the projected waste volumes of 3×10^5 m^3 (1.1×10^7 ft^3) requiring disposal under this alternative in the next 10 years. The Area 5 Resource Conservation and Recovery Act Part B Permit would be revised to address the additional mixed waste disposal capacity. Owing to these projected volumes, additional facilities and infrastructure would have to be constructed. Additional facility information is described below in Storage Operations. Pit P03U would not be used for the disposal of mixed waste under Alternative 3.

STORAGE OPERATIONS—A low-level waste storage unit would be constructed under Alternative 3. The low-level waste storage would be a curbed concrete pad located at the Area 5 Radioactive Waste Management Site. Most of the pad would be covered with a roof. The uncovered portion would serve as an unloading platform and as an additional storage area for solid material. The pad would provide approximately 279 m^2 (3,000 ft^2) of storage area for waste awaiting examination prior to disposal. Storage would also be made available for the DOE sites that do not have adequate storage capacity.

The hazardous waste storage unit under Alternative 3 would be increased to 0.138 acres in size, with a capacity of 208,175 L (55,000 gal) to address the additional needs of the NTS Defense and Environmental Restoration Programs. The NTS Resource Conservation and Recovery Act Part B permit application would be modified to address the additional storage capacity.

A mixed waste storage unit is planned to be constructed pending the approval of the Resource Conservation and Recovery Act Part B Permit application. The mixed waste storage unit would be an epoxy-coated, curbed, concrete pad located inside the existing Area 5 Radioactive Waste Management Site. Most of the pad would be covered with a roof. The uncovered portion would serve as an unloading platform and as an additional storage area for solid material. The pad would provide approximately 279 m^2 (3,000 ft^2) of storage area. The pad would serve the expanded needs of the Environmental Restoration and Defense Programs activities. The unit would store mixed waste in need of technology development and facility construction that can properly reclaim, recycle, treat, or dispose of the waste. Currently, mixed waste that cannot be disposed of in Pit P03U of the Area 5 Radioactive Waste Management Site is stored on the transuranic waste storage pad in the Area 5 Radioactive Waste Management Site. This storage pad would operate under a Mutual Consent Agreement between the DOE and the state of Nevada. In addition, the pad would be available, pending approval from the State, for sites requiring emergency assistance for storage of DOE mixed waste for up to 1 year.

The NTS transuranic and transuranic mixed waste would be stored, certified, and eventually transported to the Waste Isolation Pilot Plant when it becomes operational. A transuranic waste examination facility would be constructed to handle breaching and certification of this waste before it is transported to a designated disposal facility. The Transuranic Waste Storage Pad Cover Building (Bldg. S-29) would serve as the loading facility.

TREATMENT AND CERTIFICATION OPERATIONS—A waste examination facility comprised of the waste breaching and sampling building and the real-time radiography building would be constructed. The waste breaching and sampling building would be used to conduct on-site verification and certification of mixed wastes that are accepted for disposal at the Areas 3 and 5 Radioactive Waste Management Sites. This facility would house a breaching room for opening and viewing waste, a sampling facility for the collection and preparation of samples for chemical and radiochemical analysis, and an office and shower/change room. Remote package handling and decontamination capability would be included. Waste determined to be mixed through these verification activities would be returned to the waste storage area for further disposition or, if conditions warrant, returned to the generator if unacceptable.

A real-time radiography building would be constructed at the Area 5 Radioactive Waste Management Site and operated by the DOE/NV in conjunction with the waste breaching and sampling building to conduct verification of mixed waste received at the Areas 3 and 5 Radioactive Waste Management Sites. Real-time radiography imagery is a nondestructive, noninvasive method used to provide preliminary package examination before breaching questionable packages for waste sampling. Detection of unacceptable conditions within the waste package would enable the package to be opened and the unacceptable item(s) either to be removed or other appropriate action to be taken. The facility would be designed to process approximately 2,832 m^3 (100,000 ft^3) of waste per year.

The transuranic waste certification building would be constructed to certify NTS and off-site-generated transuranic waste for shipment to a designated DOE disposal facility (i.e., Waste Isolation Pilot Plant). The facility would be used for the breaching, sampling, inspecting, and repackaging of transuranic waste containers and would process approximately 82 m^3 (2,896 ft^3) of waste annually.

A treatment facility for the solidification of the cotter concentrate waste would be constructed in Area 5. This material residue from uranium ore processing that was sent to the NTS for storage from the DOE Mound Plant in Miamisburg, Ohio, in 1987, is known to contain uranium, thorium, and protactinium. These concentrates were once considered a valuable resource for source material. This solidification facility is planned for the treatment of the 1,244 fifty-five gallon containers of cotter concentrate mixed waste currently in storage at the Area 5 Radioactive Waste Management Site. Cementation was the treatment of choice for the majority of the waste, based on criteria such as feasibility, radiation dose to personnel, and cost. Eight of the containers from population B would require incineration.

CLOSURE OPERATIONS—Filled and unnecessary mixed, and greater confinement disposal waste disposal units would be closed under Alternative 3. The Integrated Closure Program recommendations would be followed with the approval of the state of Nevada. Details described under Alternative 1 apply to this alternative. A minimum of two additional low-level waste disposal units opened to accommodate the expanded use waste volumes would not be closed unless they reach disposal capacity during this activity period covered by this EIS.

SITE IMPROVEMENTS—Because the design and load limits of the existing roads are not for the number of expected waste shipments, the following upgrades would occur under Alternative 3. Either the 5-01 road would be repaired and widened, or the 5-07 road would be modified and redirected to provide adequate access to the Area 5 Radioactive Waste Management Site. This construction would be necessary to enhance the roads and provide safe access to the disposal site.

A new controlled access building would be constructed at the Area 5 Radioactive Waste Management Site under Alternative 3. This building would provide access security and personnel accountability to the site from road 5-01, the main entrance. All NTS personnel and visitors would need to be cleared through the entrance. Identifying people through the gate would provide accountability of all personnel on site at any time and would be especially useful under emergency situations.

The equipment maintenance and storage building would include a storage area for earthmoving equipment and light-duty machinery and would provide a sheltered work area for the three workers. The facility would be built in close proximity to the existing maintenance shed. The new facility would have approximately 297 m² (3,200 ft²) of space.

A water supply line that would connect the Area 5 Radioactive Waste Management Site with the main supply line near Mercury Highway would be constructed under Alternative 3. This supply line would provide the site with a constant source of water, thereby eliminating the need for daily trucking of water. The two 227-m³ (60,000-gal) water storage tanks would remain in use to provide an emergency supply should the new line become inoperable.

A flood protection dike and channel would be constructed to protect the Area 5 Radioactive Waste Management Site. This flood diversion system is expected to be an approximately 4,725-m (15,500-ft) long horseshoe-shaped barrier around the planned mixed waste disposal unit area and the existing Radioactive Waste Management Site. Another construction project designed to assist with fire protection for the site consists of laying underground water lines with a number of regularly spaced fire hydrants. The system would encircle the existing 92 acres of the Area 5 Radioactive Waste Management Site and would be extended to encircle the area of the future mixed waste units. The existing communication system would be expanded and modified to provide enhanced coverage for the site and better capabilities for communication to link to off-site locations. The communication system expansion would ensure the Area 5 Radioactive Waste Management Site reporting capabilities in emergency situations.

A Class I or Class II sanitary landfill would be constructed in Area 5 to serve the needs of the expanded Defense and Environmental Restoration Programs activities as well as serve the needs of neighboring rural counties. This landfill would receive construction and sanitary waste, and would have an approximate capacity of 424,753 m³ (1.5 x 10^7 ft³). It is proposed that the landfill would use an existing borrow pit that is approximately one-half mile north of the Mercury Highway and adjacent to Road 5-01 (east side). The disturbed area for this site would be approximately 15 acres. Borrow pit activities have already disturbed this area.

A.2.3.3 Area 6 Waste Management Operations. The NTS would continue to store PCB waste in compliance with applicable regulations, as would occur under Alternative 1.

The liquid waste treatment system would operate as described under Alternative 1. Mobile treatment units would be used on potential mixed waste streams that require further characterization prior to deciding the appropriate treatment option. Plans and schedules for characterizing these wastes, undertaking technology assessments, and providing the required plans and schedules for developing treatment capacity would be described in accordance with the requirements of the Federal Facility Compliance Act. As the Defense and Environmental Restoration Program activities continue at the NTS, mobile treatment units that can address lead encapsulation technology would be considered, at a minimum.

A.2.3.4 Area 11 Explosive Ordnance Disposal Unit. Treatment operations under Alternative 3 would increase to a level near maximum capacity, as described under Alternative 1, for handling explosive waste.

A.2.4 Alternative 4

Waste Management Program operations and construction would include the activities described under Alternative 3, but scaled back to provide service solely for DOE/NV waste generated within Nevada.

A.2.4.1 Area 3 Radioactive Waste Management Site. Under Alternative 4, the Area 3 Radioactive Waste Management Site disposal crater (U-3ah/at) would be adequate to meet the projected Nevada-generated waste volume needs of 150,000 m^3 (5.3×10^6 ft^3). Only closure of cell U-3ax/b1 would take place under this alternative.

A.2.4.2 Area 5 Radioactive Waste Management Site. Under Alternative 4, disposal of mixed waste would continue at the NTS for only those DOE/NV waste generators within the state of Nevada. Accordingly, waste volumes would be reduced from Alternatives 1 and 3 levels to 336 m^3 (11,900 ft^3) of low-level waste and 500 m^3 (18,000 ft^3) of mixed waste. No additional mixed waste disposal cells would need to be prepared to dispose of these projected waste volumes. Waste disposal cell closure activities would be the same as those described for Alternative 3.

NTS transuranic and transuranic mixed waste would continue to be stored, pending development of transuranic waste certification capabilities in the DOE complex. When such capability is available, this waste would be shipped off site for completion of certification activities and eventual shipment to the Waste Isolation Pilot Plant. Under Alternative 4, the hazardous waste storage unit would remain at the same capacity level as described under Alternative 1. The mixed waste storage pad would not be constructed under this alternative. Mixed waste storage would continue to take place on the transuranic waste storage pad.

No waste certification facilities would be constructed under this alternative. Certification activities for waste acceptance would continue under existing methods, as described under Alternative 1. The following facility construction activities described under Alternative 3 would be conducted under Alternative 4:

- Access Control Building
- Water Supply Line
- Maintenance Building
- 5-07 Road Reconfiguration
- 500-year Flood Protection
- Fire Protection Utilities
- Communication System.

Construction and operation of the mixed waste treatment facility for solidification of cotter concentrate waste would occur as described in Alternative 3.

A.2.4.3 Area 6 Waste Management Operations. Waste management activities at Area 6 would be identical to those described under Alternatives 1 and 3.

A.2.4.4 Area 11 Explosive Ordnance Disposal Unit. Treatment operations under this alternative would decrease owing to the loss of the majority of NTS explosive waste generators.

A.3 Environmental Restoration Program

In November 1989, the Secretary of Energy established the Office of Environmental Restoration and Waste Management to improve the management of remediation, waste management, and facility decommissioning by consolidating these missions into one office. In Nevada, environmental restoration activities are under the auspices of the Environmental Restoration Division and are managed as the Nevada Environmental Restoration Project. The DOE is committed to assessing and remediating contaminated sites, complying with all applicable environmental regulations and statutes, and protecting the public and workers' health and safety.

The specific activities under the Environmental Restoration Program are identified as follows:

- Underground Test Area Project
- Soils Media Project (including portions of the Nellis Air Force Range [NAFR] Complex)
- Industrial Sites Project
- Decontamination and Decommissioning Project
- Defense Nuclear Agency industrial sites
- Tonopah Test Range industrial sites
- Central Nevada Test Area
- Project Shoal Area.

The Defense Nuclear Agency sites are being identified as part of the Environmental Restoration Program because Defense Nuclear Agency site activities entail environmental remediations. However, it should be noted that the Defense Nuclear Agency is responsible for the operations, as well as the funding. It is, in this sense, a Work for Others Program project.

A.3.1 Alternative 1

Under this alternative, the DOE/NV would continue following the current scope of environmental restoration work identified in the Nevada Environmental Restoration Cost, Schedule, and Technical Baseline, and milestones as identified in Appendix III of the Federal Facility Agreement and Consent Order.

A.3.1.1 Underground Test Area Project. The Nevada Division of Environmental Protection regulates DOE Nevada's corrective actions through the Federal Facility Agreement and Consent Order. Appendix VI of the agreement, the Corrective Action Strategy, describes the processes that will be used to complete corrective actions, including those in the Underground Test Area Project. Individual sites covered by the agreement are known as Corrective Action Sites, and they are grouped into Corrective Action Units. The Underground Test Area Project is comprised of six Corrective Action Units, generally reflecting the distinct geographic locations and geologic and hydrologic environments of the weapons testing areas.

Because of the complexity and scale of the NTS, the Underground Test Area Project Corrective Action Investigation was separated into two major phases. During Phase I, project activities have been focused on a regional investigation. During Phase II, work scope focusing on the Corrective Action Units will be conducted.

Phase I consists of assessing existing data, developing geology, groundwater flow and solute transport models, and conducting risk assessment. Field activities include the use of new and existing wells for monitoring and testing to help develop transport models. Some new wells would be installed near shot cavities to collect data about the near-field environment. A key portion of the data assessment activities is the completion of a preliminary risk assessment to provide input to a value-of-information analysis that would identify and prioritize potential future data needs. The results of Phase I would be directly used in the work scope for the weapons testing areas and in the implementation of Phase II.

Phase II activities would begin in Fiscal Year 1996 and would include the development of specific groundwater flow and solute transport modeling for the six areas previously identified. From this effort a regulatory compliance zone would be established. Field activities in each area would provide data collection in the near-field environment, including installation of monitoring wells in locations indicated by modeling results. The effort would include near-field groundwater flow and solute transport modeling; risk assessment; stake holder/regulatory concerns; and a monitoring network design.

Current monitoring assesses the extent of contamination and supports modeling efforts to establish protective boundaries around the six areas. A five-year monitoring program would determine if data is consistent with predictions. If monitoring results are satisfactory to the state, then a closure report would be prepared for Nevada Division Environmental Protection approval. Post closure monitoring would be conducted for a duration of 50 years and would be consistent with the requirements of compliance. The Underground Test Area Project is anticipated to continue on a long-term basis. Although it is identified as a part of the Environmental Restoration Program, the monitoring aspects would provide additional data concerning long-term knowledge of the impact of nuclear testing on subsurface water. Once into the monitoring phase, the annual cost per well is estimated to be $12,500 (1994 dollars). The total projected funding/cost of the project, from Fiscal Year 1996 to 2005, is estimated to be $171,500,000 (1994 dollars). It is also anticipated that contaminated material drilled from the wells would generate about 2,340 m^3 (83,200 ft^3) of low-level waste that would be disposed on the NTS at one of the Radioactive Waste Management sites.

A.3.1.2 Soils Media Project (including portions of the NAFR Complex). The Soils Media Project provides for cleanup of approximately 3,257 acres of plutonium-contaminated soils (based on a 200 pCi/g cleanup level) on the NTS, the Tonopah Test Range, and the NAFR Complex combined. Contamination was a result of safety experiments in the 1950s and 1960s to determine if nuclear weapons can reach criticality through detonation of conventional explosives. Investigation and remediation activity has been expanded to include other NTS areas containing soil contaminated by other radionuclides. These areas include cratering experiment sites, atmospheric test sites, and underground test releases of activity to the surface.

While the areal extent of contamination related to these activities is found primarily on the NTS (Figure 4–30), seven additional sites of contamination are located on parts of the NAFR Complex and Tonopah Test Range. These sites consist of the plume east of the Smallboy site (Frenchman area) and the plume north of the Schooner site located on the NAFR Complex (see Figures 4-31 and 4-32, respectively), which are extensions of sites located on the NTS. Other contaminated areas located on the NAFR Complex include the Area 13 and the Double Tracks sites, shown in Figures 4-33 and 4-34, respectively. The Double Tracks test, part of Operation Rollercoaster, was conducted on the NAFR Complex, while three others, known as Clean Slate 1, 2, and 3, were conducted on the Tonopah Test Range.

Characterization of areas of contamination has been performed in the past and would continue. Previously, radiological contamination of surface soil at the NTS and contaminated sites near the NTS were evaluated by the Radionuclide Inventory and Distribution Program and the Nevada Applied Ecology Group, respectively. The objective was to estimate the total amount and the distribution of all manmade radionuclides in surface soils at the NTS, Tonopah Test Range, and NAFR Complex.

Cleanup operations would be designed utilizing information gathered from characterization work. Remediation levels would be based on dose limits and would consider the proposed future land use. When the extent of the area and volume of the cleanup have been determined, excavation would begin. The soil would then be transported to an approved disposal site. Transportation of contaminated soil is anticipated to use both existing roadways as well as roads specifically constructed for contaminated soil haulage. The waste would be transported, handled, and disposed of in accordance with applicable regulations and orders.

Currently, completed remediation plans exist only for the Double Tracks site which is located on the NAFR Complex. Characterization activities are expected to be concluded at this site in Fiscal Year 1996. Excavation activities would be expected to begin, with approximately 1,300 m^3 (46,222 ft^3) of low-level plutonium-contaminated soil waste being generated.

The estimated funding/costs for this Project during Fiscal Years 1996 to 2005 are identified in the Baseline Environmental Management Report (DOE, 1995a) as totaling $155,500,000 (1994 dollars). Total waste generated from all activities within this Project, during the same time period, has been estimated to be 307,000 m^3 (10,800,000 ft^3) of low-level plutonium-contaminated soil.

After the contaminated soil has been removed, the area would be surveyed to document that contamination has been reduced to the cleanup criterion. Upon confirmation, long-term site stabilization activities, including potential revegetation activities, would begin.

A.3.1.3 Industrial Sites Project. The Industrial Sites Project consists of 306 Corrective Action Units which are in turn comprised of 926 Corrective Action Sites Corrective Action Units located at the NTS and Tonopah Test Range. The Corrective Action Units have been functionally grouped into source groupings. Source groupings provide an efficient mechanism to plan environmental restoration activities at Corrective Action Units with similar characteristics. The twelve source groupings are:

<u>Disposal Wells</u>—Machine drilled boreholes of various diameters for the disposal of liquid or solid waste.

Inactive Tanks—Aboveground storage tanks, underground storage tanks and the surrounding soils potentially containing petroleum products or other hazardous constituents.

Contaminated Waste Sites—Generally sites with waste piles of solid material.

Septic Tanks and Lagoons—Impoundments, sewage lagoons, or septic tanks designed to handle wastewater from a variety of facilities.

Tunnel Ponds and Muckpiles—Muckpiles are generally heterogeneous solid wastes derived from postshot activities after an underground nuclear test in a tunnel. The solid waste is placed near the entrance to the tunnel. Tunnel ponds are impoundments created to contain contaminated meteoric waters flowing from the tunnel portals.

Drains and Sumps—Informally known as "french drains," these sites are comprised of vertical borings, backfilled with gravel, and receive liquid wastes, usually from an underground pipe connected to a facility.

Ordnance Sites—A site containing hazards from unexploded ordnance.

Bunkers, Chemicals and Material Storage Sites—Generally a structure which housed hazardous or radioactive materials.

Spill Sites—An area of soil contamination not associated with a fixed facility.

Part A Sites—Comprised of the seven original Resource Conservation and Recovery Act sites listed in the hazardous waste permit for the NTS. These sites are briefly discussed later in this section.

Decontamination and Decommissioning Facilities—Mission related surplus facilities which may be contaminated from usage are generally confined to the structural boundaries of the facility (i.e., floor, walls, roof).

Miscellaneous Sites—Sites that do not fit the above categories of source groupings.

Within the context of the Federal Facility Agreement and Consent Order, activities at Corrective Action Units within the source groupings will follow the following sequence: 1) Preliminary Assessment, 2) Corrective Action Investigation, 3) Corrective Action, and 4) Closure. If enough process knowledge and data are available at a site, a Streamlined Approach For Environmental Restoration Plan would be written to streamline this process. The Streamlined Approach For Environmental Restoration Plan would replace the Preliminary Assessment and the Corrective Action Investigation Plan. This sequence does not apply to the "Part A Sites" source grouping. These sites will be closed through the traditional Resource Conservation and Recovery Act approach in accordance with separate characterization and closure plans. The status or phase of activity for each Corrective Action Units is tracked in the Appendices to the Federal Facility Agreement and Consent Order agreement which are updated quarterly. Corrective Action Units in Appendix II are awaiting the initiation of investigative activities. Appendix III contains Corrective Action Units on which activities have been initiated. Appendix IV contains Corrective Action Units that are closed. Currently, within the Industrial Sites Project, there are 217 Corrective Action Units in Appendix II, 20 Corrective Action Units in Appendix III, and 69 Corrective Action Units in Appendix IV.

Preliminary Assessment activities generally consist of historical records search, interviews with former site workers, geophysical surveys, air photo interpretation, and limited site visits or sampling activities. Corrective Action Investigations usually begin with the writing of a Corrective Action Investigation Plan. The Corrective Action Investigation Plan guides field work at the Corrective Action Units which may consist of surface soil sampling, subsurface boring sampling, or groundwater sampling. At the completion of Corrective Action Investigation activities, a Corrective Action Decision Document documents the results of the sampling activities, and explores remedial alternatives for the site. A Corrective Action begins with the writing of a Corrective Action Plan which guides the remediation of the Corrective Action Units through closure.

Three Part A sites have been closed. The five sites remaining to be characterized, remediated, and closed are the Building 650 Leach field, Area 6 Steam Cleaning Effluent Ponds, Area 6 Decontamination Pond Facility, Area 2 Bitcutter Shop and Post-shot Containment Shop Injection Wells, and Area 2 U-2bu Subsidence Crater. A brief description of each site and its associated closure strategy is presented in the remainder of this section.

BUILDING 650 LEACH FIELD—The Building 650 Leach field is a land disposal unit that was in operation from 1965 to October 1992. The site would be characterized in Fiscal Year 1997 and the probable closure alternative would be clean closure. Ground disturbance would be 0.034 acre.

AREA 6 STEAM CLEANING EFFLUENT PONDS—The Steam Cleaning Effluent Ponds were evaporation basins used for the disposal of untreated liquid effluent discharged from the Steam Cleaning Buildings 6-621, 6-623, and 6-800. The discharges to the steam cleaning effluent ponds were discontinued in June 1993. They are currently being characterized and would be scheduled for closure in Fiscal Year 97. The probable closure alternative for this site would be clean closure; clean closure requires removing the waste-impacted soils. About 0.224 acre of ground would be disturbed.

AREA 6 DECONTAMINATION POND FACILITY—The Decontamination Pond Facility was used for the disposal of untreated liquid effluent discharged from Buildings 6-605 (decontamination facility) and 6-607 (industrial laundry). The Decontamination Pond Facility is scheduled for characterization in Fiscal Year 1996 and is scheduled for closure in Fiscal Year 1997 and the probable closure alternative for this site would be closure in place. Approximately 0.0046 acre of ground would likely be disturbed.

AREA 2 SHOPS—The Bitcutter Shop (constructed in 1981) and Post-shot Containment Shop Injection Wells (constructed in 1963) in Area 2 were used to dispose of hazardous wastes from steam cleaning operations. This site is scheduled for closure in Fiscal Year 96. The proposed closure alternative would be closure in place. Approximately 1 acre of land would be disturbed.

AREA 2 U-2BU SUBSIDENCE CRATER—The U-2bu subsidence crater in Area 2 was created by an underground test in 1971 and was used as a land disposal unit from 1973 to 1988. Site characterization and closure are pending. The site would most likely be closed in place, which would consist of covering and sealing. About 1 acre of land would likely be disturbed.

All five Resource Conservation and Recovery Act industrial sites would be scheduled for closure and/or continuation of postclosure monitoring activities through Fiscal Year 2005. Approximately 2.5 acres of land would be disturbed by these activities. It is estimated that Resource Conservation and Recovery Act sites would generate about 3,720 m^3 (130,000 ft^3) of mixed waste and 310 m^3 (10,900 ft^3) of hazardous waste over the next 10 fiscal years (1996 to 2005). The total projected funding/cost of this project is estimated to be slightly over $55 million during that same time period.

A.3.1.4 Decontamination and Decommissioning Project. The decontamination and decommissioning facilities activity was established in 1978 to provide safe caretaking (surveillance and maintenance) and disposition (decommissioning) of retired, DOE-owned or -sponsored nuclear facilities that were used to support the development of nuclear power and nuclear weapons. Since 1989, the Assistant Secretary for Environmental Restoration and Waste Management has had responsibility for decontamination and decommissioning. The decontamination and decommissioning project in Nevada is part of the Nevada Environmental Restoration Project, which is administered by the DOE/NV Environmental Restoration Division.

Decontamination and decommissioning are concerned with the safe caretaking of surplus nuclear facilities until their entombment, dismantlement/segmenting and removal, or conversion to another nonnuclear reuse. Decontamination and decommissioning tasks encompass (1) surveillance and maintenance,

(2) assessment and characterization, (3) environmental review, (4) engineering design, (5) decontamination and decommissioning operations, (6) waste disposal, and (7) closeout. The inventory of surplus facilities includes reactors, laboratory facilities, and storage areas with radioactive and hazardous materials.

Currently, there are seven facilities included in the NTS decontamination and decommissioning project: (1) EPA Farm, (2) Engine Maintenance Assembly and Disassembly Facility, (3) Reactor Maintenance Assembly and Disassembly Facility, (4) Test Cell A, (5) Test Cell C, (6) Pluto Disassembly Facility, and (7) Super Kukla Reactor Facility. An eighth facility, the Jr. Hot Cell, was decommissioned in Fiscal Year 1995. It has been assumed that the structures associated with all of the facilities would be demolished to ground level after verification that radioactivity levels are below the action level. No monitoring after this verification is anticipated; however, until the demolition and disposal of the waste occurs, all monitoring and security regulations would be enforced. It should also be noted that decontamination and decommissioning apply only to structures. Soils, if contaminated, would be remediated under Environmental Restoration Program activities. Demolition and waste removal would be the principal physical activities, and it is anticipated that these seven facilities would be decontaminated and decommissioned over the 10-year timeframe covered by this EIS.

The seven decontamination and decommissioning project facilities contain approximately 12,100 m^2 (165,000 ft^2) of building area. The total projected funding/cost (1994 dollars) of these activities over the 10-year timeframe is estimated at less than $5 million. An estimated total of 37 m^3 (1,300 ft^3) of low-level waste would be generated between Fiscal Years 1996 and 2005.

A.3.1.5 Defense Nuclear Agency Industrial Sites. The Defense Nuclear Agency operates as a tenant activity at the NTS under a Memorandum of Understanding with the DOE. The terms of the Memorandum of Understanding require that the Defense Nuclear Agency comply with all DOE environment, safety and health, and quality assurance orders (DOE Orders 5820.2A and 5400.1) that require an integrated waste management plan for the NTS. The Defense Nuclear Agency, funded by the DoD, is a Work for Others Program. All the remaining activities in the program are environmental restoration related. Consequently, the Defense Nuclear Agency project description is located in the environmental restoration section of this EIS.

The Defense Nuclear Agency primarily conducted its underground nuclear weapons effects tests in tunnels within Rainier Mesa located in the north-central portion of NTS in Area 12. Most of the approximately 100 sites included in this project are within Area 12. The 100 sites include muck piles, tunnel ponds, contaminated tunnel portal areas, drums, batteries, and lead materials that are or may be identified as the responsibility of the Defense Nuclear Agency. The Defense Nuclear Agency would be responsible for this project and costs. The activity envisioned for all sites would include characterization, remediation, and/or closure. Presently, the costs of restoration activities are estimated to be $15 million (1994 dollars); the restoration activities would take place between Fiscal Years 1996 and 2005. Approximately 500 acres of land would be involved, and about 50,000 m^3 (1.8×10^6 ft^3) of low-level mixed wastes would be generated.

A.3.1.6 Tonopah Test Range. There are 43 source units (environmental restoration sites) identified within the Tonopah Test Range. All sites are on controlled-access lands. For the purpose of this EIS, potential release sites at the Tonopah Test Range were divided into seven categories: (1) underground storage tanks, (2) landfill and lagoons-01, (3) landfill and lagoons-02, (4) soil contamination sites, (5) surface and near-surface radioactive sites, (6) ordnance sites, and (7) photographic french drains.

UNDERGROUND STORAGE TANKS—Four potential release sites are identified under the underground storage tank category. The anticipated activity would include characterization, contaminated soil removal, and site closure. The sites are located in Area 3.

LANDFILL AND LAGOONS-01—The landfill and lagoons-01 category consists of four potential release sites. Capping and monitoring are the anticipated activities. The sites are located in Areas 3 and 9. Capping and monitoring well-installation activities are estimated to begin in 1999. Approximately 20 acres would be disturbed as a result of these activities.

LANDFILL AND LAGOONS-02—This category consists of two potential release sites. The anticipated activities include characterization, remediation, and closure of the landfill and lagoon. Approximately 5 acres within the Tonopah Test Range would be affected. Monitoring activities are not anticipated upon completion of the remediation and closure of the sites.

SOIL CONTAMINATION SITES—Twenty potential release sites are included in this category. The sites are primarily located in Areas 3 and 9. The anticipated activities include characterization, remediation, and closure. Approximately 5 acres of land would be disturbed.

SURFACE AND NEAR-SURFACE RADIOACTIVE SITES—Seven potential release sites are included in this category. The anticipated activities are characterization and remediation (soil and debris removal). The combined total of disturbed land for the 7 sites is estimated to be 50 acres.

ORDNANCE SITES—Three potential sites are included in this category; the anticipated activities include ordnance removal or detonation, characterization, remediation, and closure. The units are all located within the Tonopah Test Range. The ordnance sites are no longer in use; however, one of the sites is directly along the active Tonopah Test Range flightpath. Ordnance tests are occasionally performed along the flightpath. Activities may affect up to 1,000 acres (buffer area is 50,000 acres).

PHOTOGRAPHIC FRENCH DRAINS—This category consists of two potential release sites located in Areas 3 and 9. Approximately 0.5 acres of land may be disturbed.

Over the 10-year timeframe of this EIS, approximately 960 m^3 (33,900 ft^3) of low-level waste would be generated from this project. About 16,600 m^3 (587,300 ft^3) of hazardous waste would also be generated in the same 10-year time period.

A.3.1.7 ***Central Nevada Test Area.*** The Central Nevada Test Area is located approximately 92 km (57 mi) northeast of Tonopah in south-central Nevada. Project Faultless was the only nuclear (underground) test at this site (the test occurred on January 19, 1968). The device was detonated 975 m (3,200 ft) belowground surface. No venting of particulate debris occurred during or after the explosion. Several environmental restoration sites have been identified within the Central Nevada Test Area. Some of these sites consist of abandoned mud pits that are contaminated with heavy metals and petroleum hydrocarbons. Other industrial sites are also included within the Central Nevada Test Area; these may include sewage lagoons, trash dumps, 2 emplacement holes, an uncovered 9 m (30 ft) deep hole in the ground, and a runoff ditch. The activities to be conducted are site characterization, appropriate remediation and long-term hydrologic monitoring. The deep subsurface environments would likely remain restricted for an indefinite period of time.

A.3.1.8 ***Project Shoal Area.*** The Project Shoal Area is located approximately 48 km (30 mi) southeast of Fallon, Nevada and covers a 10 km^2 (4 mi^2) area. The underground nuclear test at the Project Shoal Area occurred October 26, 1963. The device was detonated 411 m (1,350 ft) below ground. No venting of particulate debris occurred during or after the explosion. Deactivation of the site commenced almost immediately with all surface equipment removed by January 31, 1964, and the site was placed on standby status. Future activities would likely include continuing the site characterization, appropriate remediation, and long-term hydrologic monitoring. The DOE's long-term strategy for the Project Shoal Area is for unrestricted use of surface land. The deep subsurface environments would likely remain restricted for an indefinite period of time.

A.3.2 Alternative 2

In Alternative 2, Environmental Restoration Program activities would be discontinued, and sites would be left abandoned as is. All reports, studies, field investigations, characterization, and decommissioning and/or decontamination would cease. Environmental monitoring would continue to the extent necessary to detect contaminant migration at compliance boundaries. All remediation projects under way would be discontinued, with the goal of progressing to a suitable conclusion within one calendar year of the decision to pursue this alternative.

A.3.3 Alternative 3

In Alternative 3, Environmental Restoration Program activities would continue as identified in Alternative 1. Most Environmental Restoration Program activities are expected to be accelerated relative to Alternative 1. Expanded uses may require cleanup level adjustment in accordance with the applicable environmental requirements.

A.3.4 Alternative 4

Environmental Restoration Program activities would continue at current or accelerated rates. Cleanup levels and/or remediation could be stricter (where applicable), based on designated land use and/or the potential return of some lands to the public domain.

A.4 Nondefense Research and Development Program

The DOE has historically supported a variety of research and development activities at the NTS in cooperation with universities, industry, and other federal agencies. The nondefense research and development projects, activities and business services evaluated in this EIS are described below.

A.4.1 Alternative 1

Under this alternative, the DOE would continue to support the ongoing Nondefense Research and Development Program operation.

A.4.1.1 Alternative Energy. Southern Nevada represents an ideal place for the research and development of a variety of alternative energy resources. Principal among these is solar-power electrical production. The abundance of this resource, coupled with the available land and existing labor forces, presents a significant opportunity for demonstration and development of large-scale solar energy systems with the potential for commercial success.

A Solar Enterprise Zone facility concept has been advanced by a consortium of federal, state and local entities along with the solar power industry. Established through an open, public process, the collective effort is to develop, finance and construct one or more solar power production plants in southern Nevada. Up to 1000 MW has been considered as a long-term goal starting with a 100 MW project solicitation. Four sites, including the NTS, are currently being considered for construction of the initial solar generation facilities. Additional sites may be considered to support the long-term goals of a Solar Enterprise Zone facility initiative.

The Corporation for Solar Technology and Renewable Resources was created in early 1995 to facilitate the mission and goals of a Solar Enterprise Zone facility. It is a non-federal corporation established specifically to implement the action plans of a Solar Enterprise Zone facility. The actual cost of construction of a solar project on one or more of the sites considered will be financed by the project developers who may have access to tax exempt bonding through the Corporation for Solar Technology and Renewable Resources. The DOE is not expected to hold equity interest in the facilities actually constructed.

A.4.1.2 Spill Test Facility. The DOE Spill Test Facility is a research and demonstration facility. It is available on a user-fee basis to private and public sector test and training sponsors who are concerned with the safety aspects of hazardous chemicals. Safety research associated with the handling, shipping, and storage of hazardous fluids and liquefied gaseous fuels is conducted within this facility. The Spill Test Facility is the only facility of its kind for either large- or small-scale testing of hazardous and toxic fluids, including wind tunnel testing, under controlled conditions. The facility consists of a control building, a wind tunnel, meteorological and camera towers, a tank farm and spill area, and a personal safety equipment building. The site is composed of four test areas.

Since 1986, the Spill Test Facility has been used for evaluating and modeling hazardous releases into the atmosphere. The facility is ideally suited for test sponsors who wish to develop verified data on prevention, mitigation, cleanup, and environmental effects of toxic and hazardous gaseous liquids. In addition to testing, the facility provides structured training for emergency spill response for most chemicals in commercial use. Performing controlled, measured releases of toxic and hazardous materials into the environment is the most reliable means of simulating the behavior of these chemicals during a full-scale accidental release. The Spill Test Facility is located on Frenchman Flat at the NTS, approximately 121 km (75 mi) northwest of Las Vegas, Nevada.

To date, six environmental assessments and associated Findings of No Significant Impact spanning 1981 to 1994 have been written to cover the testing of certain chemicals at the Spill Test Facility. Specific tests proposed to be conducted at the Spill Test Facility must be assessed by the DOE in an addendum to the *Environmental Assessment for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility* (DOE/OFE, 1994) according to predefined exposure limits or bounds for testing. If these tests are determined to be within the bounding analysis of the aforementioned environmental assessments, the DOE issues a Findings of No Significant Impact for that specific test. The Spill Test Facility is already permitted for the release of 30 gases.

Operations would continue at the Spill Test Facility at its present level of testing. Through the enactment of the Clean Air Act Amendments of 1990, Congress has directed the EPA and the DOE to oversee experimental research and to develop a list of chemicals and a schedule for testing at the Spill Test Facility. Specifically, Section 103(f) of the Clean Air Act specifies that a minimum of two chemicals per year should be field tested at the facility, with priority given to chemicals presenting the greatest potential risk to human health. The Act requires the DOE to make the facility available to interested persons, including other federal agencies wanting to conduct related research and activities.

A.4.1.3 Alternative Fuels Demonstration Projects. Executive Orders 12759 and 12856, the Energy Policy Act of 1992, and the Clean Air Act mandate the general requirements for using alternative fuels in the federal and private sectors and establish baseline conversion tables and procurement schedules for new alternative-fueled vehicles.

Although the NTS does not have the refueling infrastructure to support alternative-fueled vehicles, the DOE has converted 16 of its vehicles to compressed natural gas. These vehicles would be stationed in Las Vegas and shuttle between the Nevada Operations Office and the NTS. This initiative used Fiscal Year 1994 funding; additional funding is anticipated once the costs for procurement and conversion of original-equipment-manufacturer vehicles is developed in a formal proposal. It is anticipated that initial refueling requirements to support future compressed natural gas conversions at the NTS might consist of tanker refueling deliveries until the demand establishes the need for permanent facilities.

Without future funding availability for refueling infrastructure, further conversion activity for the remaining vehicle fleet would be unlikely. The intent is to build the infrastructure, convert the original fleet, and further develop partnerships geared to study other alternative fuel and energy sources, including, but not limited to, fuel-cell research and development, exotic-fuels development, additive research, and electric-automobile development and use.

Under Alternative 1, the DOE would continue to support the 16 DOE-owned vehicles already converted to compressed natural gas. The DOE would also continue developing a formal proposal for the conversion of the original-equipment-manufacturer vehicles fleet. However, no conversion would take place beyond the development of a formal proposal.

A.4.1.4 Environmental Management and Technology Development Project. The DOE is committed to improving the effectiveness of all of its programs and organizations. In support of this commitment, the Office of Environmental Management Program, in cooperation with other DOE research organizations, will use the best science and technology available to solve the most challenging set of environmental problems in the world. This approach will build upon existing programs and will seek continual improvement of all environmental management operations and processes.

The goal of environmental management and the Technology Development Office is to conduct a research and technology development program that is focused on overcoming major obstacles to progress in cleaning up the DOE sites and that involves the best talent in the DOE and the international science communities.

The focus of the Technology Development Project is on five major remediation and waste management areas:

- Contaminant Plume Control and Remediation
- Mixed Waste Characterization, Treatment, and Disposal
- High-Level Tank Remediation
- Landfill Stabilization
- Facility Transitioning, Decommissioning, and Final Disposition.

Implementation of this program is through the following teams:

- Management Team
- Implementation Team
- Focus Area Review Group
- Site Technology Coordination Groups (DOE).

The implementation of this program at the DOE/NV is through the development of a Site Technology Coordination Group and participation in national focus area groups. The Site Technology Coordination Group is made up of personnel from the various DOE programs and includes the involvement of stakeholders and regulators. The environmental management activities at the DOE/NV are the responsibility of the assistant manager for Environmental Restoration and Waste Management Division.

The DOE/NV goals related to technology development are to participate in the demonstration of technologies at the NTS and other DOE sites. Examples of current activities include development and:

- Field demonstration of the associated particle imaging system, a nonintrusive technology for three-dimensional, elemental characterization of sealed, or inaccessible, containers and structures. This system would be used for decontamination and decommissioning activities
- Field demonstration of airborne and hand-held, laser-induced fluorescence systems for decontamination and decommissioning application. This system is particularly useful for characterizing depleted uranium contamination, as well as for petroleum products
- Implementation of improved techniques for integrating remote sensing data into geographic information systems.

The current funding level for these activities is about $2 million, of which $1.7 million is operating budget and $300,000 is capital equipment.

A variety of other projects has been proposed for the DOE/NV, including refinement of landfill monitoring technologies, demonstration of waste treatment and management techniques, applications of remote sensing technologies, and soil sorting and washing techniques.

A.4.1.5 Environmental Research Park. The National Environmental Research Park Program was started in 1972 by the DOE in response to recommendations by citizens, scientists, and members of Congress to set aside land for ecosystem preservation and study. Seven such ecosystem sanctuaries have been established, the latest of which is the NTS in 1992.

Under a cooperative agreement between the DOE/NV, the University of Nevada and the University of Nevada, Las Vegas, the DOE/NV Office of the Assistant Manager for Environmental Restoration and Waste Management is providing financial assistance to the University of Nevada, and the University of Nevada, Las Vegas, to conduct scientific research projects unique to the NTS Environmental Research Park. Areas of research include, but are not limited to, habitat reclamation, hydrogeologic systems, radionuclide transport, ecological change, waste management, monitoring processes, remediation, and characterization. Projects are selected by the park director from annually submitted proposals.

Existing projects and new projects will be conducted in accordance with this agreement. The number of projects conducted is commensurate with the available budget, the infrastructure, and the functions in place to support the projects. In addition, scientific research projects conducted by parties other than those in the above-mentioned agreement are being conducted, and more are anticipated. These parties are funded from sources other than the DOE/NV. The number of projects is limited only by the infrastructure and functions in place to support the projects. The current infrastructure and facilities operable at the NTS, and perhaps even in a reduced capacity, are sufficient to support the park.

A.4.2 Alternative 2

Under this Alternative, the DOE would discontinue support of ongoing program operations.

A.4.3 Alternative 3

Under Alternative 3, the DOE would continue to support the ongoing activities described under Alternative 1 and pursue new initiatives.

A.4.3.1 Alternative Energy. A Solar Enterprise Zone facility concept is being advanced by a consortium of federal, state, and local entities along with the solar power industry. Established through an open, public process, the intent of this effort is to develop, finance, and construct one or more solar power production plants in southern Nevada. The Corporation for Solar Technology and Renewable Resources has headed this effort and was created in early 1995 to facilitate the mission and goals of a Solar Enterprise Zone facility.

The actual cost of constructing a solar power project on one or more of the sites considered will be financed by the project developers who may have access to the tax exempt bonding through the Corporation for Solar Technology and Renewable Resources. Costs or profits generated from the development of solar technologies will be realized by the project developers, and the Corporation for Solar Technology and Renewable Resources, not the DOE.

Impact analyses for Solar Enterprise Zone facility activities presented in this EIS were based on the worst case scenario which maximized disturbed land and water use. The worst case scenario analyzed was one which assumed a single 1,000-MW facility disturbing 2,400 acres of land, and using solar technology which required 5,550 acre-feet/year of water. Also included in the land disturbance analysis was the construction of additional power lines and natural gas pipe lines required for the facilities. Power lines and pipe lines to Las Vegas were assumed to disturb 2,182 acres of land for a six-month period. It is important to note, however, that specific sites and/or technologies have not yet been chosen and may affect this scenario.

Additional National Environmental Policy Act documentation may be required before the construction of Solar Enterprise Zone facilities begins. The documentation will contain the latest pertinent data to provide decisionmakers with up-to-date information regarding the Solar Enterprise Zone facilities initiative, including possible disturbances resulting from the installation of power lines or pipe lines. The private corporation implementing the solar technology(ies) would bear the burden of performing the additional analysis and of mitigating any adverse effects realized by these activities.

Photovoltaic systems convert solar radiation to direct-current electricity without moving parts or thermal energy sources. The solar cell contains a semiconductor material, the most common of which is silicon, that typically produces about 100 watts of direct current power per square meter. Commercial solar modules convert between 11 to 13 percent of incident sunlight into electricity unless mounted on a tracking system that can increase output by 20 percent or more.

Parabolic-trough solar thermal systems use parabolic mirrors shaped to concentrate insolation on a receiver tube along the focal line of the trough. The heat generated by the concentrated sunlight is transferred to a working fluid, which is transferred through insulated pipes to a heat transfer device used to raise steam. The steam is then used to power a steam turbine and produce electricity. This technology also incorporates the use of natural gas as a back-up system.

Power tower systems consist of fields of heliostats that focus solar radiation on a power tower. The receiver absorbs the heat energy and transfers it to a circulating fluid that can either be stored or used directly to produce power.

Parabolic dish systems are point-focus devices that use a parabolic mirror to focus solar energy on a single receiver located at the focal point of the dish. The heat is then absorbed in a fluid, which can then be converted to electricity via a generator system located at the focal point of the dish or be piped to a central location for electricity generation or thermal applications. Systems coupled with engine generators at the focal point have the greatest potential to produce electrical energy.

The location of a large-scale solar-power production facility at the NTS would require upgrades to the existing transmission infrastructure. The NTS power transmission system could support 100 MW of capacity with no additional investment in upgrading the system; approximately 30 MW is used by the NTS, and the remaining 70 MW would be available for export. In order to handle the planned 1,000 MW capacity, power transmission lines would have to be upgraded to between 345 kilowatts (kW) and 500 kW from the NTS to Southwest Intertie or Eldorado Valley near Las Vegas. Other infrastructure upgrades required for the siting of the solar production facility at the NTS may be a natural gas line and/or water system improvements, as determined by the type of technology used.

Alternatively, other sites may be used in conjunction with the NTS to support a Solar Enterprise Zone facility initiative to minimize infrastructure improvement requirements and improve access to power markets. Additional sites in southern Nevada have been proposed for deployment of a Solar Enterprise Zone facility. The Eldorado Valley, south of Boulder City, the Dry Lake Valley (Apex/Harry Allen) site, and the Coyote Spring Valley in Lincoln County, are alternative southern Nevada locations being considered for a Solar Enterprise Zone facility development.

Six thousand acres of land in Eldorado Valley recently annexed by the city of Boulder City has been designated for the purpose of renewable resource development. Eldorado Valley lies in the center of the southwestern power transmission system that links the power markets of Arizona, Utah, southern Nevada, and southern California, providing unparalleled access to transmission and utility markets. Consequently, Eldorado Valley is the most likely marketing location for power generated at any of the sites being considered for a Solar Enterprise Zone facility development. Natural gas and water transmission systems would need to be developed before this area could employ hybrid solar technologies or any solar-energy production systems requiring water. Two natural gas pipe lines transect this area, and depending on the siting of solar facilities in this area, the gas line could be from 2 to 10 km (1 to 6 mi) away. There is very little groundwater in this area; however, the city of Boulder City has indicated an interest in making available up to 3.7×10^6 m^3/yr (3,000 ac ft/yr) of treated effluent to support solar development of this area. This amount of water would be sufficient to support a 300 MW solar-powered steam facility.

The Nevada Power Company's Harry Allen site is located about 32 km (20 mi) northwest of Las Vegas, just north of Interstate 15 in the Apex industrial area. Nevada Power Company has identified 3,600 acres for development of renewable energy supply. Currently, the area has a power transmission capacity of 305 MW, but plans of the Nevada Power Company to site 280 MW of gas combustion turbines would seriously limit the transmission availability for development of solar power. Infrastructure improvements being considered for the area include the termination of a major line for Idaho and completion of the Sunrise Corridor project, which could expand the transmission capability of the Harry Allen site. Also, a natural gas pipe line is currently being arranged between the Nevada Power Company and gas pipe line companies. These improvements could be completed in time for Solar Enterprise Zone facility development. Water supply is very limited in this area, and there are no plans to construct a permanent water supply line to this area; Nevada Power plans to truck water to support its combustive turbines.

The Coyote Spring Valley site is located approximately 93 km (58 mi) north of Las Vegas. Site boundaries fall within both Clark and Lincoln counties and have 3,200 acres of land available for solar power development. The property is currently owned by Aerojet Investments, Ltd. The Lincoln County Power District owns and operates the existing transmission system, which runs along the western border of the Aerojet property. The existing system is capable of accommodating 35 MW of solar generated power. Providing water to a solar facility on site would require either drilling or a new well or transporting water from an off site location. The closest supply of natural gas is 47 km (29 mi) to the east where a Southwest Gas pipe line is located.

A.4.3.2 Spill Test Facility. Activities would be similar to those described under Alternative 1, but the level of activity would be increased.

A.4.3.3 Alternative Fuel Demonstration Projects. Activities would be the same as those described under Alternative 1, with two exceptions. Under Alternative 3, the DOE would construct a compressed natural gas fueling facility for compressed natural gas vehicles at the NTS. In addition, the DOE would further develop partnerships geared to study other alternative fuel and energy sources.

A.4.3.4 Environmental Management and Technology Development Program. Under Alternative 3, the technology development activities would increase in all areas. Those activities listed as proposed under Alternative 1 would be implemented. As a national resource for the management of mixed waste, the DOE/NV would develop and refine waste-management monitoring methods.

In Alternative 1, the DOE would convert vehicles to and use compressed natural gas. Under Alternative 3, any vehicle or fueled equipment associated with DOE/NV work activities may be evaluated as to their potential conversion to alternate fuels. In addition, alternate fuels and associated technologies other than compressed gas may be evaluated, tested and demonstrated. Alternate fuel systems that may be considered include electric vehicles (powered by fuel cells or batteries), superconducting magnetic levitation vehicles, and vehicles with internal combustion engines running with alcohol-based fuels (methanol and ethanol), gaseous fuels (compressed or liquefied natural gas and liquefied petroleum gas), and non-conventional fuel mixtures (such as hydrogen and oxygen).

In February 1996, the DOE initiated a joint team with NTS Development Corporation, a DOE community re-use organization, and Kistler Aerospace Corporation. The DOE supports, as part of the increase in technology development activities at the NTS, the Kistler Aerospace Corporation's proposal for a commercial satellite delivery service as a potential future activity under this program. The DOE considers this activity compatible with the existing and future uses of the NTS.

Kistler identified in the public comment process on the Draft NTS EIS their proposal to manufacture and operate an aerospace vehicle for the delivery of communications satellites to low earth orbit at the NTS. Specific activities may include the fabrication of composite structures, vehicle assembly, processing, fueling, and recovery. Kistler anticipates conducting three suborbital test flights and three orbital test flights in the first year of operation, followed by an anticipated two operational flights per month after the test phase.

A.4.3.5 Environmental Research Park. Activities would be the same as those described under Alternative 1.

A.4.4 Alternative 4

In some cases under this alternative, activities would be the same as those described under Alternative 1. In other cases, activities would be the same as those described under Alternative 3.

A.4.4.1 Alternative Energy. Activities would be the same as those described under Alternative 3.

A.4.4.2 Spill Test Facility. Activities would be the same as those described under Alternative 1.

A.4.4.3 Alternative Fuels Demonstration Projects. Activities would be the same as those described under Alternative 1.

A.4.4.4 Environmental Management and Technology Development Program. Activities would be the same as those described under Alternative 3.

A.4.4.5 Environmental Research Park. Activities would be the same as those described under Alternative 1.

A.5 Work for Others Program

The Work for Others Program is 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 DoD for various military training exercises and research and development projects.

A.5.1 Alternative 1. Under Alternative 1, the DOE would continue to host the projects and activities of other federal agencies at activity levels not exceeding those of the past 3 to 5 years.

A.5.1.1 Treaty Verification. Activities at the NTS and NTS support facilities throughout Nevada, including the Tonopah Test Range, have been, and will continue to be, impacted by implementation of current and future international arms control treaties. Principal responsibility for implementing and coordinating the DOE/NV arms control activities is assigned to the Emergency Management and Nonproliferation Division. The DOE/NV Safeguards and Security Division shares responsibility and may actually take the lead for those activities that are principally overflights or walk-through inspections of short duration and are nonoperational in nature. Treaties currently in effect or under negotiation and the relevant rights granted under those treaties are discussed below.

The negotiation of a Comprehensive Test Ban Treaty is underway at the Conference on Disarmament in Geneva, Switzerland. The DOE/NV is conducting various projects for the DOE Headquarters to help develop a strong, verifiable treaty that will deter proliferant activities.

A.5.1.1.1 Threshold Test Ban Treaty—The Threshold Test Ban Treaty permits Russian scientists and engineers to conduct an inspection of one nuclear test per calendar year if tests were conducted. The purpose of the inspection is to verify that the United States is in compliance with treaty limits.

A.5.1.1.2 Peaceful Nuclear Explosion Treaty—Russian scientists and engineers would conduct inspections and geophysical measurements of any peaceful nuclear explosions at the NTS. However, the United States has no plans to conduct peaceful nuclear explosions, so this treaty would have no effect on the NTS related sites or facilities.

A.5.1.1.3 Chemical Weapons Convention—The Chemical Weapons Convention Treaty provides for on-site inspections of the United States' facilities capable of manufacturing or storing chemical weapons. Although the NTS has not been used for the production or storage of treaty-limited chemical agents, the presence of operations, such as the Spill Test Facility, may be sufficient justification to trigger challenge inspections under terms of the Chemical Weapons Convention.

A.5.1.1.4 The Treaty on Open Skies—In an effort to promote openness and to facilitate monitoring of arms control treaties, the Treaty on Open Skies provides for aerial inspections by foreign observers of virtually any site in the United States, including those sites that might be engaged in the production, testing, or storage of treaty-limited weapons systems. Periodic inspections of the NTS facilities are expected as this treaty is implemented.

A.5.1.2 Nonproliferation. The policy of the United States is to resist the proliferation of weapons of mass destruction. These weapons cause indiscriminate, widespread destruction and include nuclear, biological, and chemical weapons. Nonproliferation can be defined as the use of the full range of political, economic, and military tools to prevent proliferation, reverse it diplomatically, or protect the United States' interests against an opponent armed with weapons of mass destruction should that prove necessary. Nonproliferation tools include intelligence, global nonproliferation norms and agreements, diplomacy, export controls, security assurances, defenses, and the application of military force.

The NTS and Tonopah Test Range continue to provide critical support for the United States' nonproliferation goals and objectives, particularly in the areas of research and technology development. In the past, seismic signatures and ground disturbances produced from underground nuclear weapons tests at the NTS have been analyzed to develop techniques and methods for detecting and evaluating underground nuclear tests worldwide. Additional nonproliferation-related experiments are currently using the unique capabilities of the Spill Test Facility for the development, characterization, and testing of remote sensors of chemical effluent.

A.5.1.3 Counterproliferation Research And Development. Counterproliferation refers to the DoD efforts to combat the international proliferation of weapons of mass destruction. As with nonproliferation, these efforts include the full range of political, economic, and military tools available. However, since facilities for developing, producing, and storing weapons of mass destruction are likely to be located belowground, a considerable amount of counterproliferation research and development involves the detection, monitoring, and neutralization of buried targets.

The tunnels and bunkers at the NTS provide ideal testing environments for a variety of counterproliferation research and development experiments. Experiments that use various remote imagery and sensory applications in conjunction with NTS bunkers and tunnels are conducted to develop techniques and methods to detect, characterize, and monitor buried objects. Such experiments involve both land-based and airborne operations. Experiments to develop various techniques for destroying or neutralizing weapons of mass destruction and buried objects, such as bunkers and tunnels, are also performed. These experiments involve the surface and belowground detonation of conventional explosives in the immediate vicinity of the NTS and Tonopah Test Range bunkers and tunnels.

The NTS could become the center for a national counterproliferation program. This program would integrate the Nevada-based military and U.S. Bureau of Land Management ranges into a national counterproliferation test bed, with the NTS at its center. This test bed would be used for a variety of research and technology development experiments aimed at countering the proliferation of weapons of mass destruction.

The Big Explosives Experimental Facility was specifically designed as a hydrodynamic testing facility for the research, development, and testing of counterproliferation technologies. Modern United States nuclear weapons contain sophisticated safety features and are small in size relative to the first nuclear weapons, making their disablement straightforward and certain. Proliferant countries and terrorist organizations, on the other hand, are likely to produce nuclear weapons that are unstable and, therefore, difficult to render safe with certainty. Several promising technologies have been proposed and are under development to counter the special problems associated with this more primitive class of nuclear device. In order for these technologies to be successfully developed, a facility must be available to test the hydrodynamic functioning of simulated nuclear devices containing large amounts of conventional high explosives. The Big Explosives Experimental Facility is crucial for this task given the absence of underground nuclear testing. This is the main purpose of Big Explosives Experimental Facility (see Appendix F).

The Dipole Hail Project involves a series of tests to evaluate the effectiveness of various techniques and munitions in damaging tunnels and thereby impairing nuclear weapons development operations in those tunnels. The Cut and Cover Project involves using unattended ground sensors to identify and distinguish remotely between various types of equipment being operated in bunkers.

A.5.1.4 Conventional Weapons Demilitarization. By the year 2000, it is expected that the United States government will need to dispose of over $4.5x10^7$ kg

($1.0x10^8$ lb) of solid rocket motors. In addition, the United States government is currently the custodian of over 200,000 tons of obsolete conventional munitions and pyrotechnics (Joint Ordnance Commanders Group, 1995a). There is a definite need to disposition these obsolete munitions and ordnance in a safe, environmentally sound, and economical manner.

The demilitarization activity proposed for the NTS is a demonstration of potential technologies used to destroy obsolete conventional munitions, pyrotechnics, and solid rocket motors by testing the technologies. Any future, large-scale activity involving the demilitarization of obsolete munitions would require additional National Environmental Policy Act Review and would be subject to all other applicable federal, state, and county regulations as well as permitting requirements.

The existing underground tunnels and facilities at the NTS offer a unique opportunity to demonstrate environmentally sound methods of destruction/treatment of solid rocket motors, pyrotechnics, and other non-nuclear energetic materials by using specially designed pollution abatement systems that remove the gaseous combustion products from the air prior to atmospheric release and provide for containment/treatment of residual debris. The Spill Test Facility in Area 5 would suffice for the demonstration of the thermal treatment technologies for pyrotechnics, and a tunnel environment at the NTS would suffice for the demonstration technologies involving solid rocket motors and other conventional munitions. Using an NTS tunnel takes advantage of a known geologic cavern as well as the expertise of the NTS workforce in tunnel handling and firing of high explosives and in monitoring explosives in a contained environment.

Research indicates that X tunnel would suffice for demonstration projects involving destruction/treatment of solid rocket motors and conventional munitions. Calculations would be made to determine pressure and temperature, as well as other effects, which would then be applied to design basis documentation and a test plan. The tunnel would be modified with containment plugs, monitoring instrumentation, containment valves, and scrubbing and sampling outlets. All environmental requirements would be met, and all environmental, safety, and health protection precautions would be taken.

The demonstration would consist of transporting a solid rocket motor or conventional munition from off site to an underground cavern. The plugs and bulkheads would be closed, and with instrumentation fully established and calibrated, the solid rocket motor or conventional munition would be detonated from a remote location. Gases would be sampled before and after scrubbing in preparation for ventilation. The goals of the technologies are to develop "...an optimized demilitarization research and development demonstration capability at the NTS, a set of fully characterized demonstrations of environmentally benign destruction or resource recovery and recycling processes, and final design packages for innovative processes" (Joint Ordnance Commanders Group, 1995b).

The construction and installation phases would include facility preparation, tunnel modification, excavation, grouting, sealing, and foundation work, as well as equipment installation, startup and shakedown of equipment and procedures, and personnel training. It is estimated that the planning, design, construction, and installation phases of this activity would require the services of approximately 15 workers for 3 years, while the demonstration phase would require the services of approximately 20 workers for approximately 0.5 years. Total cost of the project is estimated at nearly $5 million.

A.5.1.5 Defense-Related Research and Development. In the past, defense-related research and development activities have included 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, including, but not limited to, infrared, lasers, and radar. Table A-1 lists examples of recent defense-related research and development projects conducted at the NTS. It is expected that additional experiments and tests similar to those mentioned in Table A-1, but not yet identified, would take place at the NTS.

Table A-1. Recent defense-related research and development projects conducted at the NTS

Project	Organization	Description	NEPA Documentation/Year
Captive Flight Tether Test	Lawrence Livermore National Laboratory	Captive flight test at the BREN tower of a small, maneuverable, rocket-powered, laser-equipped prototype vehicle designed to detect, track, and intercept ballistic missiles.	Environmental Assessment/1992
Mine Detection	Lawrence Livermore National Laboratory	Evaluation of ground-based and airborne technologies, including infrared imaging, laser-based optical imagery, and ground-penetrating radar for detection of buried objects such as mines and simulated hazardous waste containers.	Categorical Exclusion/1993
Advanced Infrared Imaging	Lawrence Livermore National Laboratory	Use of the BREN tower for development of technology and measurement techniques for advanced infrared imaging from satellites.	Categorical Exclusion/1994
Theater Missile Defense Experiment	U.S. Army Space and Strategic Defense Command	The release of 200 kg (441 lb) of nontoxic soda lime glass beads, ranging in size from 40 to 200 microns, at a specific altitude at or above 6,096 m (20,000 ft) over the NTS to obtain data for use in validating and evaluating atmospheric transport and diffusion models and computer codes.	Categorical Exclusion/1994
Depleted Uranium Testing	U.S. Army Ballistics Research Laboratory	Various tests including controlled burns and live firings of depleted uranium munitions to determine appropriate hazard classifications.	Environmental Assessment/1992
Re-entry Body Impact Fuse Flights	Sandia National Laboratories	Flight impact tests would be conducted to develop the techniques required for the accurate delivery of reentry body test units at extremely high impact velocities.	Categorical Exclusion/1995

NOTE: NEPA = National Environmental Policy Act
BREN = Bare Reactor Experiment Nevada

A.5.2 Alternative 2

No Work for Others Program activities would occur at the NTS under Alternative 2 with one exception. Those activities described under treaty verification for the Treaty on Open Skies and the Comprehensive Test Ban Treaty would be the same as those described for Alternative 1.

Activities at the Tonopah Test Range would be the same as those described for Alternative 1.

A.5.3 Alternative 3

Activities at the NTS and the Tonopah Test Range would be the same as those described under Alternative 1, with certain activities having a greater number of experiments to conduct, resulting in an expanded scope.

A.5.4 Alternative 4

Activities at the NTS would be the same as those described under Alternative 2. Additionally, there would be an increased use of the NTS airspace by the U.S. Air Force.

Activities at the Tonopah Test Range would be the same as those described under Alternative 1.

A.6 Site-Support Activities at the NTS

Section A.6 describes the existing infrastructure and support facilities present at the NTS and supporting facilities in Clark County, Nevada. These facilities include the utilities, communications, and transportation systems, as well as the existing support facilities, both on and off site. The current and planned infrastructure projects are also described.

The NTS-related employment has always depended on programmatic requirements; consequently, wide fluctuations in employee numbers can be tracked throughout the history of the NTS. Over the past 20 years, civilian personnel have numbered as many as 10,000 and as few as 4,900.

The DOE/NV reported 6,576 NTS-related employees (DOE, laboratory, and contractor) in July 1995. Approximately 27 percent (1,794) of the employees work in the forward areas of the NTS, 18 percent (1,153) are based at Mercury, and 55 percent (3,629) work in Las Vegas and North Las Vegas. These figures include personnel assigned to the Yucca Mountain Project at the NTS and in Las Vegas. Currently, the Yucca Mountain Project employs 1,912 or 29 percent of the NTS-related workforce.

More than half the Mercury-based workers are administrative, clerical, professional, and technical. The NTS has room accommodations for approximately 1,700 people and parking for approximately 60 recreational vehicles; however, because the majority of workers commute from Las Vegas and other communities, the number of accommodations is adequate for the present.

If nuclear testing is halted completely, the number of contractor personnel would not drop to zero. Continuing activities that must be performed would require that many personnel be retained. However, personnel idled by a complete testing halt would include the experienced and skilled scientists and technicians who drill and mine emplacement holes, emplace devices, design and install data-gathering systems, and collect and analyze test data. If this large block of talent were lost, it would take at least 3 years to locate, train, and activate a comparable test-support organization. The DOE/NV provides sites and facilities on the NTS for underground weapons testing and numerous advanced research and development projects that support the Defense Program. For off-site safety, the EPA carries out extensive radiation monitoring and dosimetry programs in areas surrounding the NTS. Projects for other federal programs are fielded on a cost-reimbursable basis. A Maintenance and Operating contractor currently operates all user-occupied facilities. Operations include construction and maintenance. The DOE/NV Nevada Test Site Office provides operations oversight of the Maintenance and Operating Contractor.

The NTS is not a production facility; therefore, there are no quantities of production to report. The site work load fluctuates with the mission and depends on the funding received. Resources are periodically redistributed to maintain productivity and efficiency. Both resources and facilities are fully used by design.

The NTS is used to test research and development efforts undertaken by three DOE national laboratories. Two of these laboratories, Los Alamos National Laboratory and Lawrence Livermore National Laboratory, conduct nuclear device tests.

The third organization, Sandia National Laboratories, is responsible for tests of non-nuclear elements of nuclear weaponry. Other users include the U.S. Air Force, the DoD, and the Defense Nuclear Agency. These groups conduct programs that include nuclear and non-nuclear weapons-effects tests and weapons-development tests.

Nonweapons users include the Yucca Mountain Site Characterization Office and the Nuclear Emergency Search Team.

Support of the underground testing program requires a drilling and mining operation. The DOE/NV contractors are directly involved in these operations. The DOE/NV contractors also provide security, guard force services, operation and management of the DOE/NV centralized computer system, and auditing.

The following agencies assist the DOE/NV with its testing and public safety programs:

- The U.S. Bureau of Mines conducts mine and well inspections before and after underground tests
- The U.S. Geological Survey conducts hydrological studies, including flow paths of groundwater
- The National Weather Service correlates test-area weather data with national weather information to make local preshot forecasts
- The EPA performs radiological health and safety services, including determining background radiation levels, determining extent of radiation in connection with accidental release of radioactivity, and preparing for emergency action.

Other contractors that assist in the safety programs at the NTS include the following agency:

- The University of Nevada's Desert Research Institute calculates groundwater migration of radioactive material resulting from underground nuclear testing.

Facilities at the NTS generally consist of permanent or temporary, low-rise, industrial-type structures. Land use in the camps is low to medium density.

The distribution, assignment, use, and planning of space at the NTS follow the requirements of the Federal Property Management Regulations. For office space, the objective is to achieve an overall space usage rate of 11 m^2 (120 ft^2) or less per person. Although allocations for other types of spaces (e.g., laboratories and shops) are less precise, reasonable measures are taken to ensure the use of the minimum space necessary to perform the required function.

The site support of the NTS supports all activities that occur at the NTS. This includes utilities, transportation, communication, and on-site and off-site support. Each of these five subjects is described in detail in this section, along with the current and future infrastructure construction projects.

Construction projects with proposed starting dates beginning in Fiscal Years 1995 through 2001, as well as prior-year projects scheduled to be completed during and beyond Fiscal Year 1994, are described in their appropriate programmatic area in this appendix.

A.6.1 Alternative 1

Existing infrastructure at the NTS and supporting facilities in Clark County are described under this alternative. This information has been obtained from the *Fiscal Year 1994 Nevada Test Site Technical Site Information* (RSN, 1994a) and the *Fiscal Year 1996 Capital Asset Management Process Report* (RSN, 1994b).

A.6.1.1 Utilities. Utilities include electrical power, natural gas, water supply and wastewater, and industrial wastes. It also includes the related distribution, transmission, treatment, and disposal systems, as appropriate, for these utilities. The personnel that maintain these utilities comprise a group of approximately 68 full-time employees at the NTS. This includes approximately 45 personnel in the electrical power group, 17 in the water and steam group, and 6 in the sanitary/solid waste group (excluding hazardous, radioactive, and mixed waste).

A.6.1.1.1 Electrical Power—Electrical power at the NTS includes off-site and on-site power transmission systems, on-site subtransmissions, existing and projected subtransmissions, and NTS area transmission.

OFF-SITE POWER TRANSMISSION—In September 1993, Raytheon Services Nevada completed an updated load-flow study, to modify the results of a 1991 load-flow study. The update was required because of the Yucca Mountain Project load reduction and program changes at the NTS. Projected loads had been reduced significantly from 71 MW to 52 MW. The proposal of a new 138 kV line from the Nevada Power Company was withdrawn; however, the addition of capacitor banks at the NTS is still necessary to provide voltage support if the Yucca Mountain Site Characterization project reaches 15 MW.

ON-SITE POWER TRANSMISSION—The existing on-site power transmission system at the NTS is similar to that of a municipality. Power is procured at 138 kV at the Mercury switch station and the Jackass Flats substation and is metered at both locations by the Nevada Power Company. The option also exists to purchase power from Valley Electric Association, Inc., through transmission lines supplying 138 kV to the Jackass Flats Switching Station. The on-site power system is operated and maintained by Bechtel Nevada. The total disturbed area of the on-site power system is $1.3 \times 10^6\ m^2$ ($1.4 \times 10^7\ ft^2$) as shown in Table A-2.

Power at the NTS is transmitted through a 161-km (100-mi)-long, 138 kV transmission loop that supplies eight major substations and one 138 kV radial transmission line. The subtransmission of power is via an extensive 34.5 kV system and two small 69-kV systems. The 138, 69, and 34.5 kV systems provide distribution voltages of 4.16 kV and 12.47 kV at various substations. The 34.5 kV subtransmission system is also used as a distribution voltage at several remote sites. Distribution voltages are transformed to both 480/277-volt (V) and 208/120-V three-phase systems for most NTS loads with a few single-phase, 120 V services.

The basic load centers served at the NTS are Mercury (Area 23) and Areas 2, 3, 6, 12, and 25. The 138 V transmission system loop runs from the Mercury (Area 23) switching station, north to Frenchman Flat substation (Area 5), extends to Yucca Flat substation (Area 3), then to the Tap Structure/Valley Substation (Area 2). The main loop continues to Rainier Mesa substation (Area 12), then 19km (12 mi) southwest to Stockade Wash substation where a radial 69 kV line taps off the main loop via an autotransformer and is extended to Pahute Mesa substation (Area 19). Taps off the 69 kV line are made at Castle Rock substation and Echo Peak substation. The main 138 kV loop then runs 56 km (35 mi) south from Stockade Wash substation to both Canyon and Jackass Flats substations.

The Jackass Flats substation (Area 25) bus ties to the Mercury switching station via a 138 kV Nevada Power Company tie line, which is an integral part of the NTS 138 kV transmission loop. At Canyon substation and Jackass Flats substation, voltage is stepped down to 69 kV by autotransformers, and a subtransmission loop ties the Jackass Flats and Canyon substations together at the 69 kV level. Another 138 kV tie line between the Frenchman Flat and Jackass Flats substations is now permanently out of service. Mercury substation in Area 23 is fed from a 138 kV tap out of the Mercury switching station.

A system analysis evaluated load-flow conditions under normal conditions, as well as several emergency outage scenarios, to determine voltage levels under adverse conditions. The lowest voltage levels at the NTS are always at Valley Tap. Opening the 138-kV loop at any point does not drop voltages below 97 percent under projected NTS loads.

Losing a source of power from the Nevada Power Company or Valley Electric Association causes severe voltage drops at the NTS Valley Tap under existing loads and causes the system to go down using projected loads, specifically the Yucca Mountain Project projected load of approximately 15 MW.

Table A-2. Utilities table

Location	Utilities - Total Disturbance Area in m² and ft²						
NTS Area Designation	Power	Water		Wastewater		Sanitary Waste	
		m²	ft²	m²	ft²	m²	ft²
1 & 2	No area total	2,109	22,701	2,439	26,253	0	0
3	No area total	4,085	43,971	1,626	17,502	112,409	1,209,960
5	No area total	7,689	82,764	70	754	0	0
6	No area total	12,079	130,017	37,044	398,738	44,592	479,984
7 & 11	No area total	42	452	0	0	0	0
12	No area total	1,586	17,072	30,657	329,989	0	0
10 & 15	No area total	1,417	15,253	0	0	69,675	749,975
16, 17, & 18	No area total	1,935	20,828	0	0	0	0
19 & 20	No area total	18,733	201,640	9,406	101,245	7,432	79,997
23	No area total	1,394	15,005	15,560	167,486	44,592	479,984
25	No area total	4,408	47,447	5,574	59,998	0	0
26	No area total	465	5,005	2,439	26,253	0	0
27	No area total	84	904	518	5,576	0	0
Total (m²) Total (ft²)	**1,299,899 m² (13,992,000 ft²)[a]**	**56,026 m² (603,059 ft²)[b]**		**105,333 m² (1,133,794 ft²)**		**278,700 m² (2,999,900 ft²)**	

a Land disturbance for the power utilities is based on an estimated 427 km (265 mi) of primary and secondary supply lines times a 3-m (10-ft) wide emplacement/maintenance path

b This total does not include an estimated 161 km (100 mi) of water supply lines which would include an emplacement path that would average 2 m (5 ft) wide (approximately one-half of the 3-m (10-ft) wide water supply line ground disturbance already covered by the power supply line path).

The analysis showed that capacitor banks are necessary at Stockade Wash substation to provide adequate voltage on the 138 kV loop when Yucca Mountain Project loads reach approximately 15 MW. Under outage conditions that cause a loss of either power source, the projected system loads cannot be maintained without load-shedding or using the existing generation plant as a back-up power source.

With the addition of capacitor banks at Stockade Wash substation, the existing 138 kV transmission system is adequate for projected loads at the NTS through approximately 1997 to 1998.

ON-SITE SUBTRANSMISSION—At most of the 138 kV substations, voltage is stepped down from 138 kV to 34.5 kV. Other 138 kV substations convert from 138- to 69 kV, 12.5, and 4.16 kV levels.

The 34.5 kV network is made up of a backbone circuit that extends from Frenchman Flat substation to Rainier Mesa substation, with switched connections to circuits out of Yucca Flat and Valley substations. By using sectionalizing switches, this circuit may be operated from various 34.5 kV feeders out of various substations.

In addition to this circuit, other 34.5 kV radial feeders spread out from the major 138/34.5 kV substations to cover the area from Frenchman Flat into Rainier Mesa. Radial 34.5 kV circuits originating at Castle Rock and Pahute Mesa substations feed power to Area 18 and Pahute Mesa, respectively. Area 25 has its own network made up of 34.5, 12.5, and 4.16 kV lines. The Mercury substation provides seven 4.16 kV circuits for the base camp and one 12.5 kV circuit for Army Well 1.

EXISTING AND PROJECTED SUBTRANSMISSION LOADS—Programmatic changes at the NTS, along with consolidations of facilities and abandonment of other facilities, have changed the loading from each substation, making all power studies prior to 1991 obsolete. Recent power system studies performed by Raytheon Services Nevada, including the Tiger Team study for protective device coordination, have evaluated new loadings at all main substations.

138-kV/34.5-kV Substations—A review of substation loading indicates that all 138 kV/34.5 kV substations have adequate reserve capacity.

Representative Subtransmission Lines—The capacity of the existing lines is maintained and is adequate for the reduced load in these areas for the next several years. Any new programs with significant loads requiring capacity from the existing 34.5 kV system would require individual evaluations to determine their impacts upon the existing system.

NTS AREA TRANSMISSION—Area 1 is fed by a 34.5 kV transmission line from the Yucca Flat substation. This line also feeds a well pump (Well UE-16d), the abandoned Area 16 tunnel, and several communications stations. The subtransmission line feeding Area 1 is a #2/0 aluminum-conductor, steel-reinforced with a capacity of 266 amperes (amps) at 34.5 kV. Circuit analysis has determined that additional future loads from new and relocated facilities would not adversely affect this line. Area 2 is fed by a 34.5 kV subtransmission line from the Valley substation. This line also feeds Areas 8 and 15. The #2/0 aluminum-conductor, steel-reenforced transmission line feeding Area 2 has a capacity of 266 amps. The existing lines are more than adequate for current loads. Analysis indicates that the subtransmission line feeding Area 2 from the Valley substation has adequate capacity and that the transformer and feeder lines from the substations also have adequate capacity.

Electrical power for Area 3 is provided by the 1,000 kV substation 3-3, which is fed by the existing 34.5 kV overhead line (DAE) from the Yucca Flat substation. Line DAE, which also feeds Area 1, is connected to this substation by the north branch. The subtransmission line feeding Area 3 is #4/0 aluminum-conductor, steel-reinforced, with a capacity of 300 amps and has adequate capacity for the existing loads.

The existing electrical distribution system, which originated with testing in the Los Alamos National Laboratory test areas, is an underground system operating at 4.16 kV. Previously, this system was modified to reflect changes in testing requirements that were necessary due to deterioration of the system and the ground shock caused by testing. The 34.5 kV line, which parallels Orange Blossom Road, extends into Area 9 and supplies the east side of Yucca Flat. This line is adequate for projected power requirements.

The 34.5 kV line from the Valley Tap/Substation, which supplied the EPA Farm and the Pile Driver/Climax stock, has adequate power for these facilities. In addition, the 138 kV line tap from the Valley Tap/Substation extends through Areas 8 and 15 to a test area 27 km (17 mi) away in the northeast corner of the NTS.

The existing 4.16 kV power distribution overhead and underground lines are supplied from the Frenchman Flat substation by way of the 34.5 kV north feeder and from the Yucca Flat substation by way of the 34.5 kV south feeder. The Yucca Flat substation is fed by a 138 kV line running north from the Mercury substation. The subtransmission lines feeding Area 6 are #4/0 aluminum-conductor, steel-reinforced, with a capacity of 300 amps.

Area 12 is fed by a 34.5 kV subtransmission line from the Valley substation to substation 12-1. The 4.16 kV distribution line feeding the camp is a #2/0 steel-reinforced aluminum conductor. The cable has a capacity of 266 amps. A review of loading indicate that the Rainier Mesa substation has adequate capacity.

There are no facilities in Area 14. Facilities at the High-Explosive Simulation Test site have been abandoned or removed. The area is not serviced by any utilities other than power. The existing power distribution consists of 64 kV and 138 kV lines that parallel the southern boundary of Area 14 and a

34.5 kV line that crosses the northwestern corner of the area.

The distributed communications repeater network for the NTS is located at Shoshone Peak in Area 29. A telemetry and microwave station was installed nearby and currently is maintained by the U.S. Air Force. Originally, it was installed for data collection and relay during the flights of the X-15 experimental aircraft from Edwards Air Force Base in California. Currently, this station is used as part of the U.S. Air Force communications network.

Existing power to Area 29 consists of a 34.5 kV line crossing Area 14 from the Yucca Flat substation. Substation 29-1 supplies power to the Shoshone receiver station and the Shoshone Mountain transmitter. In addition, a 138 kV line runs through Area 29 from the Jackass Flats Substation to the Stockade Wash substation. A portion of the 138 kV NTS power loop passes through Areas 17, 18, and 30. This portion of the loop connects the Stockade Wash substation in the northeast corner of Area 18 to the Rainier Mesa substation in Area 12 and extends south to the Canyon substation in Area 25. A 69 kV radial extends from the Stockade Wash substation up to the Castle Rock, Echo Peak, and Pahute Mesa substations in Area 19. At the Pahute Mesa substation, the voltage is stepped down to 34.5 kV, and the line splits to the far north and west. Other existing power lines and signal cables used for specific test events in the past are still visible. Power for Pahute Mesa (Areas 19 and 20) is presently fed by a 34.5 kV subtransmission line from the Pahute Mesa substation. This substation is tied into the NTS 138 kV loop at the Stockade Wash substation. The transmission line from the Pahute Mesa substation is a #4/0 steel-reinforced aluminum conductor. This cable has a capacity of 340 amps. The radial, single-thread system traverses mountainous terrain and is frequently downed by severe winds and winter storms. A downed line in this area is difficult to repair and can cause prolonged loss of commercial power on Pahute Mesa. The condition of the power lines, insulators, and poles is poor and needs to be upgraded.

Area 23 is fed by 4.16 kV, overhead power distribution lines from the Mercury substation. Some of these lines also feed sites outside Area 23. The Mercury substation has a total of 11 circuits that feed Area 23. Two of these circuits (3 and 7) are spares, and one circuit (10) is boosted from 4.16 kV to 12.4 kV by means of transformers. Circuits 4, 6, 8, 9, and 11 are fed with a #2/0 steel-reinforced aluminum conductor. This cable has a capacity of 266 amps. Circuits 1 and 5 are fed with #2 aluminum steel-reinforced conductor, with a capacity of 179 amps. Circuit 10 is fed with #2 copper wire with a capacity of 233 amps. Circuit 2 is a dedicated circuit to Building 300. It is a #6 copper wire with a capacity of 135 amps. It has been determined by circuit analysis that additional future loads will not adversely affect this line.

Power to Area 25 is supplied from the Jackass Flats substation 1 via the 138 kV line from Las Vegas. Auxiliary power sources consist of diesel engine-driven generators at the Control Point.

Area 27 facilities are fed by a 34.5 kV subtransmission system. The work sites are fed by 4.16 kV lines stepped down by transformers as required from substation 11.

A.6.1.1.2 Natural Gas—Currently, the NTS does not use piped natural gas and has no supply line for furnishing it on site. Any project(s) requiring natural gas (other than propane, which can be supplied via truck) would have to construct a pipe line to the project site to meet its needs.

A.6.1.1.3 Water Supply—The NTS is served by a water system comprising 11 operating wells for potable water, one well for nonpotable water, 27 utilized storage tanks, 13 usable construction water sumps, and 6 water transmission systems (with 5 permitted water distribution systems currently being used). The wells are not being used to their full capacity and are capable of producing much more water if needed. Additional wells are available or may be drilled and developed if increased water production is required. Wells, sumps, and storage tanks are used as required to support construction or operational activities. Five water storage tanks are currently under construction at the NTS. A variety of domestic, construction, and fire-protection water uses are served by this system. The water system disturbs 56,026 m^2 (603,059 ft^2) of land on the NTS as shown in Table A-2.

This evaluation focuses on major operating water systems at the NTS; descriptions of abandoned water wells have been excluded. Temporary aboveground pipe lines serving drilling locations in Areas 19 and 20 have also been excluded because their configurations change frequently.

For purposes of this evaluation, the NTS water system has been divided into four water service areas (A, B, C, and D), according to the location of the water system and support facilities.

System capabilities within water service area A are limited. This water system can only transfer water from Area 19 to Area 20. Water cannot be transferred between construction sumps. To prevent freezing, a continuous flow of water must be maintained within the aboveground, 15 cm (6-in.) victaulic pipe line (piping connected together with a circular clamp) that parallels Pahute Mesa Road. Currently, the line has been drained.

Water Well 19c and Well 20 can supply nonpotable construction water in water service area A. Well 19c pumps to some drilling locations in Area 20. Although relatively high fluoride concentrations have been detected at Well 19c, water from this well is soft and of good quality. Well 19c can pump to the Area 20 sump to augment the Well 20 supply. The pump for Well 20 has failed and funding/program cutbacks preclude its being replaced. However, when it was functioning, Well 20 could only supply the Area 20 camp sump and could not supplement the Well 19c supply for Area 19.

Three sumps can provide construction water storage within Areas 19 and 20. When in service, water can be delivered to these sumps from Well 19c by a 15 cm (6-in.) aboveground pipe line that parallels Pahute Mesa Road. Booster pumps at the Well 19c road sump and the Area 20 camp sump delivered water to remote drilling locations through temporary aboveground pipe lines.

Truck-fill stands at these sumps provided water for other construction applications. The control panels at the sump pumps and the fill stand pumps cannot be used until they are upgraded to meet the required electrical codes; however, these upgrades have not been planned due to funding restrictions and program changes. All potable water must be trucked to the Area 20 support facilities.

All other water wells in water service area A have been abandoned due to casing damage. All wells that are no longer functional or when the water is unusable are capped prior to being abandoned.

Well 2 is not operating, and no plans have been made to repair it due to funding restrictions and program changes. Well 2 served construction and drilling water needs. The Well 2 sump and reservoir provide construction water storage.

Well 8 serves construction, fire protection, and potable water uses at Area 2 support facilities and at the Area 12 camp and provides construction water for Area 2. Well 8 produces the highest quality water at the NTS.

Water from Well 8 is pumped from the Pahute Mesa pumping station into four storage tanks in Area 12. The water is pumped through the 20 cm (8-in.) pipe line and the old 10 cm (4-in.) pipe line that parallels Stockade Wash Road. System head losses limit the flow rate through this pipe line; however, the flow rate is adequate.

Water is delivered to the Area 2 support facilities by a 25-cm (10-in.), reinforced thermosetting resin pipe or composite fiberglass pipe line from the Area 12 reservoirs (storage tanks).

Two reservoirs and a construction sump provide on-site water storage near Well 8, but the sump is not operational. Another construction sump is located at the former Pahute Control Point. The Area 2 sump provides construction water storage at the Area 2 support facilities.

Well UE-16d serves construction water requirements at Area 1 support facilities. It also provides potable water through a chlorine injector that is also located in Area 1. The concentration of total dissolved solids in water from Well UE-16d exceeds the maximum containment level specified by the Safe Drinking Water Act.

Water from Well UE-16d is delivered to Area 1 support facilities through a 31-cm (12-in.) polyvinylchloride water line that parallels Pahute Mesa Road. Construction water storage is provided at the storage tank in Area 16.

Well UE-15d served construction and potable water needs at the EPA complex in Area 15 prior to abandonment of the complex. This well is not operating due to funding restrictions. A reservoir and construction water sump still provide water storage capabilities near Well UE-15d. Concentrations of iron and of total dissolved solids in water from this well exceed maximum contaminant level standards.

Seven wells serve water uses within water service area C. Wells C, C-1, 4, and 4a also provide water services for facilities in Area 6 (the Well 3 area, the Yucca Lake area, and the Control Point). Nitrate concentrations in water from Well A periodically exceed maximum contaminant level. Iron, total dissolved solids, and hardness concentrations in water from Well C significantly exceed the maximum contaminant level. Water from Well C-1 is high in color. The underground construction water pipe line that connects Well C and the C-1 sump to the Well A sump and to the Well 3 sump is badly deteriorated. Lack of funds prevents the many constant leaks from being repaired until they become bad enough to stop the flow of water through the pipe line.

Wells 5b and 5c and Army Well 1 serve construction, fire protection, and potable water uses for Area 5 and Mercury. Well UE-5c served water uses at Area 5 support facilities before the facilities were abandoned. Well UE-5c is only used for environmental sampling. Well F, originally developed as an exploratory well, is not operational, and there are no plans to use it in the future. Total dissolved solids and hardness concentrations in water from Well F exceed maximum contaminant level.

NORTHERN HALF—A major portion of the Area 3 water supply serving construction and fire protection purposes is delivered by the deteriorated 20-cm (8-in.) water line that originates at the Well C sump. This sump is currently supplied by Wells C, C-1, 4, and A. There is no potable water available in Area 3, and the temporary storage tank is out of service and needs repairs. A large sump provides nonpotable water storage at the Area 3 camp.

Fire protection water for the Well 3 yard is provided by the Well 3 sump. This well originally satisfied nonpotable water requirements in this location; however, it was abandoned owing to low yield. The Well 3 yard does not have a reservoir, and separate potable and nonpotable water systems preclude provision of a water system loop within the Well 3 area.

Both the Control Point and the Yucca Flat facilities in Area 6 receive fire protection and potable water service from the Control Point reservoir. These facilities are supplied by an 20-cm (8-in.) water line originating at the Well C/C-1 forebay tank. Pressure-reducing stations at points on the water distribution system serving the Control Point, Yucca Flat, and the Well 3 area maintain acceptable system operating pressures. A large sump located at Well C serves construction water demands within the area.

The underground asbestos-cement water pipe in the Area 6 distribution system is very old and needs to be replaced. The pipes have become soft and waterlogged and have ruptured in several locations because new pipe was coupled to the older pipe. The pressure created by coupling the new and old pipe causes the additional ruptures.

Well 4 and a water transmission line extension to the Well C/C-1 forebay tank were recently completed to provide a better source of potable water for Area 6 facilities, which include the Device Assembly Facility, the Control Point, the Yucca Flat facilities, and the Well 3 yard. The water quality analyses for Well 4 indicate that this attempt has been reasonably successful; however, the relatively low-quality water from Wells C and C-1 is still the source of potable water because it is the only water that can be softened to the desired 0 to 15 milligrams per liter (mg/L) (0 to 15 ppm) quality needed.

Well 4a is part of the system serving Area 6, which includes the Control Point, Yucca Flat, and the Well 3 yard. During normal operations, Well 4a provides water to the Well C booster that connects to the Control Point. The water is no longer softened at the Well C booster; point-of-use softeners have been installed instead. Wells C and C-1 provide redundancy and construction water.

Truck-fill stands at the Area 3 support facilities, Well 3, and Well C served event-related construction activity in the northern half of Water Service Area C.

A potable truck-fill stand in Area 6 provides construction water.

SOUTHERN HALF—Construction, fire protection, and potable water demands in the southern half of Water Service Area C are served by Wells 5b, 5c, and Army Well 1. Construction water in Area 5 is provided by the Well 5b sump. Wells 5b and 5c and a booster pump station provide a portion of the potable water for Mercury. Water is delivered to a large storage reservoir near Mercury by an 20-cm (8-in.) water line. A portion of this water line provides construction water to the aggregate pit. The potable water reservoir at Mercury is also fed by Army Well 1 through an existing 20-cm (8-in.) water line. Some potable water storage is provided at Army Well 1 by a small forebay tank.

The water distribution system at Mercury serves potable, fire protection, and construction water requirements. Truck-fill stands at Well 5b and in Mercury currently serve construction water needs within the area.

Water is currently hauled into Areas 26 and 27 by truck. Four reservoirs in Area 26 store construction water and potable water. One reservoir in Area 27 stores fire protection and potable water.

The current water distribution systems NTS revitalization project will add the redundancy, reliability, and operational flexibility that has not existed in the past. However, this project will also add operational complexity to the system. This type of complexity would be better controlled with the aid of a supervisory controlled and data acquisition system, which is not currently included in the scope of the revitalization project.

The water service area D system is a network of water lines interconnected with 11 water-storage reservoirs. This system serves construction, fire protection, and potable water needs in Area 25 and is serviced by Wells J-12 and J-13. A third well, J-11, was abandoned due to low yield, poor water quality, and a collapsed casing. Changes in Area 25 test program objectives within the past decade have reduced water demands in water service area D.

The Area 25 water system is fed by Wells J-12 and J-13. Fluoride and nitrate concentrations in the Well J-12 water exceed the maximum contaminant level and the water is high in color. Fluoride, nitrate, and iron concentrations in the Well J-13 water exceed maximum contaminant level.

All operable water storage reservoirs in Area 25 have been converted to potable water storage. Five of the 11 existing water-storage reservoirs are elevated structures. The other six reservoirs are ground-level structures.

The overflow and drain lines for the reactor control point tank in Area 25 no longer drain away from the nearby buildings and structures because of the addition of a helicopter pad. The overflow and drain lines for the Well J-11 and Well J-12 tanks do not meet state regulations because the pipes terminate under the sump water level. An air gap of 12 degree-inches is required.

Construction water storage in Area 25 is provided by a construction sump located near Well J-11. Two additional construction sumps are located near the former MX facilities.

Current water needs for the Yucca Mountain Project site are serviced by Wells J-12 and J-13. These wells produce soft water from permeable fractured-tuff and alluvial aquifers. Well J-11, which had poorer-quality water, has been abandoned primarily due to a collapsed casing. The underground pipe lines in Area 25, which are in very poor condition, include a line from Well J-12 to Well J-13, from Well J-11 to the Engine Test Stand facility, and a line from Well J-12 to Well J-11.

Water for the Area 1 complex is supplied by Well UE-16d, which has a current pumping capacity of 734 liters per minute (L/min) (194 gallons per minute [gal/min]). The water is pumped from the well to an adjacent 189,265-L (50,000-gal) storage tank and then to the facilities through a 31-cm (12-in.) line. Although not potable, this water is usable for industrial needs. A chlorine injector in Area 1 makes the water potable when necessary.

A.6.1.1.4 Nonhazardous and Nonradioactive Wastes—Domestic and industrial wastewater is transported through the sewage systems into sewage lagoons or septic systems located in the base camps throughout the NTS. Sewage waste treatment is an interim process before final disposal. Treatment operations are normally handled by sewage lagoons or septic tanks. Liquid wastes are treated through evaporation. Other nonhazardous solid waste is disposed of in sanitary landfills in Areas 9 and 23 of the NTS. A landfill in Area 6 is reserved for petroleum-contaminated soil and debris. Other unneeded materials are sold as scrap (metal and vehicles) or recycled (lead bricks and batteries). The land disturbance resulting from wastewater systems and sanitary waste landfills is $3.8x10^5$ m^2 ($4.1x10^6$ ft^2) at the NTS as shown in Table A-2.

<u>Wastewater System</u>

Area 1—The drilling operations, drilling subdock, and coal tar/epoxy building are connected to an underground leachfield. Portable sanitary units are provided at other facilities.

Area 2—On the west side of Rainier Mesa Road, the Area 2 camp is served by one septic tank/leachfield system fed by an underground gravity-flow collection network. On the east side of Rainier Mesa Road, the Area 2 camp discharges waste into two sewage lagoons. Each lagoon contains 511 m^2 (5,501 ft^2) of surface area and is 2 m (8 ft) deep. These lagoons are presently not used.

Area 3—Several facilities are serviced by underground collection systems, which feed three separate septic tank/leachfields.

Area 5—Support areas have or will soon have sanitary sewer capacity that is sufficient for proposed expansion in this area.

Area 6—Support areas have or will soon have sanitary sewer capacity that is sufficient for proposed expansion in this area.

Control Point—The facilities on the south side of the Control Point have a sewage lagoon disposal system, including four ponds that have been taken out of service. These facilities are connected via the Yucca Lake Sewage Lagoon System. Based on the total anticipated discharge and present capacity of the lagoons, the system is adequate.

Yucca Lake—There are two existing sewage systems at the Yucca Lake complex. One lagoon handles sewage from the shop areas; the other two lagoons handle the effluent from two steam-cleaning facilities. A separate system handles only radioactive waste from the decontamination facility and the decontamination laundry building.

Warehousing and Staging Area—The sewage system at the warehousing and staging area north of the Control Point consists of a new, 15-cm (6-in.) underground sewer pipe system that is connected to the Yucca Lake sewage lagoons.

Area 12—The existing sewage facility serving the Area 12 camp was replaced by a new system of eight sewage lagoons designed to meet present and future requirements. A 10-in-diameter cast-iron pipe feeds sewage effluent from the camp into the ponds.

The abandonment of inactive sewer lines has been completed. The inactive lines within the system have been isolated at manholes, cleanouts, and diversion boxes to reduce considerably the chance of future blockages and unauthorized discharges.

Areas 19 and 20—The existing sanitary systems in Areas 19 and 20 are limited. The abandoned Area 19 camp has no permanent provision for a sewer system. The Area 20 camp is serviced by an underground collector line connected to a septic tank/leachfield system, which only serves a first-aid-station trailer and a small Lawrence Livermore National Laboratory trailer.

Mercury, Area 23—Support areas have or will soon have sanitary sewer capacity that is sufficient for proposed expansion in this area.

The existing sewer system is a network of underground collectors leading to a sewage lagoon system. In the past, a sewage treatment plant southwest of the main camp was adequate to handle wastewater. However, mechanical problems required that this plant be abandoned and replaced. Currently, a lagoon system and evaporative ponds are used to treat waste.

Area 27—The Able and Baker sites are served by underground gravity-flow sewer systems, which empty into a septic tank/leachfield. The construction compound and Super Kukla sites are served by portable septic tanks.

A.6.1.2 Communications. The communications section of the infrastructure at the NTS employs approximately 119 NTS workers. Additional support personnel are located in Las Vegas because the majority of communications take place between the NTS and various Las Vegas facilities.

A.6.1.2.1 Telephone Service—The DOE/NV's facility on Highland Avenue in Las Vegas, Nevada, houses a central switching center employing a stored program-controlled host to provide the DOE/NV and its contractors with telephone communications. The system backbone is interconnected with major telephone systems by fiber-optic cable, copper cable, and microwave links through T-1 carriers.

All internal switching functions and interconnect microwave services are in digital format. All key components are redundant for service protection, and all satellite locations for the DOE/NV are EPABX and remote/peripheral switching centers. The DOE/NV uses a five-digit dialing plan within the system, and all locations have a uniform access arrangement for any calls placed outside the system. This system also includes transportable microwave radio systems capable of extending telephone services from any switching location to a distance of 32 km (20 miles). These systems enable quick and efficient service for programs at remote areas within the boundaries of the NTS.

The central switch at the DOE/NV facility is a Northern Telecom SL-100 Digital Switch. Telephone service within the building is provided by direct connection to the switch. All other DOE operations in Las Vegas and the NTS are slaved from this switch, which serves as the gateway for all telephone services within the DOE community. All trunking to outside telephone services are provided at this hub location. This switch also serves as the gateway for local commercial service, radio paging service access, local commercial outdial service, Wide Area Telephone Service and Federal Telecommunications Service. In the near future, this switch will provide the tie line to the Emergency Operations Center.

The basic system, along with the Remote Line Connector Modules at the DOE/NV facility, the North Las Vegas complex, and Echo Peak, were upgraded to Electromagnetic Module Interference-protected status in September 1987. Remote switching concentrators at Mercury, Area 6, and Area 12 of the NTS were also upgraded to EMI-protected status in September 1987. The SL-1M at the Tonopah Test Range was upgraded to an SL-1NT in April 1990.

SL-1s have been added to the system through a T-1 carrier at the following locations:

- SL-1NT, release 17 (Yucca Mountain Project Office) 09/87
- SL-1NT, release 13 (Remote Sensing Laboratory) 10/89
- Meridian option 61, release 16 (Device Assembly Facility) 10/91
- Meridian option 61, release 17 (IT Corporation) 04/92
- Meridian option 61, release 17 (Summerlin) 11/92.

Six DS-3 fiber-optic circuits, leased from Nevada Bell, provide service between the DOE/NV facility in Las Vegas and CP-18 (Smokey Jr.) in Area 6 of the NTS. Two DOE-owned fiber-optic routes are in service between Building CP-18 and Building CP-42 in Area 6 of the NTS and between Checkpoint Pass in Area 5 and Building 725 in Area 23 (Mercury).

The microwave tower and equipment shelter located at the rear of the DOE/NV facility provide redundant service for all facilities at the NTS through Angel Peak located on Mt. Charleston in the Spring Mountain Range and Building CP-18 in Area 6 of the NTS. Two parallel paths, each capable of supporting 84 T-1 digital carrier systems, are provided. Interconnection to the NTS SL-1 PBXs is provided over leased fiber-optic circuits and a microwave system.

Circuits from the central switch are routed over the Bechtel Nevada backbone microwave system. The microwave terminal and its associated analog multiplex system is located in the shelter behind the DOE/NV building. Emergency back-up alternate routing for specific telephones is provided as follows:

- 12 circuits, Control Point, Area 6
- 11 circuits, Mercury, Area 23
- 2 circuits, Area 12.

Foreign exchange lines from the Sprint Central Telephone-Nevada, South Five Facility, are connected to the DOE/NV terminal for the NTS. The signals from intrusion-detection alarm systems at the NTS are transmitted via outside cable distribution system-provided circuits. These circuits are routed through various main distribution frames on the NTS, depending on the location of the alarm system.

The Octel Maximum Voice Mail System, located at the DOE/NV facility, is networked to four Aspen voice mail systems located at the Yucca Mountain Project Office, the Remote Sensing Laboratory, the Tonopah Test Range, and the Summerlin building. Total storage for the complete voice mail system is 88 hours.

There are numerous radio remote-control units located throughout the NTS. These radio remote-control units allow operators to communicate via radio net(s) to other remotes, mobile units, and/or base stations. The radio remote-control units use telephone radio order lines connected to local transceivers. The routing is dependent upon the location of the radio remote-control unit in relation to the nearest Base Station Site or Reynolds Electrical and Engineering Co., Inc., backbone microwave system terminal.

Telephone service for Area 6 is provided by digital carrier service from Control Point-18 over outside distribution cable via the main distribution frame located at Control Point-40. Telephone service to Area 3 is also provided by this remote switching connector by back-feeding digital carrier on the outside distribution cable to CP-18 and then via microwave to the main distribution frame in Area 3.

The remote switching connector will allow local communications in the event of any disruption of service from the SL-100 in Las Vegas. The remote switching connector is equipped with emergency trunking that provides limited service to Areas 12 and 23 and access to the host switch via microwave.

Off-premise service is also provided from the Area 6 remote switching connector to systems construction.

Checkpoint Pass in Area 5 serves as a substation location with a microwave path to Skull Mountain in Area 25. Cable digital carrier on the outside cable distribution system provides service to the remote switching connector at Mercury, which provides the telephone service for Mercury and Area 5. Digital cable carrier is backfed to Checkpoint Pass where microwave carries the signal to Skull Mountain and then to the Area 27 main distribution frame to provide telephone service for that area. Two off-premise lines are provided to Indian Springs Air Force Base from the Mercury remote switching connector.

Intrasite trunking routes provide telephone service between Areas 6, 12, and 23 when in an emergency switching access mode, which would occur with the loss of the host switch located in Las Vegas.

Direct digital microwave service is provided from Control Point-18 to Area 12. The Area 12 remote switching connector provides service to the local area and to the tunnel portals at Rainier Mesa. Alternate trunking to other areas is a part of the emergency switching access mode for this remote switching connector.

The Echo Peak remote line concentrator module provides service for Areas 19 and 20, and direct digital carrier to the Tonopah Test Range, which is served by a Northern Telecom SL-1 digital switch. The Echo Peak Remote line concentrator module uses both the outside cable distribution system and mobile microwave systems with digital multiplex to provide telephone service for Areas 19 and 20.

In addition to the fixed and mobile microwave systems, a solar-powered mobile telephone microwave provides service to the Yucca Mountain Project Office and to Crater Flat to support drilling activities.

A.6.1.2.2 Microwave System—Voice, data, security and alarm, mobile radio communications, and event video are primarily provided by three separate microwave systems. A limited amount of fiber-optic and copper cable exists between the microwave sites and adjacent areas. The primary network for all voice, most data communications, and security and safety alarm systems is provided by a digital microwave system.

The mobile radio backbone system, some limited back-up telephone services, a number of security- and safety-related alarm systems, and a small number of data circuits use an analog microwave system. In addition to these two systems, a third event-related video system can carry services between the NTS and Las Vegas.

A.6.1.2.3 Data Communications—The Department of Energy Communications Network provides data, video, and voice communication links for the DOE/NV, laboratories, contractors, and the DOE Headquarters. The network provides data service in 1,200-baud (Bd) increments, beginning at a bandwidth of 1,200 Bd to full T-1 and is managed by the DOE/NV network operations center located in Las Vegas or the network operations center located in the Washington, DC, area. If either site were disabled, the other site could continue to monitor and manage the network.

The Department of Energy Communications Network can be accessed through the network operations center located in the DOE/NV facility. This operation will relocate to the new DOE/NV facility in the North Las Vegas complex when it is completed.

A.6.1.2.4 Video Communications— Currently, the DOE/NV, its contractors, and the laboratories have several video and related systems being used to support activities ranging from general administration to special project-related activities. Some of these systems parallel each other, although this type of back-up system is not necessary.

There are several video systems that support activities ranging from physical security to event-related activities.

A.6.1.2.5 Video Teleconferencing—In addition to the three conferencing systems that have been installed in Las Vegas and on the NTS, a multichannel conference unit has been installed for the purpose of configuring multipoint conferences. This system is currently equipped with cryptographic equipment, which will allow for secured multipoint conferences.

A.6.1.2.6 Radio—Central monitoring of the NTS radio nets is maintained at Station 900, which serves as the NTS radio-net coordination point. This station primarily functions as the reporting point for all emergency telephone and radio calls. It also provides for access of up to 30 radio nets for the purpose of coordination, all-net keying, voice countdown, telephone-to-radio patching, net-to-net patching, and net maintenance.

The Station 900 facility is manned 24 hours a day. Station 900 can be called by telephone by dialing 911 or 123 or on radio nets by using the international distress call "Mayday." By means of a hotline telephone system, the 900 operator connects the calling party to the Bechtel Nevada Medical, Fire, and Safety Departments; the Nye County Sheriff; Operational Control Center; and other essential units. The calling party can then communicate directly with the organization that responds to the emergency. This method of direct communications prevents misunderstanding that might occur if a relay system were used.

A special public safety network identified as Net 12 provides radio coverage throughout most of Nevada and neighboring parts of California and Utah through its 12-repeater system. The hub of Net 12 is located at the DOE station on Rainier Mesa, and the other 11 repeaters are at off-site locations ranging from Potosi Mountain near Las Vegas in the south to Mount Lewis near Battle Mountain, Nevada, to the north. These repeaters are linked by a VHF/UHF network and provide half-duplex operation. A completely solar-powered site is located at Hayford Peak, north of Las Vegas, to provide improved coverage of strategically important areas northeast of the NTS.

To meet operations security, three digital-encryption-standard simulcast UHF radio nets have been installed. A fourth trunking-capable simulcast UHF net that will be operated in a nondigital-encryption standard mode is being installed to support the Yucca Mountain Project.

A.6.1.2.7 Mail—A small United States Post Office is maintained in Mercury. It is run by four full-time employees. In addition to the post office, an internal mail system has been developed that connects various DOE and DOE contractor facilities in Las Vegas, as well as various facilities at the NTS. At these facilities, the mail is picked up, taken to a mail room, and sorted. It is then transported and delivered between various buildings on the NTS and in Las Vegas.

A.6.1.3 Transportation Systems. The NTS transportation system is composed of land, air, and rail facilities. A 1,127-km (700-mi) network of primary and secondary roadways serves land transportation needs, while three air strips and nine helicopter pads serve authorized aircraft. Two on-site rail systems in Areas 25 and 26 were previously used to transport heavy, oversized, and hazardous payloads between facilities. A total of 176 full-time employees is included in this portion of the NTS infrastructure.

A.6.1.3.1 Roads—The main access road to the NTS (Mercury highway) originates at U.S. Highway 95, approximately 105 km (65 mi) north of Las Vegas. Both the NTS and the Yucca Mountain Project area have restricted access from Amargosa Valley on U.S. Highway 95. Other existing roadways, although unpaved, could provide access or exit routes in case of emergency.

The on-site road network consists of 644 km (400 mi) of paved roads and over 483 km (300 mi) of unpaved roads. Additionally, the NTS contains numerous event-related unpaved roads, which are no longer used after a test has been conducted.

<u>NORTHERN ROAD NETWORK</u>—The primary paved roads in the northern part of the NTS are Pahute Mesa Road, Buckboard Mesa Road, and Tippipah Highway. The areas served by these roads are Buckboard Mesa, Pahute Mesa, and Rainier Mesa. Pahute Mesa Road from Yucca Flat to the Area 20 camp is typical of hot-mix paved roads on the NTS. At the higher elevations, the road is winding and crosses rugged terrain that is extremely hazardous under winter conditions. Chains or snow tires are essential when these conditions prevail. From the Area 20 camp to the intersection of Buckboard Mesa Road, the road consists of graded gravel.

Tippipah Highway is an adequately drained, all-weather highway that bypasses areas where testing has damaged Mercury Highway. This 8-m (26-ft) wide road has 2-m (8-ft) compacted shoulders and was constructed with 8-cm (3-in.), hot-mix asphalt over a 31-cm (12-in.) gravel base.

Rainier Mesa Road, one of the first gravel roads on the NTS, was hastily constructed with little planning for its long-range use. Currently, this narrow oil-and-chip road with no shoulders receives minimum maintenance.

In Yucca Flat, the segment of Mercury highway from the intersection of Rainier Mesa Road and Mercury Highway north to Sedan Crater is not passable for normal traffic due to damage from numerous local underground nuclear weapons events. Although there are many detours and bypasses from Sedan Crater to Guard Station 700, the 6-m (20-ft) wide roadway is in good condition.

Stockade Wash Road from Area 12 camp to Pahute Mesa Road is a hot-mix asphalt road in good condition; however, the mountain pass section through Eleana Ridge requires maintenance due to weathering.

Buckboard Mesa Road from Road 18-03 north to Pahute Mesa Road is a relatively new 18-km (11-mi)-long paved road providing convenient access to the mesa testing areas.

Orange Road, which was constructed during the early development of the NTS, was abandoned in favor of Tippipah Highway. Since this road has not been maintained for a number of years, most of the paving has deteriorated and crumbled.

SOUTHERN ROAD NETWORK—The primary paved roads in the southern part of the NTS include Mercury Highway, Jackass Flats Road, Cane Spring Road, and Lathrop Wells Road.

Mercury Highway is the primary route to the NTS from the interchange at U.S. Highway 95. Most of this road is 8-m (26-ft) wide (the same width as the Tippipah Highway); however, the shoulders are variable from 1 to 2-m (4 to 6-ft) wide.

The Mercury Bypass is well-constructed and runs from just north of Gate 100 to north of Mercury. This 8-m (26-ft) wide road was built to enable the rerouting of all traffic with a forward-area destination.

Jackass Flats Road from Mercury to the Area 25 support area is a hot-mix asphalt road that is in fair condition. Currently, some repair work is needed to meet passing standards. The road system in Area 25 is made up of 7-m (22-ft) wide roadways with 5-m (2-in.) hot-mix asphalt surfaces. This roadway provides the principal access to the Yucca Mountain Project area. Recycling this roadway with a plant mix would save it from deteriorating.

The Lathrop Wells Road provides access to the Yucca Mountain Project and the southwestern NTS from U.S. Highway 95. This plant-mix oil-and-chip road with no shoulders extends to Guard Station 500 (east of the Area 25 support region) where it becomes Cane Spring Road. Cane Spring Road extends east to Mercury Highway where it terminates. It is also an oil-and-chip road, except for an asphalt-overlaid section 3 km (2 mi) west of Mercury Highway.

Road 28-03 in Area 27 is a cold-mix, low-traffic road. Owing to the nature of security in that area, the road is adequately maintained. Tweezer, Angle, and Orange Blossom roads are narrow, secondary, oil-and-chip roads with no shoulders. These roads require periodic maintenance. Orange Blossom Road has been abandoned, and signs have been posted warning drivers to use at their own risk.

Major access to Area 29 is by Mine Mountain Road from Tippipah Highway. Secondary roads to Area 29 include Fortymile Canyon Road and Shoshone Mountain Road. All access roads to Area 29 are unpaved.

The remainder of the roadway network is composed of graded gravel roads and jeep trails. Gravel roads to event sites are maintained as requirements dictate. Gravel roads that remain in good condition include the Mine Mountain and Mid-Valley/Saddle Mountain Roads.

POTENTIAL HAZARDS

Northern Areas—Unique conditions at the NTS often preclude the use of conventional planning methods. Roadways have always been subject to extensive damage by localized seismic movements during underground nuclear tests. This type of damage has presented a unique challenge in road maintenance, especially around Mercury Highway in Areas 1, 2, 3, 7, 9, and 10. More detours or a more stable, efficient access to the northeastern area of the NTS might be required if further damage occurs to this roadway.

Significant traffic delays have occurred on Pahute Mesa Road during movement of heavy and oversized loads from the base of the mesa (elevation 1,219 m [4,000 ft]) to its summit (elevation 2.134 m [7,000 ft]). If this area is selected for any future projects or programs, traffic loads would also increase.

Southern Areas—Urban design standards for streets and roads must be modified to serve the particular needs of the NTS. Practical standards should be used to evaluate transportation needs in Mercury and the forward camps so that accident-risk areas within the traffic-flow patterns are minimized.

Traffic flow through Mercury is impeded by numerous intersections and the speed-reduction restrictions. Feeder traffic from Mercury Highway into the administrative and housing areas east of the highway and the industrial district west of the highway causes congestion during early morning and evening hours. This congestion is also a result of diverse and uncontrolled types of traffic, such as passenger vehicles, trucks, and buses.

Paved local-traffic streets at Mercury are approximately 6 m (18 ft) wide, which is sufficient for the projected traffic loads if parking is prohibited. However, streets do not have curbs and gutters, and surface drainage is carried in ditches parallel with streets.

In addition to vehicular traffic, pedestrian traffic in Mercury could become a problem because Mercury has an incomplete sidewalk system. Crosswalks at major Mercury Highway intersections do provide adequate safety at those points.

Project areas are initially accessed by graded gravel or dirt roads. If the projects become long term, these roads will require upgrading to all-weather oil-and-chip seal coats which are 8 m (26 ft) wide, with 2-m (8-ft) compacted shoulders.

A.6.1.3.2 Related Facilities—Transportation facilities related to the roadway network include bus parking and commuter-vehicle parking areas. Commuter buses provide regular and express passenger service daily to the NTS from Las Vegas and Pahrump by way of U.S. Highway 95. The number of buses entering the NTS can vary daily, depending upon the on-site activities in progress. The bulk of traffic accesses the NTS from Guard Station 100 near Mercury. Bus service is also provided between Mercury and the forward areas. Paved areas are provided for the commuter buses at the support facilities within Areas 6, 23 (Mercury), 12 and 25. Limited bus parking is also available at other support facilities on the NTS.

A.6.1.3.3 Railroads—The closest mainline railroad to the NTS, the Union Pacific, which runs through Las Vegas, is 80 km (50 mi) away from Mercury. This line connects southern California with points east, but does not connect with the NTS.

There is a 14 km (9 mi), standard-gauge railroad within Area 25. The former nuclear rocket development station facility employed a remotely operated train engine to move specially designed/equipped flatbed cars carrying extremely heavy, large, and highly radioactive materials. At the engine maintenance and disassembly facility, the railroad was used on site to transfer radioactive storage casks into heater holes.

A shorter, similar line was located at the Area 26 disassembly and test bunker sites. This line is abandoned, and much of the trackage and equipment has been removed.

A.6.1.3.4 Air Facilities—Air facilities include helipads and several unused airstrips in the northern and southern areas of the NTS.

NORTHERN AREA—The only airstrip in the north is the Buckboard Mesa/Pahute airstrip in Area 18. Classified as a secondary support facility for authorized aircraft at the NTS, Buckboard Mesa/Pahute airstrip has had minimal use in the last few years. Its primary purpose was as a landing strip for aircraft carrying supplies and personnel to Pahute Mesa sites. Occasional helicopters and approximately 10, fixed-wing aircraft per year landed at the strip when the mesa was in use. Permission to use the strip had to be prearranged and was restricted to daylight hours, since no runway lighting exists. The runway is relatively short, and its surface was unable to withstand the impact from high-speed takeoffs and landings of jet aircraft when it was in peak condition. The largest aircraft that could be accommodated was the prop-driven C-130. At the present time, the Buckboard Mesa/Pahute airstrip is unusable. The runway contains many potholes, as well as severe depressions in the center of its surface.

Helipads are located at the Buckboard Mesa/Pahute airstrip, the Area 12 camp, and the abandoned Pahute Mesa Control Point (Area 18).

SOUTHERN AREA—The southern area of the NTS is served by the Desert Rock and Yucca Lake airports.

Desert Rock Airport is the primary aircraft support facility at the NTS. Existing features at Desert Rock Airport include a paved runway, an administration/control building, a fireman standby trailer, an aircraft unloading pad, aircraft parking tie-down spurs, two lighted windsocks, and radio-activated runway lights. Additionally, the airport has a landing-arrester cable system for use in the recovery of damaged aircraft that require emergency landing facilities. Desert Rock Airport is no longer manned, and no services are available because of funding and program cutbacks. However, Desert Rock Airport is still operational, and the use of this airstrip is controlled by the DOE.

Yucca Lake Airport is a secondary NTS support facility for authorized aircraft, but is currently not used. Features at this facility include an unpaved runway, an abandoned terminal building, and an aircraft refueling station. The runway is subject to flooding following local storms.

Helipads, equipped with windsocks, fire extinguishers, and painted markings, are located in the following places:

- Area 5, Radioactive Waste Management Site (Inactive)
- Area 6, east of Mercury Highway across from the Control Point
- Area 6, east side of Yucca Lake (Aerial Response Team facility)
- Area 22, Desert Rock Airport
- Area 23, adjacent to the Bechtel Nevada medical facility
- Area 25, west of the administration building in the Central Support Area
- Area 29, on Shoshone Peak.

A.6.1.3.5 Pathways—There is no real pathway system at the NTS. Pedestrians walk along the side of the roads and streets or through open lots.

A.6.1.3.6 Parking—Transportation facilities related to the roadway network include bus, government vehicle, and commuter vehicle parking areas. Paved areas are provided for the commuter buses at the support facilities within Areas 6, 12, 23 (Mercury), and 25. Limited bus parking is also available at other support facilities on the NTS. Approximately 3 km^2 (1 mi^2) have been paved and are available for parking at the NTS. Parking for government and private commuter vehicles is available at most buildings on the NTS.

A.6.1.4 Facilities and Services. The on-site support is comprised of various groups of personnel conducting many diverse functions. These groups include medical, fire protection, Nye County Sheriff's Department, security, housing/janitorial/food services, administration, analytical services, information systems, quality assurance, engineering, environmental compliance, health protection, recreation, maintenance, National Oceanic and Atmospheric Administration, and the DOE. This on-site support includes 1,099 employees. These people are located in numerous facilities throughout the NTS.

A.6.1.5 Off-Site Support. Off-site support includes many of the support functions similar or related to the on-site support functions and is also comprised of diverse groups. These groups include medical, security, administration, information systems, quality assurance, engineering, facilities/maintenance, communications, utilities, transportation, Desert Research Institute, EPA, National Oceanic and Atmospheric Administration, and the DOE. These groups are located in Clark County, Nevada (Las Vegas and North Las Vegas), in various facilities and employ 1,639 people.

A.6.1.6 Landlord-Related Construction and Maintenance Projects. The majority of the facilities at the NTS were constructed 30 to 35 years ago as temporary structures; less than 10 percent have been constructed in the last 15 years. The DOE/NV did not have a line-item construction project from 1970 to 1980, and all building additions and modifications were accomplished with General Plant Project funds. This funding has been insufficient to meet programmatic needs and offset deterioration. Although the previous $1,200,000 cost cap on individual General Plant projects was raised to $2,000,000 as of November 1993, this ceiling will not enable the DOE/NV to replace any large facilities. The revitalization project has funded only 18 projects since its inception in 1984. Two of these projects were major capital equipment purchases, and six others were located in North Las Vegas or Nellis Air Force Base; consequently, only 10 major projects have been constructed for the NTS under revitalization. A number of the facilities at the NTS are also currently inadequate in one or more of the structural, mechanical, or electrical categories. In many instances, refurbishing these units only extends their useful lives by 5 to 10 years each. Additionally, the cost of refurbishment often exceeds the cost of replacement. The following projects are shown in the NTS Five-Year Construction Plan as underway or planned and are needed to maintain the NTS infrastructure (Table A-3). These are funded by the Defense Program as the responsible NTS landlord. The ability of the NTS to accept new missions relies on maintaining this infrastructure with sustained levels of funding and projects, such as those noted below. If, as indicated in Alternative 4, Defense Program activities are eliminated, these responsibilities would need to be underwritten by another program in order to retain NTS capabilities.

A.6.2 Alternative 2

The current level of infrastructure support regarding utilities, communications, transportation, on-site support, and off-site support would still be available under Alternative 2, but used commensurate with the ongoing site-related activities. With the reduction of site-related activities identified under Alternative 2, there would be no landlord-related construction or maintenance projects.

A.6.3 Alternative 3

The current level of infrastructure support in regard to utilities, communications, transportation, on-site support, and off-site support would still be available under Alternative 3, but used and expanded commensurate with Alternative 3 activities on site. With the increase of site-related activities identified under Alternative 3, the landlord-related construction or maintenance projects would be undertaken as circumstances dictate.

A.6.4 Alternative 4

The current level of infrastructure support in regard to utilities, communications, transportation, on-site support, and off-site support would still be available under Alternative 4, but used commensurate with the ongoing site-related activities. With the reduction of site-related activities identified under Alternative 4, there would be no landlord-related construction or maintenance projects.

Table A-3. Currently active or planned site-support projects (Page 1 of 4)

Fiscal Year 1992 currently active site-support projects

Project Overview	Summary Description
Title: Valley Substation Upgrade, Area 2 Sponsor: Defense Program Funding: GPP TEC: $244,000 Begin: FY 1992 End: FY 1995	Upgrade Valley substation to install a second feeder circuit to provide backup to the Rainier substation.

Fiscal Year 1993 currently active site-support projects

Project Overview	Summary Description
Title: Remodel the NTS Badge Office, Building 1000, Area 23 Sponsor: Defense Program Funding: GPP TEC: $491,000 Begin: FY 1993 End: FY 1995	Remodel the current facility to expand the waiting area, construct interview rooms; remodel restrooms to accommodate the handicapped, and upgrade the utilities.
Title: Control Point-1 Cafeteria Renovations, Area 6 Sponsor: Defense Program Funding: GPP TEC: $654,000 Begin: FY 1993 End: FY 1995	Renovate the cafeteria that is serving the Control Point compound, Area 6, and adjacent areas.
Title: Mercury Cafeteria Renovations, Building 300, Area 23 Sponsor: Defense Program Funding: GPP TEC: $983,000 Begin: FY 1993 End: FY 1995	Renovate Mercury, Area 23, cafeteria by increasing the fire sprinkler system coverage; remodel the restrooms and the entrance; upgrade the sanitation sewer system.
Title: Water Distribution Systems, NTS Sponsor: Defense Program Funding: RP TEC: $8,860,000 Begin: FY 1993 End: FY 1995	Provide necessary upgrades, modifications, and expansions to accommodate weapons testing program needs in seven prioritized phases serving Areas 5, 6, 16, and 23.
Title: Nevada Support Facility, North Las Vegas Sponsor: Defense Program Funding: LIP TEC: $38,650,000 Begin: FY 1993 End: FY 1996	Design and construct a two-story multifunction office building (17,930 m^2 [193,000 ft^2]) with associated site improvements on an 11-acre area.

Table A-3. Currently active or planned site-support projects (Page 2 of 4)

Fiscal Year 1994 currently active site-support projects

Project Overview	Summary Description
Title: Sewer Main Installation, Control Point to Yucca Lake, Area 6 Sponsor: Defense Program Funding: GPP TEC: $336,000 Begin: FY 1994 End: FY 1995	Provide for a gravity sewer main in Area 6 at Control Point to close two sewage lagoon facilities and eliminate the costs for operation, maintenance, and permit compliance at both sites.
Title: Expansion of Office Bldg. 117, Area 23 Sponsor: Defense Program Funding: GPP TEC: $350,000 Begin: FY 1994 End: FY 1995	Provide an addition to the Raytheon Services Nevada NTS division Building 117 to accommodate changes from an engineering to a multifunctional building, consolidating functions from four other buildings.
Title: Mercury Gas Station Upgrades, Area 23 Sponsor: Defense Program Funding: GPP TEC: $669,000 Begin: FY 1994 End: FY 1995	Locate and repair underground fuel leaks; upgrade tank overfill protections; install fuel inventory control system improvements; and install two new aboveground tanks.

Fiscal Year 1995 currently active site-support projects

Project Overview	Summary Description
Title: Bulk Fuel Storage Facility Upgrade, Area 5 Sponsor: Defense Program Funding: GPP TEC: $225,000 Begin: FY 1995 End: FY 1995	Clean and install a double-wall epoxy liner and a floating lid vapor recovery system in the 1.8×10^6 L (500,000-gal) gasoline tank in Area 23.
Title: Paging Terminal and Controller Replacement, NTS Sponsor: Defense Program Funding: OP/GPP TEC: $305,000 Begin: FY 1995 End: FY 1995	Replace the system with the most state-of-the-art equipment possible to ensure the longest system life (10 to 15 years) possible.
Title: Differential Global Positioning System, NTS Sponsor: Defense Program Funding: OP/GPP TEC: $310,000 Begin: FY 1995 End: FY 1995	Introduce system to provide several new mobile radio communication technologies to enhance surveying, intruder interdiction, fleet maintenance, and vehicle tracking services.

Table A-3. Currently active or planned site-support projects (Page 3 of 4)

Fiscal Year 1995 currently active site-support projects (continued)

Project Overview				Summary Description
Title: Sponsor: Funding: Begin:	Class III Landfill Construction, Area 5 Defense Program GPP FY 1995	 TEC: End:	 $663,000 FY 1995	Design and construct a new 191,139 m^3 (250,000 yd^3) capacity landfill for the disposal of inert construction and demolition debris.
Title: Sponsor: Funding: Begin:	New Records Management Center, Area 23 Defense Program GPP FY 1995	 TEC: End:	 $1,578,000 FY 1998	Construct a one-story facility consisting of 790 m^2 (8,500 ft^2), including restroom facilities.
Title: Sponsor: Funding: Begin:	Administration Office Addition, Bldg. 650, Area 23 Defense Program LIP FY 1995	 TEC: End:	 $1,883,000 FY 1998	Renovate and modify building 650 to provide office/administrative space for 25 full-time employees plus two classrooms; restrooms; and mechanical and electrical systems.
Title: Sponsor: Funding: Begin:	Road 5-01 Reconstruction (or Cane Spring Extension), Area 5 EM Program LIP FY 1995	 TEC: End:	 $5,005,000 FY 1996	Provide for the reconstruction of Road 5-01 (or the construction of an eastward extension of the Cane Spring Road) into an all-weather, paved access road for both heavy- and light-vehicular traffic to the Area 5 Radioactive Waste Management Site. Design for H-20 highway wheel-loading and employ drainage controls for the 100-year flood.

Fiscal Year 1996 planned site support projects

Project Overview				Summary Description
Title: Sponsor: Funding: Begin:	900 Operations Consolidation, NTS Defense Program OP/LIP FY 1996	 TEC: End:	 $452,000 FY 1996	Provide consolidation of other locations; provide greater access to equipment for maintenance purposes.
Title: Sponsor: Funding: Begin:	Microwave Radio Replacement, NTS Defense Program OP/LIP FY 1996	 TEC: End:	 $8,000,000 FY 1998	Replace existing Wiltel, REECo, EG&G/EM, and other miscellaneous microwave and communication systems needed in support of NTS activities.
Title: Sponsor: Funding: Begin:	IRAC Radio Replacement, NTS Defense Program OP/LIP FY 1996	 TEC: End:	 $15,000,000 FY 1998	Replace approximately 60 radio systems, 3,500 mobile radios and transmitters, consoles, and related equipment with a digitally trunked mobile radio system.

Table A-3. Currently active or planned site-support projects (Page 4 of 4)

Fiscal Year 1997 planned site-support projects

Project Overview	Summary Description
Title: Net 12 Upgrade, NTS Sponsor: Defense Program Funding: OP/LIP TEC: $3,000,000 Begin: FY 1997 End: FY 1998	Upgrade current NTS radio system.
Title: Renovate Existing Roadways, NTS Sponsor: Defense Program Funding: RP TEC: $10,170,000 Begin: FY 1997 End: FY 1998	Provide 52 km (32 mi) of Mercury Highway from the southern boundary of the NTS to the intersection of Road 6-09 at the Well 3 yard in Area 6.
Title: 138-kV Substation Modernization, NTS Sponsor: Defense Program Funding: RP TEC: $21,004,000 Begin: FY 1997 End: FY 2001	Replace one major substation, one switching center, and one switching station on the 138-kV transmission system loop at the NTS.

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 1 of 9)

k-ft³ - 1,000 ft³		Alternative 1 Totals	Defense	Waste Management	Environmental Restoration	Nondefense R&D	Work for Others	Site Support
		Alternative 1						
Waste Generated								
Hazardous	(kg/yr)	380,101	709	0	377,767	503	503	619
LLW	(k-ft³)	5,355	10	0	5,322	7	7	9
	(m³)	149,999	280	0	149,079	198	198	244
MW	(k-ft³)	18	0	0	18	0	0	0
	(m³)	501	1	0	497	1	1	1
Domestic (Class 1-Solid)	(k-ft³/yr)	756	169	29	45	22	40	451
	(m³/yr)	21,200	4,740	810	1,250	620	1,130	12,650
Waste Stored/Disposed								
Additional LLW	(k-ft³)	12,495		12,495				
	(m³)	350,000		350,000				
Additional MW	(k-ft³)	18		18				
	(m³)	500		500				
PCB	(k-ft³)	22		22				
	(m³)	612		612				
New Cotter Waste	(k-gal)	0						
	(k-l³)	0						
Off-site Waste Shipments[a]								
Hazardous	(Shipments/yr)	20	4	1	1	1	1	12
LLW	(Shipments/yr)	700		700				
MW	(Shipments/yr)	0		0				
Area Disturbed								
Average Month	Acres	75	2	19	52	0	0	2
Total	Acres	9,905	30	34	9,823	0	0	18
Water Demand								
Air Quality Mitigation	(acre-ft/yr)	24	0	6	17	0	0	1
Consumptive Use	(acre-ft/yr)	1,699	380	65	100	49	91	1,014
Employment	(FTE)	6,576	1,472	250	389	191	350	3,924
Fuel Use	(gal/mo)	187,000	41,846	7,114	11,051	5,440	9,959	111,590
Expenditures	($k/yr)	$670,312	$150,000	$25,500	$39,612	$19,500	$35,700	$400,000

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 2 of 9)

	Alternative 2						
k-ft^3 - 1,000 ft^3	Alternative 2 Totals	Defense	Waste Management	Environmental Restoration	Nondefense R&D	Work for Others	Site Support
Waste Generated							
Hazardous (kg/yr)	4,962	0	0	0	0	0	4,962
LLW (k-ft^3)							
LLW (m^3)							
MW (k-ft^3)							
MW (m^3)							
Domestic (Class 1-Solid) (k-ft^3/yr)	10	0	0	0	0	0	10
Domestic (Class 1-Solid) (m^3/yr)	300	0	0	0	0	0	300
Waste Stored/Disposed							
Additional LLW (k-ft^3)	0						
Additional LLW (m^3)	0						
Additional MW (k-ft^3)	0						
Additional MW (m^3)	0						
PCB (k-ft^3)							
PCB (m^3)							
New Cotter Waste (k-gal)	0						
New Cotter Waste (k-l^3)	0						
Off-site Waste Shipments[a]							
Hazardous (Shipments/yr)	1	0	0	0	0	0	1
LLW (Shipments/yr)							
MW (Shipments/yr)							
Area Disturbed							
Average Month Acres	0	0	0	0	0	0	0
Total Acres	0	0	0	0	0	0	0
Water Demand							
Air Quality Mitigation (acre-ft/yr)	0	0	0	0	0	0	0
Consumptive Use (acre-ft/yr)	22	0	0	0	0	0	22
Employment (FTE)	86	0	0	0	0	0	86
Fuel Use (gal/mo)	2,441						2,441
Expenditures ($k/yr)	$8,750	$0	$0	$0	$0	$0	$8,750

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 3 of 9)

	Alternative 3						
k-ft³ - 1,000 ft³	Alternative 3 Totals	Defense	Waste Management	Environmental Restoration	Nondefense R&D	Work for Others	Site Support
Waste Generated							
Hazardous (kg/yr)	768,402	1,433	0	763,685	1,017	1,017	1,250
LLW (k-ft³)	5,355	10	0	5,322	7	7	9
LLW (m³)	149,999	280	0	149,079	198	198	244
MW (k-ft³)	18	0	0	18	0	0	0
MW (m³)	501	1	0	497	1	1	1
Domestic (Class 1-Solid) (k-ft³/yr)	1,526	342	58	90	44	81	911
Domestic (Class 1-Solid) (m³/yr)	42,810	9,580	1,630	2,530	1,250	2,280	25,540
Waste Stored/Disposed							
Additional LLW (k-ft³)	32,130		32,130				
Additional LLW (m³)	1,000,000		1,000,000				
Additional MW (k-ft³)	10,710		10,710				
Additional MW (m³)	300,500		300,500				
PCB (k-ft³)	22		22				
PCB (m³)	623		623				
New Cotter Waste (k-gal)	68		68				
New Cotter Waste (k-l³)	259		259				
Off-site Waste Shipments[a]							
Hazardous (Shipments/yr)	40	9	2	2	1	2	24
LLW (Shipments/yr)	2,460		2,460				
MW (Shipments/yr)	1,540		1,540				
Area Disturbed							
Average Month Acres	448	50	115	52	229	0	2
Total Acres	15,632	1,000	209	9,823	4,582	0	18
Water Demand							
Air Quality Mitigation (acre-ft/yr)	144	16	37	17	73	0	1
Consumptive Use (acre-ft/yr)	8,986	789	210	203	5,641	92	2,051
Employment (FTE)	13,294	3,052	813	786	352	358	7,933
Fuel Use (gal/mo)	378,035	84,595	14,381	22,340	10,997	20,134	225,588
Expenditures ($k/yr)	$1,355,089	$311,114	$82,911	$80,079	$35,850	$36,453	$808,682

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 4 of 9)

Alternative 4								
k-ft³ - 1,000 ft³		Alternative 4 Totals	Defense	Waste Management	Environmental Restoration	Nondefense R&D	Work for Others	Site Support
Waste Generated								
Hazardous	(kg/yr)	221,326	0	11,646	18,091	8,906	0	182,683
LLW	(k-ft³)	5,355	10	0	5,322	7	7	9
	(m³)	149,999	280	0	149,079	198	198	244
MW	(k-ft³)	18	0	0	18	0	0	0
	(m³)	501	1	0	497	1	1	1
Domestic (Class 1-Solid)	(k-ft³/yr)	440	0	23	36	18	0	363
	(m³/yr)	12,299	0	647	1,005	495	0	10,152
Waste Stored/Disposed								
Additional LLW	(k-ft³)	6,783		6,783				
	(m³)	150,000		150,000				
Additional MW	(k-ft³)	179		179				
	(m³)	500		500				
PCB	(k-ft³)	22		22				
	(m³)	623		623				
New Cotter Waste	(k-gal)	68		68				
	(k-l)	259		259				
Off-site Waste Shipments[a]								
Hazardous	(Shipments/yr)	12	0	1	1	0	0	10
LLW	(Shipments/yr)	0		0				
MW	(Shipments/yr)	0		0				
Area Disturbed								
Average Month	Acres	289	0	6	52	229	0	2
Total	Acres	14,434	0	11	9,823	4,582	0	18
Water Demand								
Air Quality Mitigation	(acre-ft/yr)	93	0	2	17	73	0	1
Consumptive Use	(acre-ft/yr)	6,539	0	105	203	5,641	0	590
Employment	(FTE)	3,829	0	407	786	352	0	2,284
Fuel Use	(gal/mo)	108,887	0	5,730	8,900	4,381	0	89,876
Expenditures	($k/yr)	$390,213	$0	$41,456	$80,079	$35,850	$0	$232,828

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 5 of 9)

General Assumptions	1) Any underground nuclear test would be conducted in existing downhole locations. This would result in no further impacts from land disturbances, infrastructures support, etc. 2) All NTS EIS resource estimates were prepared to cover the 10-year analysis period. 3) Water use for dust control. 50% control = 285 gal/acre/day (8,700 gal/acre/month)[b]. This is valid of areas of active construction prior to soil stabilization. 4) Disposal of low-level waste in Alternatives 1 & 3 will be divided between Areas 3 & 5. Seventy-five percent (75%) will be placed in facilities in Area 3 while twenty-five percent (25%) will be placed in Area 5 disposal facilities. Disposal of low-level waste in Alternative 4 will be exclusively in Area 3. Disposal of all mixed low-level waste will be in Area 5.
Resource Specific Assumptions	
TOTAL EXPENDITURES	*Alternative 1.* The annual total expenditures in 1995 was provided by the DOE/NV Office of the Chief Financial Officer. The allocation of employment by program was determined in the NTS EIS fact sheet meeting in mid-September 1995. *Alternatives 2, 3, & 4.* Projected expenditures for each alternative and program within each alternative was estimated by using the Alternative 1 expenditures and adding project funding requirements for each program as identified in the original NTS EIS data sheets.
EMPLOYMENT	*Alternative 1.* Total employment (FTEs) in 1995 was provided in the September 14, 1995 "Report on NTS-related and Other NV-related Employment." The allocation of employment by program was determined in the NTS EIS fact sheet meeting in mid-September 1995. *Alternatives 2, 3, & 4.* Projected employment for each alternative and program within each alternative was estimated by the ratio of total alternative (or program) expenditures to a similar ratio of employment and expenditures from Alternative 1.
WATER USE	*Alternative 1.* Total water demand in 1995 was 1,700 acre-feet/year. Water use by program was determined in the NTS EIS fact sheet meeting in mid-September 1995. *Alternatives 2,3 & 4.* Projected water demand for each alternative and program within each alternative was estimated by the ratio of total alternative (or program) expenditures to a similar ratio of water demand and expenditures from Alternative 1. Solar Enterprise Zone water demand[c] was added to the Non-Defense Research & Development Program projects in Alternatives 3 & 4.
DISTURBED AREA	Disturbed areas are those values provided by each program for new land disturbance activities in Appendix A. Disturbance was assumed to continue throughout the full ten-year period. Disturbed areas associated with new buildings were estimated at 2 times the building interior area. Total current disturbed area = 58,729 acres.

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 6 of 9)

<table>
<tr><td>DISTURBED AREA (Cont'd)</td><td>Alternative 1. Defense Programs: Big Explosives Experimental Facility would disturb 30 acres. Active ground disturbance would be expected for up to 6 months.

Waste Management: Area 3: Current disposal volume = 10,650,000 ft^3 of low-level waste. Current disposal area is on approximately 20 acres. Therefore, the current practice results in the disposal of 532,500 ft^3/acre or 14,900 m^3/acre. Seventy-five percent (75%) of low-level waste disposal volume= (.75 X 350,000) = 262,500 m^3. Projected area to be disturbed = 262,500 m^3/14,900 m^3 acre = 18 acres. Approximately 55% of the area would be in active operation at any time.

Area 5: Current disposal area = 30 acres, current volume = 6,344,700 ft^3. Therefore, the current practice results in the disposal of 211,500 ft^3/acre or 5,900 m^3 /acre. Projected area to be disturbed = 500 m^3/5,900 m^3/acre = less than 1 acre. Twenty-five percent (25%) of low-level waste disposal volume = (.25 X 350,000) = 87,000 m^3. Projected area to be disturbed = 87,500 m^3/5,900 m^3/acre = 15 acres. Total area disturbed = 16 acres. Approximately fifty-five percent (55%) of the area would be in active operation at any time.

Environmental Restoration: Total area to be disturbed over the 10-year period from Appendix A = [3520 + 2510 + 30 + 2.5 + (165000/43560) + 500] = 10,086 acres. Bulk materials remediation activities (Plutonium contaminated soil media corrective actions, contaminated waste sites within Industrial Sites corrective actions and Defense Nuclear Agency sites) are assumed to be sequential actions and are estimated to have active construction on approximately 55 acres/month. Soil stabilization actions (the application of soil stabilizers and other revegetation activities) are assumed to be implemented immediately and at a rate equal to that of active construction. Inactive tank remediation is expected to have active construction followed by soil stabilization on 1 acre/month for a 30-month duration. Soil disturbance on the eight decontamination and decommissioning sites is assumed to be approximately 1 acre/site for 2 months.

Results: 55 acre disturbance for 114 months for bulk materials (55 X 114) = 6270 acre-months
1 acre disturbance for 1 month for inactive tanks (1 acre-month)
1 acre disturbance for 2 months for decontamination and decommissioning (2 acre-months)
Annual Average = 52.25 acres (6273 acre-month/120 months) of disturbance for 10 years of environmental restoration activities

Nondefense research and development: Solar Enterprise Zone, listed in ALT 1 (section 3.1.1.4), does not appear on maps and does not include construction or other land disturbance; therefore, no disturbance.

Work-for-Others: No disturbance.

Site Support: Roadway Improvements for Road 5-01. 18 acres. Active construction would extend for up to one year.

Alternative 2: No disturbance.</td></tr>
</table>

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 7 of 9)

DISTURBED AREA (Cont'd)	***Alternative 3.*** Defense Programs: Facility improvements (including the National Ignition Facility , Plutonium, and Highly-Enriched Uranium, Device Assembly Facility modification and the large, heavy industrial facility) = 1000 acres. Active ground disturbance would be expected for up to 6 months. Waste Management: low-level waste volume = 1,000,000 m^3. Mixed low-level waste Volume = 300,500 m^3. Area 3 = 750,000 m^3/ 14,900 m^3/acres = 51 acres Area 5 = 300,500 m^3/ 5,900 m^3/ acres + 250,000 m^3/ acres = 94 acres Flood control dike: 15,500' long x 100' wide = 35 acres Class I Landfill: 15 acres Area 6: New liquid waste treatment facility = 14 acres Total Area Disturbed = 209 acres. Approximately fifty-five percent (55%) of the area would be in active operation at any time. Environmental Restoration: Same as Alternative 1. Nondefense Research and Development: Solar Enterprise Zone: 2,400 acres of disturbance is estimated for the development of up to 1,000 MW of generating capacity. This disturbance could be distributed among each site. Infrastructure improvement requirements are bounded by the power line and natural gas pipeline from the NTS to Las Vegas assumed to be 60 mi x 150 ft (each) = 2,182 acres. Active ground disturbance would be expected for up to 6 months. Work-for-Others: No disturbance. Site Support: Roadway improvements for Road 5-01. 18 acres. Active construction would extend for up to one year. ***Alternative 4.*** Defense Programs: No disturbance. Waste Management: Area 3 = 150,000 m^3/14,900 m^3 = 10 acres Area 5 = 500 m^3/5,900 m^3/acre = less than 1 acre Approximately 55% of the area would be in active operation at any time. Environmental Restoration: Same as Alternative 1. Nondefense Research and Development: Same as Alternative 3.

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 8 of 9)

FUEL USE	*Alternative 1.* Estimated total fuel use was based on information supplied by the liquid propane supplier, Southwest Gas, by a program which was determined in the NTS EIS fact sheet meeting in mid-September 1995. *Alternatives 2, 3, & 4.* Projected fuel use for each alternative and program within each alternative was estimated by the ratio of the total alternative (or program) expenditures to a similar ratio of fuel use and expenditures from Alternative 1.
IMPORTED AND NTS-GENERATED LOW LEVEL WASTE, MIXED LOW LEVEL WASTE, AND TRANSURANIC WASTE	*Alternative 1.* Low-level waste and mixed low-level waste figures were estimated from the existing, approved off-site waste generators. Totals were derived from DOE/NV Lifetime Generator Reports, 1995 Draft Baseline Environmental Management Report for Nevada for on-site generation (principally from environmental restoration activities) and projection from the 1993 Integrated Data Base for recently approved generators. *Alternative 2.* Low-level waste and mixed low-level waste generation from decommissioning activities is assumed to be sufficiently small to be discounted. *Alternative 3.* Low-level waste estimates were based on information from the 1993 Integrated Data Base expanded to the 10-year time frame. Environmental restoration-derived low-level figures from the NTS were estimated from the Baseline Environmental Management Report. Mixed low-level figures were estimated from the DOE Headquarters Mixed Waste Inventory Report and the Baseline Environmental Management Report. *Alternative 4.* Low-level waste and mixed low-level figures were estimated from the Baseline Environmental Management Report and the Lifetime Generator Reports. *TRU All Alternatives.* Constant for all alternatives based on the existing amount stored on the Transuranic Storage Pad within the NTS Area 5 Radioactive Waste Management Site.
OFF-SITE WASTE TRUCK TRIPS	*All Alternatives.* Low-level waste and mixed low-level waste truck "load" calculated by dividing the total waste volume by the average capacity of each truck. Historic data of shipments from Rocky Flats to the NTS indicates that each shipment was composed of approximately 7m^3 (250 ft^3) of either low-level waste or mixed low-level waste, Shipments from other DOE sites contained approximately 37.5 m^3 (12 containers, each containing 112 ft^3 of material (4 ft x 4 ft x 7 ft, Total capacity = 1,344 ft^3) of either low-level waste or mixed low-level waste. Shipments were rounded to the nearest 10 shipments/year. Hazardous waste truck transport estimated to be 20/year, based on the REECo Hazardous Waste Collection Summary and EG&G waste information.

Table A-4. NTS EIS Program Summary Data and Resource Assumptions (Page 9 of 9)

SOLID WASTE GENERATION	*Alternative 1.* Total domestic solid waste was based on the August 1995 "Final Environmental Assessment for Solid Waste Disposal," Nevada Test Site. The reported value is 7,630 tons/year. Conversion to ft^3 was derived following consultation with NTS staff responsible for management of solid wastes. Approximately ninety-one percent (91%) of the wastes are disposed at 500 lbs/yd^3. The remaining nine percent (9%) is disposed at 100 lbs/yd^3. Therefore, the composite is disposed at 20.2 lbs/ft^3. Distribution of this waste among the programs was based on the relative contribution of program expenditures to the total. Additional amounts were added for environmental restoration-derived wastes (from Appendix A). *Alternatives 2 and 4.* Total and program derived solid wastes were estimated by the ratio of total alternative (or program) expenditures to a similar ratio of solid waste generation and expenditures from Alternative 1. *Alternative 3.* Same as Alternatives 2 and 4. An additional 644 m^3 (23,000 ft^3) of waste is added to the NTS Waste Management Program (and the Alternative Total) to account for the development and operation of the regional landfill for the adjacent rural counties.
HAZARDOUS WASTE GENERATION	*Alternative 1.* Total hazardous waste generated was derived from the NTS Annual Reports for hazardous waste shipments. Shipped mass for 1993, 1994 and 1995 was averaged to generate the 280,100 kg/yr (616,220 lb/yr) estimate. Program estimates were derived from discussions with the operators of the Explosive Ordnance Disposal Unit and Hazardous Waste Operations. *Alternatives 2,3, and 4.* Total and program derived hazardous wastes were estimated by the ratio of total alternative (or program) expenditures to a similar ratio of waste generation and expenditures from Alternative 1.

[a] Does not include internally generated waste
[b] Using EPA-450/3-88-008
[c] 5,550 acre feet/year

A.7 References

REGULATION, ORDER, LAW

40 CFR Part 191	U.S. Environmental Protection Agency (EPA), "Protection of the Environment: Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 1992.
40 CFR Part 261	EPA, "Protection of the Environment: Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, July 1, 1993.
40 CFR Part 268	EPA, "Protection of Environment: Land Disposal Restrictions," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, Revised July 1, 1992.
DOE Order 5400.1	U.S. Department of Energy (DOE), "General Environmental Protection Program," Washington, DC, November 9, 1988.
DOE Order 5530.2	DOE, "Nuclear Emergency Search Team," Washington, DC, September 20, 1991.
DOE Order 5530.5	DOE, "Federal Radiological Monitoring and Assessment Center," Washington, DC, July 10, 1992.
DOE Order 5530.4	DOE, "Aerial Measuring System," Washington, DC, September 20, 1991.
DOE Order 5530.1A	DOE, "Accident Response Group," Washington, DC, September 20, 1991.
DOE Order 5530.3	DOE, "Radiological Assistance Program," Washington, DC, January 14, 1992.
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DOE, 1994	DOE, *Integrated Data Base Report - 1994: U.S. Spent Nuclear Fuel and Radioactive Waste Inventories, Projections, and Characteristics,* DOE/RW-0006, Rev. 9, prepared by Oak Ridge National Laboratory, 1994.
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DOE, 1995b	DOE, *Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste,* DOE/EIS-0200-D, Office of Environmental Management, Washington, DC, 1995.
DOE, 1995c	DOE, *Implementation Plan, Defense Nuclear Facilities Safety Board Recommendation 94-2, Conformance with Safety Standards at Department of Energy Low-Level Nuclear Waste and Disposal Sites*, Washington, DC, 1995.
DOE/OFE, 1994	DOE/Office of Fossil Energy (OFE), *Environmental Assessment for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility, Frenchman Flat, Nevada Test Site,* DOE-EA-0864, Washington, DC, 1994.
EO 12759	Executive Order (EO), Office of the President, "Federal Energy Management," U.S. Government Printing Office, Washington, DC, April 17, 1991.
EO 12856	EO, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements," Office of the President, Washington, DC.
Joint Ordnance Commanders Group, 1995a	Joint Ordnance Commanders Group, *Joint Demil Integration,* Demilitarization and Disposal Group, Demil Technology Office, 1995.
Joint Ordnance Commanders Group, 1995b	Joint Ordnance Commanders Group, memorandum from J.Q. Wheeler to J.K. Magruder, Nevada Operations Office, on "Joint Demilitarization Technology (JDT) Program," February 21, 1995.

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| RSN, 1994a | Raytheon Services Nevada (RSN), *Nevada Test Site Technical Site Information,* prepared for the DOE/NV, Las Vegas, NV 1994.

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| Shott et al., 1995 | Shott, G.G., C.J. Muller, L.E. Barker, D.E. Cawlfield, F.T. Lindstrom, D.G. Linkenheil, M.J. Sully, D.J. Thorne, and L. McDowell-Boyer, *Performance Assessment for the Area 5 Radioactive Waste Management Site at the Nevada Test Site, Nye County, Nevada*, Reynolds Electrical & Engineering Co., Inc., Las Vegas, NV, 1995.

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Appendix B

Federal Register Notice
(Volume 59, Number 153, Wednesday, August 10, 1994)
[59 FR 40897]

[FR Doc. 94-19532 Filed 8-9-94; 8:45 am]
BILLING CODE 6450-01-P

Preparation of an Environmental Impact Statement for the Nevada Test Site and Other Off-Site Test Locations Within the State of Nevada

AGENCY: U.S. Department of Energy (DOE).

ACTION: Notice of Intent.

SUMMARY: In accordance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), and the Department's Implementing Procedures (10 CFR Part 1021), the DOE announces its intent to prepare a Site-wide Environmental Impact Statement (EIS) for the Nevada Test Site and other off-site test locations within the State of Nevada. The purpose of this Notice is to invite the participation of Federal, state, and local agencies, affected Indian tribes, and other interested persons in the process that DOE will follow to comply with NEPA, and to solicit public comments on the proposed scope and content of the Nevada Test Site EIS.

In order to meet present and potential future mission responsibilities at the Nevada Test Site, the Department proposes to evaluate resource management alternatives for the Nevada Test Site which would support current and future defense related missions, research and development, waste management, environmental restoration, infrastructure maintenance, and facility upgrades and alternative uses over the next 5-10 years. This Site-wide EIS will address numerous issues, including, without limitation: (1) environmental restoration and other Departmental activities at the Nevada Test Site and at off-site locations in the State of Nevada where DOE conducted nuclear experiments, which include the Project Shoal Area, Central Nevada Test Area, Tonopah Test Range, and portions of the Nellis Air Force Range; and (2) transportation and disposal of wastes, which are generated on and off-site of the Nevada Test Site.

DATES: DOE invites and encourages the general public, other government agencies, and all other interested parties to comment on the appropriate scope and content of the EIS for the Nevada Test Site and off-site locations within the State of Nevada to ensure that all relevant environmental issues and alternatives are addressed. Public scoping meetings are discussed below in the SUPPLEMENTARY INFORMATION section. The public scoping period will continue until September 30, 1994. All comments and suggestions received or postmarked by that date, whether written, oral, submitted directly to the Department, or presented during a scoping meeting, will be given equal consideration in defining the scope of this Site-wide EIS and the issues to be discussed. Comments received or postmarked after September 30, 1994, will be considered to the extent practicable. In addition, the Department is committed to providing opportunities for the involvement of interested individuals and groups in this and other Department planning activities outside of the formal scoping process on this EIS.

ADDRESSES: Written comments on the scope of the Site-wide EIS should be directed to: Donald R. Elle, Director, Environmental Protection Division, U.S. Department of Energy, Nevada Operations Office, P.O. Box 14459, Las Vegas, NV 89114.

Copies of written comments, transcripts of oral comments, and copies of the EIS Implementation Plan will be prepared and retained by the Department for inspection by the public at the following locations:

1. DOE Public Reading Room, 2753 S. Highland Ave., Las Vegas, NV 89109
2. Las Vegas Public Library, 833 N. Las Vegas Blvd., Las Vegas, NV 89101
3. Carson City Public Library, 900 N. Roop St., Carson City, NV 89701
4. Tonopah Public Library, 171 Central Street, Tonopah, NV 89049
5. Doris Shirkey Library, 2101 E. Calvada Blvd., Pahrump, NV 89041
6. Caliente Branch Library, 100 Depot Avenue, Caliente, NV 89008
7. University of Nevada, Reno, Noble H. Getchell Library, Reno, NV 89557
8. University of Nevada, Las Vegas, James Dickenson Library, 4505 S. Maryland Parkway, Las Vegas, NV 89154
9. Freedom of Information Reading Room, Forrestal Bldg, 1000 Independence Ave, S.W., Washington, DC 20585
10. Fallon Public Library, Churchill County Library, 553 S. Main, Fallon, NV 89406-3387
11. Washington County Library, 50 S. Main, St. George, UT 84770

FOR FURTHER INFORMATION CONTACT: For further information please contact: Donald R. Elle, Director, Environmental Protection Division, U.S. Department of Energy, P.O. Box 14459, Las Vegas, Nevada 89114, (702) 794-1550.

For information on the Department's NEPA process, please contact: Ms. Carol Borgstrom, Director, Office of NEPA Oversight, U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, DC 20585, (202) 586-4600 or leave a message at (800) 472-2756.

SUPPLEMENTARY INFORMATION:

Background

The Nevada Test Site, near Las Vegas, Nevada, is the site at which the Department's Nevada Operations Office fulfills its primary responsibilities to:

* Maintain a state of readiness to conduct underground nuclear testing.
* Fulfill those activities to maintain the nation's stockpile of nuclear weapons in a safe and secure manner and fulfill other national security related missions.
* Provide an ongoing waste management program covering all wastes generated both on-site and from other DOE-approved facilities across the U.S.
* Perform site characterization and environmental restoration activities required to minimize or eliminate the impacts of past operations.
* Supervise operations of non-DOE entities at the Liquefied Gaseous Fuels Spill Test Facility to perform research and demonstrations related to the safety aspects of hazardous chemicals and liquefied gaseous fuels.
* Serve as an outdoor laboratory where scientists and students can conduct research on environmental issues as part of the DOE National Environmental Research Park Network.
* Support the Threshold Test Ban Treaty and the Peaceful Nuclear Explosives Treaty verification mission along with an expanding role in supporting the ongoing Comprehensive Test Ban Treaty negotiations.
* Provide the capability to respond to nuclear emergencies, including use of radiation detection systems for search and identification of lost or stolen nuclear weapons and special nuclear materials; exercises related to nuclear bomb threats and to radiation dispersal threats.
* Demonstrate the capability to provide alternative energy sources to meet power needs for the Southwestern United States. This would include research activities in solar and other alternative energy source technologies.

The Department's responsibilities are mandated by statute, Presidential direction, and Congressional authorization and appropriation. Other activities may be directed by regulatory mandates identified in compliance agreements or orders or other enforceable documents.

The Nevada Test Site occupies 1,350 square miles in southern Nevada, and is located approximately 65 miles northwest of Las Vegas. The Nevada Test Site is bordered to the north, west, and east by the Nellis Air Force Range, and on the south by Bureau of Land Management-administered lands. To the east, the Nevada Test Site shares a nearly contiguous border with lands managed by the U.S. Fish and Wildlife Service for the Desert Game Range. The western half of the Game Range is also used by the U.S. Air Force, which shares a contiguous boundary with the Nevada Test Site. The Nevada Test Site is a remote, secure facility for conducting underground testing of nuclear weapons and for evaluating the effects of nuclear weapons on military communications systems, electronics, satellites, sensors, and other materials. Since the signing of the Threshold Test Ban Treaty in 1974, it has been the only site used by the United States for underground nuclear weapons testing. In September 1992, Congress, within the framework of the Threshold Test Ban Treaty, imposed a nine-month moratorium on underground nuclear testing. President Clinton extended the moratorium in July 1993 for an additional 15 months and subsequently, in March 1994, extended the moratorium through September 1995.

Existing land use on the Nevada Test Site falls into four general categories: Testing Areas; Reserved Areas; Industrial/Research Areas; and Waste Management Areas. Most of the work on the Nevada Test Site has been and continues to be related to national defense, with a growing emphasis on environmental restoration and waste management programs. Changing world conditions and national policies have reduced the need for testing programs, and other DOE and non-DOE activities are now being considered for siting at the Nevada Test Site. A map showing existing land use at the Nevada Test Site and the locations of the off-site tests is available on request to Donald R. Elle at the above address.

The Nevada Test Site is a unique facility. It is a large remote area with tightly controlled access, with a substantial infrastructure, and the capability to conduct tests with hazardous and radioactive materials. The southwest region of the Nevada Test Site provides support for nonweapons and nonnuclear weapons programs and for short term activities such as the nuclear weapons accident exercises conducted by the Nuclear Emergency Search Team. In 1993, DOE designated the Nevada Test Site as a National Environmental Research Park. The Research Park is available for use by the scientific community as an outdoor laboratory for research on the effects of human activities on the desert ecosystem. Land not used for mission or other purposes has been designated as reserved areas, available for future development. The northern part of the Nevada Test Site is reserved as an underground nuclear weapons testing area. Nuclear test locations are at Yucca Flat, Pahute Mesa, Rainer Mesa, and Buckboard Mesa.

Waste management activities have been ongoing at the Nevada Test Site since 1952. For ease of identification, the Nevada Test Site has been divided into numbered geographic "Areas". Waste Operations are conducted in several areas. Sanitary and solid waste are disposed of in Areas 23 and 9. Hydrocarbon-contaminated soils are disposed of in a permitted landfill in

Area 6. Radioactive waste management sites are located in Areas 3 and 5. Area 5 is also the location of a 90-day hazardous waste accumulation site. Waste streams continue to be generated, stored, and disposed of at the Nevada Test Site. Radioactive wastes are also shipped to the Nevada Test Site for disposal from other Department and Department-authorized sites. Waste management operations at Nevada Test Site include: Accumulation of hazardous waste; disposal of low-level radioactive waste including some classified waste; management of mixed radioactive and hazardous waste; storage of mixed transuranic waste; and disposal of sanitary waste.

Mixed transuranic waste is stored on a pad at Area 5 under conditions set forth in the July 1992 Settlement Agreement between DOE and the State of Nevada. A consent agreement signed by DOE and the Nevada Division of Environmental Protection in 1994 allows storage at Area 5 of mixed waste generated during characterization activities.

Through 1994 there have been 1054 nuclear tests conducted by the United States, 928 of which were conducted on the Nevada Test Site. Defense research and weapons test verification activities were conducted at other test locations in Nevada. Nuclear devices were detonated underground at the Project Shoal Area and the Central Nevada Test Area. From 1957 to 1963, many safety tests using special nuclear materials and chemical explosives were conducted at sites on the Nevada Test Site, Nellis Air Force Range, and Tonopah Test Range to test the safety of nuclear weapons in accident situations. These tests have resulted in the release of radioactive materials and surface contamination over large areas.

The Yucca Mountain site is located on the southwestern boundary of the Nevada Test Site. In the 1987 amendments to the Nuclear Waste Policy Act (NWPA), Congress directed DOE to characterize the Yucca Mountain site for possible development of a geologic repository for disposal of spent nuclear fuel and high level nuclear waste. Prior to passage of the 1987 amendments, DOE had prepared an environmental assessment (EA) which included an analysis of the effects of site characterization activities at Yucca Mountain (DOE/RW-0073, May 1986). If DOE ultimately recommends approval of the Yucca Mountain site to the President, that recommendation must be accompanied by an EIS prepared under the specific provisions of the NWPA. All activities regarding the characterization of the Yucca Mountain site, and any eventual construction and operation of a repository, including environmental review, are regulated by the process prescribed in the NWPA. Therefore, the Nevada Test Site EIS will address ongoing Yucca Mountain site characterization activities only as they relate to the cumulative impacts of activities on the Nevada Test Site during the period covered by the EIS, using the Yucca Mountain EA as a baseline.

Public lands administered by the Bureau of Land Management surround the Nevada Test Site and Nellis Air Force Range on all sides. The Tonopah Test Range is located in the northwestern portion of the Nellis Air Force Range, and is operated by Sandia National Laboratories, under contract with the DOE Albuquerque Operations Office, and through a Memorandum of Agreement between the Department of Energy's Albuquerque and Nevada Operations Offices. The Central Nevada Test Area is located approximately 60 miles east of Tonopah between Warm Springs and Currant (approximately 160 miles north of Las Vegas), and the Project Shoal Area is located approximately 30 miles southeast of Fallon (approximately 90 miles east of Reno and 285 miles northwest of Las Vegas).

The Nevada Test Site, Nellis Air Force Range, and Tonopah Test Range each have restricted-access areas that are not open to the public for purposes such as agriculture, mining, land disposal of wastes, or mineral leasing. With the exception of very limited special hunting access to a portion of the Nellis Air Force Range, these sites are not open for recreational use. The Project Shoal Area and the Central Nevada Test Area are not restricted-access areas and are open for general public uses including grazing and recreation, but not to mining.

Public roads link the Project Shoal Area and the Central Nevada Test Area with the Nevada Test Site and these may be used to ship wastes to the Nevada Test Site. In addition, some public roads may be used to transport waste from Nellis Air Force Range and Tonopah Test Range to the waste management locations on the Nevada Test Site or elsewhere. Public roads are also used to ship low level radioactive waste from other DOE sites to the Nevada Test Site and to ship hazardous waste from the Nevada Test Site to permitted disposal facilities.

Preliminary Identification of Alternatives

The proposed action is to develop a resource management plan for the Nevada Test Site. The Department of Energy needs a site resource management plan that would allow it to continue its missions in a way that minimizes or avoids environmental impacts. A preliminary set of resource management alternatives for evaluation in the EIS has been identified below. The final set of alternatives and issues to be considered in the EIS will reflect consideration of the public input received during the scoping period.

No Action

Under the no action alternative, existing missions and operations would continue at the present level. Environmental restoration activities would continue at the Nevada Test Site and at off-site test locations within the State of Nevada. Off-site test location activities would be consistent with the applicable land use plans of the controlling agency. This alternative includes the potential to resume underground nuclear testing and conducting other nuclear weapon related experiments at the Nevada Test Site. Expanded use of the Nevada Test Site for defense-related experiments, alternative energy source technology development, non- or counter-proliferation research and development and environmental technology development would not be pursued. Waste management activities would continue to support existing DOE missions and operations in the same manner and degree as at present and in the recent past. Continuing activities at the Area 3 and 5 radioactive waste management sites include: the disposal of low-level radioactive wastes generated from both on-site activities and off-site DOE and Department of Defense facilities such as the Fernald Field Office near Cincinnati, Ohio; the Rocky Flats Environmental Technology Site (formerly the Rocky Flats Plant), Golden, Colorado; the Amarillo Area Office (Pantex), Amarillo, Texas; and the Aberdeen Proving Grounds, Aberdeen, Maryland. Other continuing activities include storage of transuranic and other wastes, accumulation of hazardous wastes prior to off-site shipment for disposal, and disposal of on-site generated mixed waste that meets the Resource Conservation and Recovery Act (RCRA) land disposal restriction criteria. Groundwater characterization would continue with the associated waste management activities. This alternative is intended to encompass current operations, including waste management and technology development operations without the improvements or expansion

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which would occur under the expanded use alternative.

Expanded Use

Under this alternative, maximum use would be made of the Nevada Test Site in support of national pr... of both a defense and non-defense nature. National Defense activities could include a resumption of underground nuclear testing with the required support activities; conducting other nuclear weapons related experiments; the construction and operation of various types of simulator facilities and other experimental test facilities; tritium production; plutonium storage and disposition; nuclear weapons storage and disassembly and similar activities that could be best conducted at a remote site. The site could also be used for various exercises and technology development aimed at countering nuclear terrorism or proliferation activities. Non-defense programs could include the study of alternative energy sources including the construction and operation of various solar energy facilities that would demonstrate the effectiveness of the technologies; expanded use of the Liquefied Gaseous Fuels Spill Test Facility; and increased use of the site as an Environmental Research Park.

This alternative would include continuation of on-going waste management activities, planned waste management and environmental restoration activities, and enhanced usage of the Site for waste management activities. In addition to on-going activities, planned waste management activities proposed for the Area 5 radioactive waste management site include construction and operation of: certification facilities for various types of waste, expanded mixed waste disposal facilities for on- and off-site generated mixed waste, increased capacity for hazardous and mixed waste storage, waste treatment facilities, closure barriers or caps, and infrastructure improvements.

Enhanced usage would include, for example, options to utilize the Nevada Test Site as specified in other DOE and Department of Defense NEPA documents (such as the Environmental Restoration and Waste Management Programmatic EIS which, among other things, addresses a programmatic alternative under which all DOE low-level radioactive wastes would be disposed of at the Nevada Test Site); regional treatment of mixed waste in accordance with the Federal Facility Compliance Act; and disposal of mixed and transuranic wastes.

Other Alternatives

The Department will consider other resource management alternatives, i.e., variations of the no action alternative that would involve no new projects or a phased reduction in current operations, and no shipments or reduced shipments of off-site waste to the Nevada Test Site. The Department invites public comment on the above, and suggestions regarding other resource management alternatives that should be considered.

Preliminary Identification of Environmental Issues

The following issues have been tentatively identified for analysis in this EIS. This list is intended to facilitate public comment on the scope of the EIS. It is not intended to be all-inclusive, nor is it intended to be a predetermination of impacts.

1. Potential effects on the public and on-site workers from releases of radiological and hazardous materials during normal operations and from reasonably foreseeable accidents.
2. Potential effects on air and water quality and other environmental consequences of normal operations and reasonable foreseeable accidents.
3. Potential cumulative effects from proposed actions and other past, present and reasonably foreseeable future actions.
4. Potential environmental effects, including human health, economic and social effects on surrounding communities, including minority communities and low-income communities.
5. Potential effects on sensitive species, economically and recreationally important species, floodplains, wetlands, and historic and archaeological resources, including paleontological sites and Native American resources.
6. Potential environmental effects of future Nevada Test Site facility decontamination and decommissioning activities.
7. Potential effects of near- and long-term waste management of off-site generated waste, and environmental restoration activities.
8. Potential unavoidable adverse environmental impacts.
9. Short-term uses of the environment versus long-term productivity.
10. Potential irretrievable and irreversible commitments of resources.

Related Documentation

The Department will prepare transcripts of the oral comments received during the scoping workshops. The records of all comments, both oral and written, received during the scoping period will be made available for public review in the reading rooms listed above. Additional background documents and references identified as pertinent during the EIS process will also be made available in the reading rooms.

The following is a list of forthcoming NEPA documentation related to this EIS that have the potential for affecting its scope by inclusion of the Nevada Test Site as an alternative site for the action being considered:

(a) Reconfiguration Programmatic EIS—On July 23, 1993, the Department published a revised Notice of Intent (56 FR 39528) to prepare a Programmatic EIS for reconfiguration of its nuclear weapons complex due to nuclear weapons stockpile reductions. The Department currently is considering how the scope of this Programmatic EIS should be revised further to reflect more recent budget and stockpile reduction decisions. The Nevada Test Site is a potential alternative site in this EIS.

(b) The Fissile Materials Storage and Disposition Programmatic EIS will address the long-term storage of all fissile nuclear materials and disposition of surplus fissile nuclear materials. The Notice of Intent announcing the preparation of this EIS was published in the Federal Register (59 FR 31985), on June 21, 1994.

(c) The Environmental Restoration and Waste Management Programmatic EIS will address waste management alternatives for existing and proposed actions and DOE complex-wide issues associated with long-term waste management policies and practices. In this Programmatic EIS, the Department is evaluating the Nevada Test Site as an alternative site for managing DOE wastes. An Implementation Plan for this Programmatic EIS was issued in January 1994. The final Programmatic EIS is scheduled to be issued in 1995.

(d) The Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS analyzes the potential environmental consequences of alternatives to the transportation, receipt, processing, and storage of the Department's spent nuclear fuel. The Nevada Test Site is being evaluated as a potential spent nuclear fuel management site in this analysis, but the Department has stated that the Nevada Test Site is not the preferred alternative;

(e) The Proposed Policy for the Acceptance of United States Origin Foreign Research Reactor Spent Nuclear

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Fuel EIS will address the potential environmental impacts of the proposed policy renewal and its implementation. Under a renewed policy, the United States could accept up to 15,000 foreign research reactor spent fuel elements over a 10 to 15 year period. The Nevada Test Site is a potential storage site in this EIS.

(f) The Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapons Components EIS will address the potential environmental impacts of the continued operation of the Pantex Plant. These include near- to mid-term foreseeable activities and the nuclear component storage activities at other Department sites associated with nuclear weapon disassembly at the Pantex Plant, over the next 5 to 10 years. The Nevada Test Site is being considered as a potential site under the relocation of operations alternative.

(g) The environmental restoration program at the Fernald Environmental Management project is divided into five operable units. For each operable unit, a feasibility study/proposed plan is being prepared to provide a detailed evaluation of the leading remedial alternative for each area of contamination. Nevada Test Site may be identified as the preferred candidate disposal site for portions of the low level waste generated during cleanup activities for each operable unit. The current schedule for the Department to submit the feasibility study/proposed plans to the U.S. Environmental Protection Agency for approval is as follows: Operable Unit 1 (Waste Pits), submitted July 1994; Operable Unit 2 (Solid Waste Units), to be submitted August 1994; Operable Unit 3 (Production Area), to be submitted November 1996; Operable Unit 4 (Silos), submitted December 1993; and Operable Unit 5 (Environmental Media), to be submitted in February 1995.

Cooperating Agencies

The preparation of this Site-wide EIS will require the participation of several Federal agencies, some of which may be identified as cooperating agencies under the NEPA process. These include the Air Force, Department of the Interior (Bureau of Land Management and Fish and Wildlife Service), and the Defense Nuclear Agency.

Public Scoping Meetings

Public scoping meetings to provide and discuss information, and receive oral comments on the scope of the EIS will be held in the States of Nevada and Utah at locations near the Nevada Test Site which may be affected by potential decisions and implementation.

The dates and locations for the public scoping meetings are listed below. All meetings are scheduled to begin at 6:30 p.m.

September 7, 1994
Fallon Convention Center
100 Campus Way
Fallon, Nevada

September 8, 1994
Carson City Community Center
851 East William Street
Carson City, Nevada

September 13, 1994
Dixie Center Convention Facilities
425 South 700 East
St. George, Utah

September 15, 1994
Tonopah Convention Center
301 Brougher
Tonopah, Nevada

September 20, 1994
Cashman Field Convention Center
850 Las Vegas Blvd, North
Las Vegas, Nevada

September 21, 1994
Bob Ruud Community Center
150 North Highway 160
Pahrump, Nevada

September 22, 1994
Caliente Youth Center
Highway 93
Caliente, Nevada

Oral Comments

All interested parties are invited to record their comments or suggestions concerning this EIS or their request to be placed on the distribution list by calling the Nevada Test Site EIS Hotline at 1-800-405-1140 or 702-794-1550. The hotline will give instructions on how to record comments or requests.

Written Comments

Written comments or suggestions to assist the Department in identifying significant environmental issues and the appropriate scope of the EIS, questions concerning the Nevada Test Site or other involved Department sites, requests for speaking times, requests for copies of the EIS Implementation Plan, and requests to be placed on the distribution list should be directed to: Donald R. Elle, Director, Environmental Protection Division, U.S. Department of Energy, Environmental Impact Statement, P.O. Box 14459, Las Vegas, NV 89114.

Public Meetings Registration and Format

Oral and written comments may be presented at the public scoping meetings. Persons desiring to speak at any of these meetings should register by calling the Nevada Test Site EIS Hotline by 3:00 p.m., Pacific Time, two working days in advance of the scoping meeting; or by writing to the Director of the Environmental Protection Division at the above address. Persons wishing to speak that have not registered in advance may register at the entrance of the meeting room. Individuals speaking on behalf of an organization should identify the organization represented.

In order to solicit individual viewpoints and facilitate interactive communication between participants and representatives of the Department, opportunities will be provided at the scoping meetings for questions and informal discussions regarding the issues to be addressed in this EIS.

Subsequent Document Preparation

After the completion of the public scoping process, the Department will prepare an EIS Implementation Plan and make it available to the public upon request and place it in the public reading rooms. The Plan will record the results of the scoping process and define the alternatives and issues that the Department will evaluate in this EIS. The Plan will also include a schedule for completing the Draft EIS. Availability of the Draft EIS will be announced in the Federal Register. The Department will solicit comments from the public, organizations, and other agencies on the Draft EIS, and will consider all comments in its preparation of the Final EIS.

Issued in Washington, DC this 4th day of August, 1994.

Peter N. Brush,

Acting Assistant Secretary, Environment, Safety and Health.

[FR Doc. 94-19531 Filed 8-9-94; 8:45 am]

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Appendix C

RELEVANT REGULATORY REQUIREMENTS

APPENDIX C
RELEVANT REGULATORY REQUIREMENTS

This appendix identifies and summarizes the major federal and state laws, regulations, executive orders, and U.S. Department of Energy (DOE) orders that may apply to the proposed action and alternatives at the Nevada Test Site (NTS). This appendix also provides information concerning the status of permits and regulatory compliances at the NTS and the off-site locations in Nevada.

Consultations with the Nevada State Historic Preservation Officer would continue on a project-specific basis for any of the alternatives considered. Consultations with the Fish and Wildlife Service pursuant to Section 7 of the Endangered Species Act are in progress and described in Chapter 8. Consultations with American Indian tribes are described in Chapter 8 and detailed in Appendix G of this Environmental Impact Statement.

Under Alternative 1, the permits identified in Section C.5 would be maintained and updated as necessary. Additional actions necessary to acquire a Resource Conservation and Recovery Act permit from the Nevada Division of Environmental Protection for the disposal of off-site generated low-level mixed waste that meet land disposal restrictions would be pursued.

Under Alternative 1, the DOE would also continue its consultations with the U.S. Bureau of Land Management and begin consultations with the U.S. Department of the Interior to define the appropriate actions to address administrative issues related to the NTS and other land withdrawals.

Under Alternative 2, no permitting actions would be required. This alternative would result in noncompliance with the requirements of the Resource Conservation and Recovery Act.

Under Alternative 3, the permits identified in Section C.5 would be maintained and updated as necessary, and additional local permits required for construction would be obtained. Additional actions necessary to acquire Resource Conservation and Recovery Act permits from the Nevada Division of Environmental Protection for a mixed waste disposal unit, a mixed waste storage unit, and a mixed waste treatment unit would be pursued.

Under Alternative 3, the DOE would also continue its consultations with the U.S. Bureau of Land Management and begin consultations with the U.S. Department of the Interior to define the appropriate actions to address administrative issues related to the NTS and other land withdrawals.

Under Alternative 4, existing permits would be maintained. Consultations with the U.S. Bureau of Land Management would continue and consultations would begin with the U.S. Department of the Interior to define and implement the appropriate actions to address issues associated with the NTS and other land withdrawals.

C.1 Federal Environmental Statutes and Regulations

Listed below are the significant federal laws, rules, regulations, and guidelines that are applicable at the NTS and the off-site locations in Nevada.

National Environmental Policy Act of 1969, 42 United States Code (U.S.C.) 4321, enacted by Public Law (Pub. L.) No. 91-190 as amended.

The National Environmental Policy Act of 1969 establishes a policy promoting awareness of the environmental consequences of major federal activities on the environment and consideration of the environmental impacts during the planning and decisionmaking stages of a project. The National Environmental Policy Act requires all agencies of the federal government to prepare a detailed statement on the environmental effects of proposed major federal actions that may significantly affect the quality of the human environment.

The Council on Environmental Quality and the DOE have proclaimed regulations for implementing the National Environmental Policy Act (40 Code of Federal Regulations [CFR] Parts 1500-1508 and 10 CFR Part 1021). The Council on Environmental Quality and DOE regulations require the preparation of this EIS in two stages: draft and final. The Draft and Final EISs must contain discussions of the purpose and need for the proposed action; reasonable alternatives to the proposed action, including the "no action" alternative; the environment potentially affected by the proposed action and the alternatives; and the environmental consequences of the proposed action and alternatives (40 CFR Part 1502.10 and 10 CFR Part 1021.315).

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, enacted by Pub. L. No. 94-580 as amended.

The Resource Conservation and Recovery Act was enacted to ensure the safe and environmentally responsible management of hazardous and nonhazardous solid waste, and to promote resource recovery techniques to minimize waste volumes. Regulations issued by the U.S. Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act set forth a comprehensive program to provide "cradle to grave" control of hazardous waste by requiring generators and transporters of hazardous waste, as well as owners and operators of treatment, storage, and disposal facilities, to meet specific standards and procedures. Hazardous waste is defined under the Resource Conservation and Recovery Act as a waste that poses a potential hazard to human health or the environment when improperly treated, stored, or disposed of.

The Resource Conservation and Recovery Act regulations include requirements for locating and operating treatment, storage, and disposal facilities. The Resource Conservation and Recovery Act also requires the EPA to issue land disposal restrictions that require the use of the best demonstrated available technologies to treat certain hazardous waste and other waste containing certain hazardous components. The land disposal restrictions also prohibit storing waste that requires treatment, except to facilitate proper recovery, treatment, or disposal. Much of the DOE's waste that is currently stored, as well as some waste that will be generated in the future, is hazardous waste or contains hazardous components that are subject to the Resource Conservation and Recovery Act requirements, including land disposal restrictions.

Hazardous Waste and Solid Waste Amendments Act of 1984, 42 U.S.C. 6901, enacted by Pub. L. No. 98-616.

The Hazardous Waste and Solid Waste Amendments Act of 1984 are amendments to the Resource Conservation and Recovery Act that authorize regulations or require that regulations be promulgated on waste minimization, land disposal of hazardous wastes, and underground storage tanks.

Federal Facility Compliance Act of 1992, 42 U.S.C. 6961, enacted by Pub. L. No. 102-386.

The Federal Facility Compliance Act of 1992 waives sovereign immunity for fines and penalties for Resource Conservation and Recovery Act violations at federal facilities. However, a provision postpones fines and penalties after three years for mixed waste storage prohibition violations at DOE sites and requires the DOE to prepare plans for developing the required treatment capacity for mixed waste stored or generated at each facility. Each plan must be approved by the host state or the EPA, after consultation with other affected states, and a consent order must be issued by the regulator requiring compliance with the plan. The Federal Facility Compliance Act further provides that the DOE will not be subject to fines and penalties for land disposal restrictions storage prohibition violations for mixed waste as long as it is in compliance with such an approved plan and consent order and meets all other applicable regulations.

Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. 9601, enacted by Pub. L. No. 96-510, also known as Superfund: Amended in 1986 by the Superfund Amendments and Reauthorization Act, Pub. L. No. 99-499.

The Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, provides a statutory framework for the cleanup of waste sites containing hazardous substances and, as amended by the Superfund Amendments and Reauthorization Act, provides an emergency response program in the event of a release (or threat of a release) of a hazardous substance to the environment. The Comprehensive Environmental Response, Compensation and Liability Act's goal is to provide for response and remediation of environmental problems that are not adequately covered by permit programs of other environmental laws, such as the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act, and the Atomic Energy Act.

Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. 11001, enacted by Pub. L. No. 99-499.

This act was included as Title III of the Superfund Amendments and Reauthorization Act. Under Subtitle A of this Act, federal facilities, including those owned by the DOE, provide various information, such as inventories of specific chemicals used or stored and releases that occur from these sites, to the State Emergency Response Commission and to the Local Emergency Planning Committee to ensure that emergency plans are sufficient to respond to unplanned releases of hazardous substances. The DOE also requires compliance with Title III as a matter of agency policy.

In addition, under Subtitle B of the Act, material safety data sheet reports, emergency and hazardous chemical inventory reports, and toxic chemical release inventory reports must be provided to appropriate state, local, national, and federal authorities.

Atomic Energy Act, 42 U.S.C. 2011, enacted by Pub. L. No. 83-703.

The Atomic Energy Act ensures proper management, production, possession, and use of radioactive materials. The Act also provides the DOE with authority for developing generally applicable standards for protecting the environment from radioactive materials. Pursuant to the Atomic Energy Act, the DOE has established a system of standards and requirements issued as DOE orders. The Act also authorizes the Formerly Utilized Sites Remedial Action Program, under which the DOE is responsible for cleaning up privately owned sites previously used and contaminated as a result of nuclear weapons production.

Clean Air Act, 42 U.S.C. 7401, enacted by Pub. L. No. 90-148 as amended.

The Clean Air Act, as amended, is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Clean Air Act, as amended, requires that each federal agency with jurisdiction over any property or facility that might discharge air pollutants, such as the DOE, comply with "all federal, state, interstate, and local requirements" with regard to the control and abatement of air pollution.

The law requires the EPA to establish national primary and secondary ambient air quality standards as necessary to protect public health, with an adequate margin of safety, from any known or anticipated adverse effects of a regulated pollutant (42 U.S.C. 7409). The Clean Air Act also requires establishment of (a) national standards of performance for new stationary sources of atmospheric pollutants; (b) emissions limitations for any new or modified building, structure, facility, or installation that emits or may emit an air pollutant (42 U.S.C. 7411); and (c) standards for emission of hazardous air pollutants (42 U.S.C. 7412). In addition, the Clean Air Act requires specific emission increases to be evaluated so as to prevent a significant deterioration in air quality (42 U.S.C. 7470).

To comply with these requirements, the EPA issued (a) New Source Performance Standards with respect to stationary sources, which impose emission or discharge limitations on new pollution sources (40 CFR Part 60); (b) National Emission Standards for Hazardous Air Pollutants which establishes limits of materials such as radioactivity, asbestos, beryllium, mercury, etc., that may be emitted into the atmosphere (40 CFR Part 61); and (c) Prevention of Significant Deterioration which contains measures which should be considered and/or implemented to minimize the deterioration of air quality at locations where air quality is already cleaner than the ambient standards (40 CFR Part 81).

The Clean Air Act requires each state to develop implementation plans to control air pollution and air quality in that state and submit them for approval to the EPA . Under EPA regulations, Nevada has been delegated authority under the Clean Air Act to maintain the Primary and Secondary National Ambient Air Quality Standards (40 CFR Part 52, Subpart N), to issue permits under the Prevention of Significant Deteriorations (40 CFR Part 52.683), and to enforce performance standards for new stationary sources. To date, the state of Nevada does not have authority to administer the National Emission Standards for Hazardous Air Pollutants Program regulating emissions of radionuclides at DOE facilities. Therefore, National Emission Standards for Hazardous Air Pollutants approvals authorizing release of radionuclides are obtained from the EPA Region 9.

Clean Water Act of 1977, 42 U.S.C. 1251, et seq. enacted by Pub. L. No. 95-917 [amendments to the Federal Water Pollution Control Act of 1972].

The Clean Water Act of 1977, which amended the Federal Water Pollution Control Act, was enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's water." The Clean Water Act prohibits the "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the Clean Water Act, as amended, requires all branches of the federal government engaged in any activity that might result in a discharge or runoff of pollutants to surface waters to comply with federal, state, interstate, and local requirements.

In addition to setting water quality standards for the nation's waterways, the Clean Water Act supplies guidelines and limitations for effluent discharges from point-source discharges, and provides authority for the EPA to implement the National Pollutant Discharge Elimination System permitting program. The National Pollutant Discharge Elimination System Program is administered by the Water Management Division of the EPA pursuant to regulations in 40 CFR Part 122 et seq. Nevada has not applied for National Pollutant Discharge Elimination System authority from the EPA. Thus, all National Pollutant Discharge Elimination System permits required for the NTS would be obtained by the DOE through the EPA Region 9 (40 CFR Part 122 et seq.).

Sections 401 and 405 of the Water Quality Act of 1987 added Section 402(p) to the Clean Water Act. Section 402(p) requires that the EPA establish regulations for issuing permits for storm water discharges associated with industrial activity. Although any storm water discharge associated with industrial activity requires a National Pollutant Discharge Elimination System permit application, regulations implementing a separate storm water permit application process have not yet been adopted by the EPA.

Safe Drinking Water Act of 1974, 42 U.S.C. 300f, et seq., enacted by Pub. L. No. 93-523 as amended.

The Safe Drinking Water Act's primary objective is to protect the quality of public water supplies and all sources of drinking water. The state of Nevada, with the EPA's authorization, regulates public drinking water supplies by establishing and enforcing drinking water standards and by developing and implementing aquifer and water source protection regulations. These regulations proclaim maximum contaminant levels, including those for radioactivity in community water systems, which are defined as public water systems that serve at least 15 service connections used by year-round residents or regularly serve at least 24 year-round residents. Other programs established by the Safe Drinking Water Act include the Sole Source Aquifer Program, the Wellhead Protection Program, the Underground Injection Control Program, and Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes.

Hazardous and Radioactive Materials Transportation Regulations.

Transport of hazardous and radioactive materials, substances, and wastes are governed by U.S. Department of Transportation, U.S. Nuclear Regulatory Commission, and EPA regulations. These regulations may be found in 49 CFR Parts 100-178, 10 CFR Part 71, and 40 CFR Part 262, respectively.

U.S. Department of Transportation regulations contain requirements for identification of a material as hazardous or radioactive. These regulations may hand off to the U.S. Nuclear Regulatory Commission or EPA regulations for identification of material. However, U.S. Department of Transportation hazardous material regulations govern the hazard communication (for example, marking, hazard labeling, vehicle placarding, and emergency response telephone number) and transport requirements (such as required entries on shipping papers or on the EPA waste manifest).

U.S. Nuclear Regulatory Commission regulations applicable to radioactive materials transportation are found in 10 CFR Part 71 and detail packaging design requirements, including the testing required for package certification.

The EPA regulations pertaining to hazardous waste transportation are found in 40 CFR Part 262. These regulations deal with the use of the EPA waste manifest, which is the shipping paper used when transporting Resource Conservation and Recovery Act hazardous waste.

National Historic Preservation Act of 1966, 16 U.S.C. 470, et seq., enacted by Pub. L. No. 04-422 as amended.

The National Historic Preservation Act of 1966, as amended, provides that sites with significant national historic value be placed on the National Register of Historic Places. If a federal activity may impact a historic property resource, a required consultation with the Advisory Council on Historic Preservation will usually generate a memorandum of agreement, including stipulations that must be followed to minimize adverse impacts. Coordinations with the State Historic Preservation Officer are also undertaken to ensure that potentially significant sites are properly identified and appropriate mitigative actions implemented.

Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa-470ll, enacted by Pub. L. No. 96-95 as amended.

The Archaeological Resources Protection Act of 1979 protects archaeological resources located on U.S. public lands and American Indian lands, including sites under the DOE's control. The requirements concerning protection of archaeological resources contained in the Archaeological Resources Protection Act should be addressed prior to site disturbances by consultation with the Department of Interior Advisory Council on Historic Preservation and the State Historic Preservation Officer.

Archaeological and Historic Preservation Act of 1974, 16 U.S.C. 469, enacted by Pub. L. No. 86-532 as amended.

The Archaeological and Historic Preservation Act of 1974 protects sites that have historic and prehistoric importance.

Endangered Species Act of 1973, 16 U.S.C. 1531-1543, enacted by Pub. L. No. 93-205 as amended.

The Endangered Species Act of 1973, as amended, is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. The Act is jointly administered by the U.S. Departments of Commerce and Interior. Section 7 of the Act requires consultation to determine whether endangered and threatened species are known to have critical habitats onsite or in the vicinity of the proposed action.

Fish and Wildlife Conservation Act of 1980, 16 U.S.C. 2901, enacted by Pub. L. No. 96-366 as amended.

The Fish and Wildlife Conservation Act of 1980 encourages all federal entities (in cooperation with the public) to protect and conserve the nation's fish and wildlife.

Fish and Wildlife Coordination Act, 16 U.S.C. 661, 48 Stat. 401 as amended.

The Fish and Wildlife Coordination Act promotes more effectual planning and cooperation between federal, state, public, and private agencies for the conservation and rehabilitation of the nation's fish and wildlife and authorizes the U.S. Department of Interior to provide assistance.

National Wildlife Refuge System Administration Act of 1966, 42 U.S.C. 668dd, enacted by Pub. L. No. 91-135 as amended.

The National Wildlife Refuge System Administration Act of 1966 provides guidelines and directives for the administration and management of all lands within the system, including "wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas." The Secretary of the Interior is authorized to permit by regulations the use of any area within the system provided "such uses are compatible with the major purposes for which such areas were established."

Migratory Bird Treaty Act of 1918, 16 U.S.C. 703, et seq., 40 Stat. 755.

The Migratory Bird Treaty Act of 1918 governs the taking, killing, or possession of migratory birds. The Act states that it is unlawful to take, pursue, molest, or disturb bald (American) and golden eagles, their nests, or their eggs anywhere in the United States.

Bald Eagle Protection Act of 1940, 16 U.S.C. 668, enacted by 54 Stat. 250.

The Bald Eagle Protection Act of 1940 protects bald and golden eagles by prohibiting the taking, possession, and commerce of such birds and establishes civil penalties for violation of this Act.

Noise Control Act of 1972, 42 U.S.C. 4901-4918, enacted by Pub. L. 92-574 as amended.

The Noise Control Act of 1972, as amended, directs all federal agencies to carry out, "to the fullest extent within their authority," programs within their jurisdictions in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare.

Toxic Substances Control Act of 1976, 15 U.S.C. 2601, et seq., enacted by Pub. L. No. 94-469 as amended.

The Toxic Substances Control Act of 1976 provides the EPA with the authority to require testing of both new and old chemical substances entering the environment and to regulate them where necessary. The Act also regulates the treatment, storage, and disposal of certain toxic substances not regulated by the Resource Conservation and Recovery Act or other statutes, particularly polychlorinated biphenyls (PCB), chlorofluorocarbons, and asbestos.

American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996 et seq., enacted by Pub. L. No. 95-341.

The American Indian Religious Freedom Act of 1978 is a policy statement intended to reaffirm American Indian rights regarding religious freedom. The purpose of the Act is to ensure that American Indians have access to and protection of physical locations and resources that are sacred and sometimes required for the practice of American Indian religious rites and ceremonies.

Native American Graves Protection and Repatriation Act of 1990, 25 U.S.C. 3001, enacted by Pub. L. No. 101-601.

The Native American Graves Protection and Repatriation Act of 1990 governs ownership or control of American Indian remains and cultural items which are excavated or discovered on federal or tribal lands.

Nuclear Waste Policy Act of 1982, 42 U.S.C. 10101, enacted as Pub. L. No. 97-425 and as amended.

The Nuclear Waste Policy Act of 1982 provides for the development of repositories for the disposal of high-level radioactive waste and spent fuel and for the establishment of a program of research, development, and demonstration regarding the disposal of high-level waste and spent fuel. The Act provides for development (by the EPA and the Nuclear Regulatory Commission) of generally applicable standards for protection of the environment and technical criteria for management and disposal of spent nuclear fuel and high-level radioactive wastes in a repository.

Occupational Safety and Health Act of 1970, 29 U.S.C. 657, et seq., enacted by Pub. L. 91-596.

The Occupational Safety and Health Act of 1970 establishes the authority for assuring, so far as possible, safe and healthful working conditions for employees. The Occupational Safety and Health Act regulations establish specific standards telling employers what must be done to achieve a safe and healthful working environment. The DOE places emphasis on compliance with these regulations at DOE facilities and prescribes through DOE orders the Occupational Safety and Health Act standards that contractors shall meet as applicable to work at government-owned, contractor-operated facilities.

Antiquities Act of 1906, 16 U.S.C. 431, et seq., enacted by Pub. L. No. 59-209.

The Antiquities Act of 1906 protects historic and prehistoric ruins, monuments, and antiquities, including paleontological resources, on federally controlled lands.

Asbestos Hazard Emergency Response Act of 1986, 15 U.S.C. 2641, enacted by Pub. L. No. 99-519.

The Asbestos Hazard Emergency Response Act of 1986 requires studies to determine the extent of danger to human health from asbestos in public and commercial buildings.

Department of Energy Organization Act, 42 U.S.C. 7101, enacted as Pub. L. No. 95-91.

The DOE Organization Act establishes the statutory responsibility of the DOE to (1) ensure incorporation of national environmental protection goals in the formulation of energy programs; and (2) to advance the goal of restoring, protecting, and enhancing environmental quality, as well as assuring public health and safety.

Energy Reorganization Act of 1974, 42 U.S.C. 5801, enacted by Pub. L. No. 93-438.

The Energy Reorganization Act of 1974 was established to improve government operations and carry out the performance of other functions including, but not limited to, the Atomic Energy Commission's military production and research activities.

Federal Insecticide, Fungicide, and Rodenticide Act of 1972, 7 U.S.C. 136, enacted by Pub. L. No. 92-516 as amended.

The Federal Insecticide, Fungicide, and Rodenticide Act of 1972 governs the storage, use, and disposal of pesticides through product labeling, registration, and user certification.

Federal Land Policy and Management Act of 1976, 43 U.S.C. 1701-1784, enacted by Pub. L. No. 94-579.

The Federal Land Policy and Management Act of 1976 governs the use of federal lands which may be overseen by several agencies and establishes the procedure for applying to the U.S. Bureau of Land Management for land withdrawals and right-of-ways.

Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1251, enacted by Pub. L. No. 92-500.

The Federal Water Pollution Control Act Amendments of 1972 is the predecessor federal statute to the Clean Water Act of 1977.

Public Lands - Wild Horses and Burros, 85 Stat. 649, enacted by Pub. L. No. 92-195.

The Public Lands - Wild Horses and Burros Act requires the protection, management, and control of wild free-roaming horses and burros on public lands. As a stated policy, free-roaming horses and burros are prohibited from capture, branding, harassment, or death and they are to be considered an integral part of the natural system of the public lands.

Withdrawal of Public Lands for Military Purposes, 16 U.S.C. 460 ff, enacted by Pub. L. No. 99-606 (Military Lands Withdrawal Act of 1986).

The Withdrawal of Public Lands for Military Purposes Act provides authority for withdrawal of nearly 3 million acres of land in Clark, Lincoln, and Nye counties for exclusive use by the U.S. Secretary of the Air Force. Comprised of the NAFR Complex (of which the NTS was once a part), such lands are reserved for high-hazard testing along with other stated purposes.

This law mandates that EISs be prepared and include evaluations of the cumulative effects (resulting from the use of these lands) on the environment and population of Nevada. Evaluations are made of possible measures to mitigate the cumulative effects of the land withdrawals. In addition, a continuing program of decontamination is necessary.

Historic Sites, Buildings, and Antiquities Act of 1965, 16 U.S.C. 1461, enacted by Pub. L. No. 89–249.

The Historic Sites, Buildings, and Antiquities Act of 1965 sets national policy to preserve historic sites, buildings, and antiquities for the inspiration and benefit of the people of the United States.

Materials Act of 1947, 30 U.S.C. 601-603, enacted by Pub. L. No. 80-291.

The Materials Act of 1947 provides for the management of minerals, timber, and other construction resource materials on public lands.

Pollution Prevention Act of 1990, 42 U.S.C. 13101, enacted by Pub. L. 101-508.

The Pollution Prevention Act of 1990 establishes the authority to prevent or reduce pollution at the source whenever feasible. Pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible. Disposal or other release of pollution into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

C.2 Executive Orders

Listed below are the significant executive orders that are applicable at the NTS and the off-site locations in Nevada.

Executive Order 11593 (May 13, 1971) (National Historic Preservation).

This order directs all federal agencies to (1) make an inventory of their holdings and nominate, in cooperation with the state liaison officer for historic preservation, all sites, buildings, districts, and objects that appear to qualify for listing on the National Register of Historic Places, a file of cultural resources of national, regional, state, or local significance kept by the U.S. Department of the Interior's National Park Service; and (2) assure that no site, etc., which might qualify for the National Register is sold, demolished, or substantially altered.

Executive Order 12088 [Federal Compliance with Pollution Control Standards (October 13, 1978), as amended by Executive Order 12580 (January 23, 1987)].

Federal Compliance with Pollution Control Standards requires federal agencies, including the DOE, to comply with applicable administrative and procedural pollution control standards established by, but not limited to, the Clean Air Act, the Noise Control Act, the Clean Water Act, the Safe Drinking Water Act, the Toxic Substances Control Act, and the Resource Conservation and Recovery Act.

Executive Order 11514 (National Environmental Policy Act).

This order requires federal agencies to continually monitor and control their activities to protect and enhance the quality of the environment. The order also requires federal agencies to develop procedures to (1) ensure that the public is informed and understands the federal plans and programs with potential environmental impact and (2) obtain the views of interested parties. The DOE has issued regulations (10 CFR Part 1021) and DOE Order 451.1 for compliance with this Executive Order.

Executive Order 12580 (Superfund Implementation).

This order delegates to the heads of executive departments and agencies the responsibility for undertaking remedial actions for releases, or threatened releases, that are not on the National Priority List. This order also delegates the responsibility of removal actions, other than emergencies where the release is from any facility under the jurisdiction or control of executive departments and agencies, to the heads of executive departments and agencies.

Executive Order 11988 (Floodplain Management).

This order requires federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for actions undertaken in a floodplain. It also requires that floodplain impacts be avoided to the extent practicable.

Executive Order 11990 (Protection of Wetlands).

This order requires governmental agencies to avoid, to the extent practicable, any short- and long-term adverse impacts on wetlands wherever there is a practicable alternative.

Executive Order 12898 (Environmental Justice).

This order directs federal agencies to achieve Environmental Justice by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. The order creates an Interagency Working Group on Environmental Justice and directs each federal agency to develop strategies within prescribed time limits to identify and address Environmental Justice concerns.

Executive Order 12856 (Right-to-Know Laws and Pollution Prevention Requirements).

This order requires all federal agencies to reduce and report toxic chemicals entering any waste stream; improve emergency planning, response, and accident notification; and encourage clean technologies and testing of innovative prevention technologies. The order also provides that federal agencies are persons for purposes of the Emergency Planning and Community Right-to-Know (Superfund Amendments and Reauthorization Act Title III), which obliges agencies to meet the requirements of the Act.

C.3 U.S. Department of Energy Regulations and Orders and Policies

Through the authority of the Atomic Energy Act, the DOE is responsible for establishing a comprehensive health, safety, and environmental program for its facilities. The regulatory mechanisms through which the DOE manages its facilities are the promulgation of regulations and the issuance of DOE orders. DOE orders generally set forth policy and the programs and procedures for implementing that policy. Listed below are the significant DOE regulations and orders that are applicable at the NTS and the off-site locations in Nevada.

DOE Land and Facility Use Policy.

This policy governs the DOE management of its land and facilities as valuable national resources, based on the principles of ecosystem management and sustainable development.

DOE Order 430.1, Life-Cycle Asset Management.

This order governs the planning, acquisition, operation, maintenance, and disposition of physical assets as valuable national resources.

DOE Order 451.1, National Environmental Policy Act.

This order establishes responsibilities and sets forth procedures necessary for implementing the National Environmental Policy Act of 1969, as amended, to operate each of its facilities in full compliance with the letter and spirit of the Act.

DOE Order 5000.3B, Occurrence Reporting and Processing of Operations Information.

This order establishes the requirements for reporting and processing occurrences relating to safety, health, security, property, operations, and environment up to and including emergencies.

DOE Order 5480.1B, Environment, Safety, and Health Program for Department of Energy Operations.

This order establishes the Environment, Safety, and Health Program for the DOE operations.

DOE Order 5480.3, Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes.

This order provides DOE policy, sets forth requirements, and assigns responsibilities for the safe transport of hazardous materials, hazardous substances, hazardous wastes, and radioactive materials.

DOE Order 5480.9A, Construction Project Safety and Health Management.

This order establishes procedures and provides guidelines for the protection of the DOE and DOE contractor employees engaged in construction activities, protection of the general public from hazards in connection with the DOE construction activities, protection of adjacent property from damage, and prevention of delay or interruption of the programs due to accident or fires.

DOE Order 5483.1A, Occupational Safety and Health Program for the DOE Contractor Employees at Government-Owned Contractor-Operated Facilities.

This order establishes requirements and procedures to assure that occupational safety and health standards prescribed pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, and the DOE Organization Act of 1977 provide occupational safety and health protection for DOE contractor employees in government-owned, contractor-operated facilities that are consistent with the protection afforded private industry employees by the occupational safety and health standards promulgated under the Occupational Safety and Health Act of 1970.

DOE Order 5700.6C, Quality Assurance.

This order provides DOE policy, sets forth requirements, and assigns responsibilities for establishing, implementing, and maintaining plans and actions to assure quality achievement in the DOE programs.

DOE Order 5820.2A, Radioactive Waste Management.

This order establishes policies and guidelines by which the DOE manages its radioactive waste, waste by-products, and radioactively contaminated surplus facilities.

DOE Order 5400.1, General Environmental Protection Program.

This order establishes environmental protection program requirements, authorities, and responsibilities for DOE operations to assure compliance with applicable federal, state, and local environmental protection laws and regulations as well as with internal DOE policies.

DOE Order 5400.5, Radiation Protection of the Public and the Environment.

This order establishes standards and requirements for operation of the DOE and DOE contractors with respect to protection of members of the public and the environment against undue risk from radiation.

DOE Order 5480.4, Environmental Protection, Safety, and Health Protection Standards.

This order specifies and provides requirements for the application of the mandatory environmental, safety, and health standards applicable to all the DOE and DOE contractor operations.

DOE Order 5480.10, Contractor Industrial Hygiene Program.

This order establishes the requirements and guidelines applicable to the DOE contractor operations for maintaining an effective industrial hygiene program to preserve employee health and well-being.

DOE Order 5480.11, Radiation Protection for Occupational Workers.

This order establishes radiation protection standards and program requirements for the DOE and DOE contractor operations with respect to the protection of the worker from ionizing radiation.

DOE Order 5484.1, Environmental Protection, Safety, and Health Protection Information Reporting Requirements.

This order establishes the requirements and procedures for the reporting of information having environmental protection, safety, or health protection significance for DOE operations.

C.4 State of Nevada Laws

Listed below, by category, are the significant State of Nevada laws, rules, regulations, and guidelines that are known to be applicable to the NTS and the off-site locations in Nevada:

Air Pollution:

Nevada Administrative Code: Chapter 445B, Water Controls; Air Pollution:

- Sections 287-366, Permits to Construct and Operating Permits
- Sections 339-351, Toxic or Hazardous Air Contaminants
- Sections 354-357, Visible Emissions
- Sections 360-367, Emissions of Particulate Matter
- Sections 381-395, Miscellaneous (includes open and incinerator burning)

These regulations (1) implement both state and federal (EPA) clean air statutes, and (2) identify the requirements for permits for each air pollution source (unless it is specifically exempted) as well as ongoing monitoring requirements.

Drinking Water:

Nevada Administrative Code: Chapter 445A, Water Controls; Air Pollution:

- Sections 450-682, Public Water Systems
- Sections 810-925, Underground Injection Control

These regulations (1) set the standards for drinking water, specifications for certification, and control of variances/exemptions; (2) set standards and requirements for the construction of wells and other water supply systems; and (3) establish the different classes of wells (Class I through V), aquifer exemptions, prohibited wells, operation, monitoring, etc., as well as plugging and abandonment activities.

Hazardous Waste:

Nevada Administrative Code: Chapter 444, Sanitation:

- Sections 842-8746, Facilities for the Management of Hazardous Waste
- Sections 8752-8788, Program for Reduction of Hazardous Waste
- Sections 940-9555, Polychlorinated Biphenyl
- Section 960, Limitations on Issuance of Permits
- Sections 965-976, Disposal of Asbestos

These regulations establish fees, variances, restrictions, and permits and adopt 40 CFR Parts 2, 124, and 260 to 270, I inclusive, as a part of the Nevada Administrative Code.

Public Waters:

Nevada Revised Statutes: Chapter 533, Adjudication of Vested Water Rights; Appropriation of Public Waters:

- Section 325, Application to State Engineer for Permit
- Section 335, Application for Permit to Appropriate Water: Contents
- Section 4373, Application for Environmental Permit: Contents

These statutes set forth the requirements, procedures, and process of acquiring a permit for the appropriation of public waters in Nevada. These statutes also establish the fees associated with the processing and issuing of permits and sets forth the environmental requirements. <u>Note</u>: The Legislative Counsel Bureau, Carson City, Nevada, has not published a corresponding chapter in the Nevada Administrative Code covering the implementation of Nevada Revised Statutes, Chapter 533.

Sewage Disposal:

Nevada Administrative Code: Chapter 444, Sanitation:

- Sections 750-840, Sewage Disposal

This regulation establishes the standards, regulations, permits, and requirements for septic tanks and other sewage disposal systems for single-family dwellings, communities, and commercial buildings.

Solid Waste:

Nevada Administrative Code: Chapter 444, Sanitation:

Sections 570-748, Solid Waste Disposal

This regulation sets forth the definitions, methods of disposal, special requirements for hazardous waste, collection and transportation standards, and classification of landfills.

Underground Water, Wells, and Related Drilling Regulations:

Nevada Administrative Code: Chapter 534, Underground Water and Wells:

Sections 280-298, License to Drill Well
Sections 300-450, Drilling, Construction, and Plugging of Wells

These regulations establish the ownership of underground waters within the State and the appropriation for beneficial use and specify the conditions, requirements, and rules for acquiring such water. The regulations also set forth the license requirements of well drillers; the requirements of drilling, construction, and plugging of wells; and the protection of the aquifers from pollution and waste.

Vegetation:

Nevada Administrative Code: Chapter 527, Protection and Preservation of Timbered Lands, Trees, and Flora.

This regulation provides for the broad protection of the indigenous flora of the State. Those plants, declared to be threatened with extinction, are placed on the state of Nevada's list of fully protected species.

Water Pollution:

Nevada Administrative Code: Chapter 445A, Water Controls; Air Pollution:

Sections 070-348, Water Pollution Control

This regulation classifies the waters of the State, establishes standards for water quality of all waters in the State, and specifies discharge permit requirements and notification requirements.

Wildlife:

Nevada Administrative Code, Chapter 503, Hunting, Fishing, and Trapping; Miscellaneous Protective Measures:

Sections 010-104, General Provisions

This regulation specifies the classification of wildlife and also specifies protected and unprotected wildlife.

C.5 Permits

Current Operating Permits for the NTS and surrounding areas are presented in Table C-1.

C.6 Pollution Prevention and Waste Minimization

Introduction

The DOE is committed to preventing pollution and reducing waste generation at the NTS. This is accomplished through establishing partnerships with private industry and complying with federal, state, and local regulations. The elements of the DOE/NV Waste Minimization/Pollution Prevention Program address reporting requirements, compliance costs, reduction costs, employee concerns, environmental liability, training, and the reduction, recycle, and reuse of commodities. These actions provide a safer environment for future generations, a more cost-effective operation, and a safer working environment. The preparation of the DOE contractor's Waste Minimization and Pollution Prevention Awareness Implementation Plan reflects the objectives and milestones identified in the DOE/NV Waste Minimization and Pollution Prevention Awareness Plan; the 1994 DOE guidance document, "Guidance For Preparation of Waste Minimization/Pollution Prevention Awareness Plan"; and the DOE/Headquarters Defense Program and the Environmental Management guidelines. The Pollution Prevention Awareness Program as identified in DOE Order 5400.1 has also been incorporated into the DOE/NV Waste Minimization Program.

Table C-1. Operating permits (Page 1 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
Not Numbered	NTS General	Water Hauling Agreement	Water Hauling	Temporary	State of Nevada Safe Drinking Water Act	Regular sampling and monthly reporting.
13-95-0034-X	NTS General	Hazardous Materials Storage	General	12/31/95	State of Nevada Fire Marshall	
95-12	NTS General	Air Quality Operating Permit	Open Burning for Training	10/02/95	State of Nevada Clean Air Act	Annual report by 11/01/95 of fire exercises and telephone notification to the State before each training with Class A flammables.
95-21	NTS, LLNL Area 27	Air Quality Operating Permit	Open Burn	01/23/96	State of Nevada Clean Air Act	Telephone notification to the State every time there is a burn, followed by telephone or written communication within 5 days.
AP9711-0549	NTS, Area 1 All stationary emission units	Air Quality Operating Permit	Shaker Plant; Rotary Dryer; Aggregate Plant; Concrete Batch Plant; Sandbagging Operation with Ancillary Systems	03/21/00	State of Nevada Clean Air Act	Annual report of yearly production and operation hours to be submitted to the State on 02/01.
AP9711-0554	NTS, Area 6 All stationary emission units	Air Quality Operating Permit	32 Storage Silos; 3 Scale Tanks; 1 Decontamination Boiler; 1 Diesel Fuel Storage Tank; 1 Gasoline Storage Tank; 1 Portable Slant Screen	11/21/99	State of Nevada Clean Air Act	Annual report of yearly production and operation hours to be submitted to the State on 02/01.

Table C-1. Operating permits (Page 2 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
AP9711-0555	NTS, Area 23 All stationary emission units	Air Quality Operating Permit	3 Boilers; 1 Incinerator; 1 Gasoline Storage Tank; 1 Diesel Fuel Storage Tank; 1 Portable Slant Screen; 1 Surface Disturbance for NTS-wide activities	12/04/99	State of Nevada Clean Air Act	Annual report of yearly production and operation hours to be submitted to the State on 02/01.
GNEV93001	NTS, Area 2; Area 6, DAF; Area 12; Areas 22 and 23; Area 25; CP, LANL, RSN, Yucca	Sewage System Permit	Sewage Treatment Facility	01/31/99	State of Nevada Clean Air Act	An Operations &Maintenance Manual has been submitted and approved by the State. An acceptable method of groundwater protection is required prior to expiration of permit.
NV2890010521	NTS, Area 27 Explosive Ordnance Disposal Facility	Lawrence Livermore National Laboratory Resource Conservation and Recovery Act Part A Permit Application	Explosive Ordnance	10/01/92 Renewal request submitted; denied by state EPA.	State of Nevada Resource Conservation and Recovery Act	Annual reporting. Site closed 09/94.
NV3890090001 NEV-HW-009	NTS General Area 5 Hazardous Waste Storage Unit; Area 11 Explosive Ordnance Disposal Unit	Notification of Hazardous Waste Activities	Resource Conservation and Recovery Act Part B Permit for storage and treatment of Hazardous Waste	5/2000	State of Nevada Resource Conservation and Recovery Act	Annual reporting of waste generation to the DOE. Report to state EPA due biannually (1996 for 1994-1995).
NV3890090001	NTS General	Resource Conservation and Recovery Act Part B Permit Application	Mixed Waste Disposal, Mixed Waste Storage (TRU)	Not Applicable	State of Nevada Resource Conservation and Recovery Act	Annual reporting of waste disposal to the DOE. Report to state EPA due biannually (1996 for 1994-1995).
NVG-PCB-006	NTS General	PCB Generator Notification	PCB Generation	Indefinite	State of Nevada Toxic Substance Control Act	Annual reporting of PCB status to the DOE and state EPA.

Table C-1. Operating permits (Page 3 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
NY-17-03310	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-104866)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NV-17-03311	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-104573)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03312	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-104364)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03313	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-105293)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03314	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No.E-105299)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03315	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-105919)	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-17-03317	NTS General	Septage Hauling Permit	Septic Tank Hauling Truck (No. E-105918)	11/30/95	State of Nevada Clean Water Act	Install automatic shutoff valves on discharge hoses.

Table C-1. Operating permits (Page 4 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
NY-17-03318	NTS General	Septage Hauling Permit	Septic Tank Pumping Contractor	11/30/95	State of Nevada Clean Water Act	Labeled both sides and rear of truck as "sewage sludge," labeled water trucks as "nonpotable water." Replaced broken hoses and caps. Installed automatic shutoff valves on discharge hoses.
NY-360-12C	NTS, Area 23	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
NY-3076-DJR	NTS General	Permit to Construct	Public Water System	Not Applicable	State of Nevada Safe Drinking Water Act	Application awaiting construction of the system.
NY-835-12 NCNT NY-836-12 NCNT NY-841-12 NCNT	NTS General	Public Water System Permit	Water-Hauling Truck	09/30/95	State of Nevada Safe Drinking Water Act	
NY-4098-12 NCNT	NTS, Area 25	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
NY-4099-12C	NTS, Areas 2-12	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
NY-5000-12 NCNT	NTS, Area 6	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
NY-5024-12NC	NTS, Area 1	Public Water System Permit	Public Water System	09/30/95	State of Nevada Safe Drinking Water Act	Monthly bacteria sampling to the State laboratory.
OP1975	NTS, Area 2, Lawrence Livermore National Laboratory Portable Stemming System	Air Quality Operating Permit	Stemming Facility with Atlas Conveyors (2)	12/04/94 (Renewal request sent to the State; still pending.)	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.

Table C-1. Operating permits (Page 5 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
OP1976	NTS, Area 2, Lawrence Livermore National Laboratory Portable Stemming System	Air Quality Operating Permit	Barber-Green Conveyor; Atlas Conveyor; Nordberg Conveyor	12/04/94 (Renewal request sent to the State; still pending.)	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.
OP2625	NTS, EG&G Energy Measurements Area 5, Spill Test Facility	Air Quality Operating Permit	Controlled Release Operations and Monitoring of Hazardous Chemicals	11/02/97	State of Nevada Clean Air Act	Reporting to the State 30 days before testing and a final report after testing.
OP2744	NTS, Area 12, Cafeteria	Air Quality Operating Permit	Ajax Boiler No. SOXFD-4500; S/N 73-269-79	03/23/98	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.
OP2849	NTS, Area 12, Concrete Batch Plant	Air Quality Operating Permit	Ideal Mfg. Co. Concrete Batch Plant	12/02/98	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15. Operating hours increased from 296 to 550 annually.
OP2850	NTS, Portable	Air Quality Operating Permit	Field Storage Cement Bins	12/02/98	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15. Operating hours increased from 296 to 550 annually.
PC2988	NTS, Area 3	Permit to Construct	Two-Part Epoxy Batch Plant	Variable (pending formal state inspection)	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.
PC3246	NTS, Area 3, Mud Plant	Air Quality Permit to Construct	6 Storage Silos; 1 Pressure Tank; 2 Weigh Hoppers	10/19/97	State of Nevada Clean Air Act	Notify the State of commencement of construction, completion of construction, and commencement of operations.
PC3774	NTS General, Portable Stemming System	Air Quality Permit to Construct	Stemming System	Variable (pending formal state inspection)	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.
AP9711-0578	NTS, Area 5, Portable Slant Screen	Air Quality Permit to Construct	Slant Screen	05/05/00	State of Nevada Clean Air Act	Annual report of yearly production and hours of operation to be submitted to the State by 04/15.

Table C-1. Operating permits (Page 6 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
S12888	NTS General and Specific (W. Kent Ostler)	Scientific Collection of Wildlife Samples	Scientific Collection of Wildlife Samples	12/31/96	State of Nevada Nevada Administrative Code Chapter 503	Annual report by 01/31/96.
*********************************** TTR ***********************************						
NEV20001	TTR, TIADS Mancamp Industrial Area	Sewage System Permit		08/20/92[a]	State of Nevada Clean Water Act	Submit quarterly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
NV1890011991	TTR, EPA Waste ID Number TTR	Notification of Hazardous Waste Activities		N/A	State of Nevada Resource Conservation and Recovery Act	Submit annual report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
NY-3014-12NC	TTR, SNL Compound	Public Water System Permit	Well 6	09/30/93	State of Nevada Safe Drinking Water Act	Submit monthly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
NY-4068-12C	TTR, Mancamp Area	Public Water System Permit	Well 1A BLM Well	09/30/93	State of Nevada Safe Drinking Water Act	Submit monthly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.

a NPDES permit renewal application has been transmitted to the State. The State is presently renewing the application and design modification. Expected renewal date is unknown.

Table C-1. Operating permits (Page 7 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
NY-5001-12NC	TTR, Industrial Area	Public Water System Permit	Well A, Well B, Well EH-2	09/30/93	State of Nevada Safe Drinking Water Act	Submit monthly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
NY-5002-12NC	TTR, TEAR	Public Water System Permit	(O&M) Well	09/30/93	State of Nevada Safe Drinking Water Act	Submit monthly report of production and hours of operation to the state of Nevada. Permit transferred back to the U.S. Air Force.
OP1661	TTR, Petro Storage	Air Quality Operating Permit	Diesel #1	09/15/93 (in process of being renewed)	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2229	TTR, Concrete Batch Plant	Air Quality Operating Permit	Ross Concrete Batch Plant, S/N 1317	02/12/96	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2231	TTR, Concrete Batch Plant	Air Quality Operating Permit	C.S. Johnson Batch Plant, S/N 64079-1	02/19/96	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2445	TTR, Petro Storage	Air Quality Operating Permit	Diesel #1	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2446	TTR, Petro Storage	Air Quality Operating Permit	JP-4	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2447	TTR, Petro Storage	Air Quality Operating Permit	JP-4	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2448	TTR, Petro Storage	Air Quality Operating Permit	JP-4	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2449	TTR, Petro Storage	Air Quality Operating Permit	JP-4	03/26/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.

Table C-1. Operating permits (Page 8 of 8)

Permit	Facility	Permit Name	Permit Item	Exp. Date	Issuing Agency and Regulation	Action/Comments
OP2450	TTR, Incinerator	Air Quality Operating Permit	MDL 500CA	03/26/98	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2455	TTR, Screen	Air Quality Operating Permit	Cedarapids Double Deck Screen (with Roll Crusher)	04/17/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2456	TTR, Crusher	Air Quality Operating Permit	Cedarapids Roll Crusher	04/17/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2457	TTR, Crusher	Air Quality Operating Permit	Cedarapids Jaw Crusher	04/17/97	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP2844	TTR, General	Air Quality Operating Permit	Surface Disturbance	09/15/98	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.
OP3172	TTR, Vapor Extraction	Air Quality Permit to Construct	Extraction Unit	03/26/98	State of Nevada Clean Air Act	Submit annual report of production and hours of operation to the State by 04/15. Permit transferred back to the U.S. Air Force.

Background

The National Environmental Policy Act emphasizes minimizing the impacts that result from federal activities. The National Environmental Policy Act's original purpose was to "promote efforts which will prevent or eliminate damage to the environment." This is complemented by both the Pollution Prevention Act of 1990 and the Hazardous and Solid Waste Amendments of 1984. These acts enable federal agencies to develop and implement waste minimization/pollution prevention programs. This relationship was further strengthened in a 1993 memorandum from the Council on Environmental Quality, which recommended that federal agencies incorporate pollution prevention principles, techniques, and mechanisms throughout the National Environmental Policy Act planning and decisionmaking processes (58 FR 18).

To help facilities meet regulatory requirements, the EPA has published strategies and guidelines on waste minimization/pollution prevention. The Pollution Prevention Act of 1990 establishes an environmental protection hierarchy, with pollution prevention/source reduction as the most desirable environmental management option. If pollution cannot be prevented, then, in descending order of preference, environmentally sound recycling, treatment, and disposal are listed as alternative waste management options.

Waste minimization centers on source reduction or recycling of solid wastes regulated by the Resource Conservation and Recovery Act. Pollution prevention complements the concept of waste minimization by focusing on the following: source reduction and other practices that reduce or eliminate pollutants through increased efficiency in the use of raw materials, energy, water, or other resources or protection of natural resources by conservation. Waste minimization is an implied element of the pollution prevention process.

The DOE has developed an overall pollution prevention strategy and framework that is consistent with EPA's recommendations and other requirements (e.g., Executive Order 12856) around which its facilities must structure their own programs. DOE Orders 5400.1 and 5820.2A establish policy requirements for environmental protection and waste management. This framework is the basis of the NTS's strategy to implement waste minimization/pollution prevention elements and techniques in all operations. The DOE/NV Pollution Prevention Program establishes commitments to use available technology to reduce waste generation, monitor operations to encourage sound practices that discourage waste generation, develop an awareness of environmental concerns and practices, and comply with existing laws governing environmental protection.

DOE/NV Waste Minimization/Pollution Prevention Program

The DOE/NV Waste Minimization/Pollution Prevention Program is consistent with the DOE and other legal requirements.

The DOE/NV provides services and support for the NTS operations. These responsibilities included waste minimization, pollution prevention, recycling, waste management, environmental restoration, and technology transfer.

The DOE/NV has adopted Emergency Planning and Community Right-to-Know Act and sitewide goals. The Waste Minimization/Pollution Prevention Program establishes the following three levels of goals:

- Program goals for reducing the number of releases and offsite transfers of Emergency Planning and Community Right-To-Know Act, Section 313, Priority Pollutants, as specified in Executive Order 12856 and the DOE 1994 Waste Minimization/Pollution Prevention Crosscut Plan
- Sitewide goals for minimization of wastes and pollutants not covered by Executive Order 12856
- Generator-specific goals for minimization of wastes and pollutants covered by Executive Order 12856.

Emergency Planning and Community Right-To-Know

The Emergency Planning and Community Right-to-Know goals are specified by Executive Order 12856 and the 1994 DOE Waste Minimization Pollution Prevention Crosscut Plan. The goals are to reduce the release and offsite transfer of pollutant chemicals from the Section 313 toxic chemicals list by December 31, 1999. To the maximum extent practicable, these reductions shall be achieved by implementation of source reduction practices. The DOE/NV has adopted these goals as contained in Executive Order 12856.

The baseline for measuring the 50-percent reduction goal shall be the first year in which toxic chemical releases to the environment and off-site transfers of such chemicals for treatment and disposal were publicly reported by the DOE. The baseline amount (1992 figures) is the aggregate amount of toxic chemicals reported in the baseline year for all of the company's operations that meet the threshold applicability requirements.

Pollution Prevention Opportunity Assessments

Generation of all forms of waste; i.e. sanitary, hazardous, radioactive, and mixed, is reviewed to determine where waste minimization/pollution prevention opportunities exist. One method of examining waste generation is through conducting Pollution Prevention Opportunity Assessments. The Pollution Prevention Opportunity Assessments take place using a graded approach. A Level I Assessment establishes the site's baseline operational information. Level II Assessments are used to develop and screen waste minimization/pollution prevention opportunities and to recommend viable options for the implementation of those opportunities. The objective of a Level III Assessment is to conduct a detailed analysis of the process for waste minimization/pollution prevention opportunities and to document the result of the process evaluation in a written report, as defined in the DOE/NV Pollution Prevention Opportunity Assessment Plan and the DOE/NV Waste Minimization and Pollution Prevention Awareness Plan.

Assessments identify, screen, and analyze waste minimization options to reduce or eliminate the generation of waste. These assessments provide a summary of hazardous materials used during production and also provide for the identification of processes and operations that can and need to be improved or replaced to promote waste minimization. The Pollution Prevention Opportunity Assessments serve as a tool for prioritizing waste minimization efforts and ensure the proper setting of baseline goals.

Pollution Prevention Opportunity Assessments are carried out by designated teams comprised of personnel who are trained in the assessment process and have an understanding of relevant environmental regulations; waste minimization concepts; principles, techniques, and quality assurance requirements; purchasing; material control and inventory; and operational line functions. In identifying waste minimization options, the Pollution Prevention Opportunity Assessment teams concentrate on process modifications resulting in source reduction, followed by recycling opportunities.

Waste Evaluation/Assessments

Hazardous and industrial wastes are continually being evaluated by generators. These evaluations provide information regarding product substitution, cross-contamination control, use of on-site treatment by existing equipment, and potential treatment using commercially available equipment. Pending resource availability, Pollution Prevention Opportunity Assessments will be conducted by multidiscipline teams.

Waste Stream Identification/Waste Tracking

The waste minimization goals are the elimination and reduction of the generation, volume, or toxicity of wastes. Prioritization is based on the presence of hazardous waste constituents, including the probability of constituent occurrence, and on the volume generated. Low-level waste is listed according to how the waste generated compares to the environmental and health risks associated with the other waste categories.

Hazardous waste generated at the NTS are tracked through several processes and databases. All waste-generating locations at the NTS are identified by utilization of a Satellite Accumulation Area designation. This is in conjunction with a waste stream identification number, which is then used as a cross verification of on-site manifested wastes to the off-site hazardous waste manifests. These manifests are available in both hard copies and databases.

Solid Waste

Solid waste such as paper, cardboard, and aluminum cans are currently being recycled through a subcontractor as well as food waste from cafeterias.

Procurement Controls

Purchase requisitions for the procurement of materials purchased outside the "Just-in-Time" system are reviewed as they are generated. If the waste generated by these materials has the potential to be regulated under Comprehensive Environmental Response, Compensation, and Liability Act/Resource Conservation and Recovery Act, or as a potential of causing harm to individuals or the environment, the reviewers will only approve their purchase if there is no approved substitute for the product and the use for the product cannot be discontinued by process modification. If the material is approved for purchase, the personnel administering the "Just-in-Time" system preapprove the material and enter it into the "Just-in-Time" system for purchase.

Waste Minimization and Pollution Prevention Awareness

The Pollution Prevention Awareness Program required by DOE Order 5400.1 and others has been incorporated in the company's training program. The purpose of the Pollution Prevention Awareness Program is to foster the philosophy that prevention is superior to remediation. The goal of the program is to incorporate pollution prevention into the decisionmaking process at all levels. The Pollution Prevention Awareness Program has the following objectives:

- Make employees aware of general environmental activities and hazards, plus Waste Minimization Program requirements, goals, and accomplishments
- Inform employees of specific environmental issues
- Train employees on their responsibilities in pollution prevention
- Recognize employees for their efforts to improve environmental conditions through pollution prevention
- Encourage employees to participate in pollution prevention activities
- Publicize success stories.

Through company publications, topics are published with the intent of increasing the employees' awareness of environmental issues and their role in improving the environmental conditions in the workplace and community.

Training

Through DOE/NV guidance, management and affected employees are routinely instructed in waste minimization and pollution prevention policies and procedures. Environmental awareness training is presented to both management and employees.

Technology Transfer

Minimization technologies are limited to commercially available product substitutes and recycling or treatment equipment. Because the DOE/NV generates small quantities of numerous waste types, significant reductions resulting from individual actions will not occur. In most cases, recycling is cost prohibitive because of the small volume of recyclable waste generated at each operation compared to equipment costs.

C.7 References

REGULATION, ORDER, LAW

58 FR 18	Council on Environmental Quality, "Memorandum to Head of Federal Departments and Agencies Regarding Pollution Prevention and the National Environmental Policy Act," Federal Register, Washington, DC, pp. 6478-6481, 1993.
DOE Order 5400.1	U.S. Department of Energy (DOE), "General Environmental Protection," Washington, DC, 1988.
DOE Order 5820.2A	DOE, "Radioactive Waste Management," Washington, DC, 1988.
EO 12856	Executive Order, "Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements," Office of the President, Washington, DC.
GENERAL	
BN, 1996	Bechtel Nevada, "DOE/Nevada Operations Office Waste Minimization and Pollution Prevention Awareness Plan," 1996.
DOE, 1993	DOE, "Guidance for the Preparation of the Waste Minimization and Pollution Prevention Awareness Plan," Washington, DC, 1993.
DOE, 1994	DOE, "Waste Minimization/Pollution Prevention Crosscut Plan," Washington, DC, 1994.
DOE/NV 1994	DOE/NV, "Pollution Prevention Opportunity Assessment Plan," Las Vegas, NV, 1994.

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Appendix D

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Executive Director
Henderson Chamber of Commerce

Administrative Assistant
Lander County Commission

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Christina Aguilera
Clark County

Robert J. Andrews
Clark County Office of Emergency Management

Jim Andrus
City of Mesquite Council

Yvonne Atkinson-Gates
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Woodfords Community Council

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Director, Dept. of Economic Development
City of Henderson

Larry K. Barton
City Manager of Las Vegas Community Services

Wade M. Barton
Esmeralda County Commission

Dennis A. Bechtel
Clark County Nuclear Waste Division

Bob Beckett
Nye County

Vicki G. Bergdale
Boulder City

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Clark County Commission

Honorable Iris Bletsch
Boulder City Council

Phillip A. Blount
Clark County Nuclear Waste Division

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Amargosa Valley Planning Board
City of Amargosa

Les Bradshaw
Nye County Nuclear Waste

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City of Mesquite

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Alan Chamberlain
Lincoln County

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Pat Christensen
Nye County

Jack Clark
City of Henderson

Ira "Red" Copass
Nye County

Bill Copeland
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Clark County School District

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Las Vegas Fire Department

Peter Cummings
City of Las Vegas

Amanda Cyphers
City of Henderson

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Clark County Fire Department

Albert C. Douglas
City of Las Vegas

Michael Dyal
City of North Las Vegas

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City of Boulder City

Jack Finney
Coordinator of Emergency Management
City of Henderson

George Forbes
City of Boulder City

Dr. Don Francom
Superintendent of Schools
Lincoln County

Theron Goynes
City of North Las Vegas

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City of Henderson

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Andy Hafen
City of Henderson

Phyliss A. Hargrove
Las Vegas Department of Community Planning and Development

Paul Henderson, City Manager
City of Mesquite

Vaughn Higbee
Lincoln County School District

Juanita Hoffman
Esmeralda County

Richard B. Holmes
Clark County

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Clark County Commissioner

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City of Las Vegas

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Department of Public Works
City of North Las Vegas

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City of Boulder City

Florindo Mariani
White Pine County

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City of St. George, UT

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City of Las Vegas

Nancy Mc Neill
City of North Las Vegas

Honorable Cameron McRae
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Bernie Merlino
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Inyo County Planning Department

Dean Molburg
Boulder City Fire Department

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Mary Key Peck
City of Henderson

W. Wayne Perkins
Nye County

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Nuclear Waste Project Office
Lincoln County

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City of Pahrump Town Board

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City of Tonopah

Philip D. Speight, Manager
City of Henderson

John Sullard
City of Boulder City

Glen Van Roekel
Director of Community Development
City of Caliente

Englebret von Tiesenhausen
Dept. of Comp. Planning
Nuclear Waste Division
Clark County

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Clark County

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Building and Safety Director
City of Las Vegas

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David Wood
City of Henderson

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American Indian

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Nevada Indian Commission

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Paiute Indian Tribe of Utah

Cheryl Andreas, Chairperson
Big Pine Paiute Tribe

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Pahrump Paiute Tribe Executive Director
Las Vegas Indian Center

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Benton Paiute Tribe

Darryl Bahe, Representative
Benton Paiute Tribe

Gloria Benson
Kaibab Paiute Tribe and Southern
Paiute Indian Tribe Association

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Yomba Shoshone Tribe

Angie Boland, Acting Chairperson
Timbisha Shoshone Tribe

Robert Boyt, Chairperson
Las Vegas Indian Center

Angelita Bulletts
Official Tribal Contact Representative
Kaibab Paiute Tribe

James C. Burton
Nevada Indian Environmental Coalition

Leslie Button
Official Tribal Contact Representative
Lone Pine Paiute Tribe

Irene Button
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Shivwitts Band of Southern Paiutes

Jerry Charles
Ely Shoshone Tribe

Lee Chavez
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Bishop Paiute Tribe

Donald Cloquet
Official Tribal Contact Representative
Las Vegas Indian Center

Betty Cornelius
Official Tribal Contact Representative
Colorado River Indian Tribes

Charlotte Domingo
Shivwitts Band of Southern Paiutes

Donna Duckey
Official Tribal Contact Representative
Big Pine Paiute Tribe

Wayne Dyer
Yomba Shoshone Tribe

Daniel Eddy, Jr.
Colorado River Indian Tribes

Pauline Esteves
Official Tribal Contact Representative
Timbisha Shoshone Tribe

Maurice Frank
Official Tribal Contact Representative
Yomba Shoshone Tribe

Grace Goad
Official Tribal Contact Representative
Timbisha Shoshone Tribe

American Indian

Boyd Graham
Duckwater Shoshone Indian Tribe

Janie Harper
Official Tribal Contact Representative
Chemehuevi Paiute Tribe

Eleanor Hemphill
Fort Independence Paiute Tribe

Gloria Hernandez
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Walker River Paiute Tribal Council

Keith Honaker
Duckwater Shoshone Indian Tribe

Levi Hooper
Official Tribal Contact Representative
Yomba Shoshone Tribe

Glenn Hooper
Yomba Shoshone Tribe

Roy Kennedy
Timbisha Shoshone Tribe

Lawanda Laffoon
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Colorado River Indian Tribes

Mathew Leivas
Chemehuevi Paiute Tribe

Cynthia Lynch
Official Tribal Contact Representative
Pahrump Paiute Tribe

Sally Marks
Ely Shoshone Indian Tribe

Marion Mc Fee
Official Tribal Contact Representative
Shivwits Band of Southern Paiutes

Calvin Meyers
Official Tribal Contact Representative
Moapa Band of Paiutes

Rosalyn Mike
Moapa Band of Paiutes

Vernon Miller
Official Tribal Contact Representative
Fort Independence Paiute Tribe

Alfreda Mitre
Las Vegas Paiute Indian Tribe

Gaylene Moose
Official Tribal Contact Representative
Big Pine Paiute Tribe

Alvin Moyle
Fallon Paiute/Shoshone Tribal Council

Priscilla Naylor
Official Tribal Contact Representative
Fort Independence Paiute Tribe

Neddeen Naylor
Official Tribal Contact Representative
Lone Pine Paiute Tribe

Eunice Ohte
Official Tribal Contact Representative
Moapa Band of Paiutes

Cynthia Osife
Kaibab Paiute Tribe

Michelle Saulque
Official Tribal Contact Representative
Benton Paiute Tribe

American Indian

Gevene Savala
Official Tribal Contact Representative
Kaibab Paiute Tribe

Alex Shepherd
Paiute Tribe of Southern Utah

Allen Summers
Bishop Paiute Tribe

Peggy Vega
Official Tribal Contact Representative
Bishop Paiute Tribe

Merril Wall
Official Tribal Contact Representative
Shivwits Southern Band of Paiute

Donald Walters
Chemehuevi Paiute Tribe

Richard Wilder
Fort Independence Paiute Tribe

Patrick T. Williams
Bureau of Indian Affairs

Sandra Yonge
Lone Pine Paiute/Shoshone Tribe

Raymond Yowell, Council Chief
Western Shoshone National Council

Other Interested Parties

Concerned Citizens Committee

Dyer Public Library

East Las Vegas Library

Friends of Nevada Wilderness

Nevada Black Chamber of Commerce

Executive Director
Nevada Nuclear Waste Task Force

Stephen Alastuey
Citizens Alert

William Andrews
University of Nevada, Las Vegas

Nick Aquilina

Clint Arnoldus
First Interstate Bank of Nevada

John Bangerter
Army of Israel

Joseph Blackburn
The Alliance of Atomic Veterans

Vernon Brechin
Tri Valley Care's

Chris Brown
Community Advisory Board (CAB) Member

Jerry Brown
We the People

David Buer
Nevada Desert Experience

Nilak Butler
Greenpeace

Tim Carlson
NTS Development Corporation

Mary Kaye Cashman
Cashman Equipment Company

Dick Conner
North Las Vegas Chamber of Commerce

Diane Cravotta
Community Advisory Board Member

James Dalton, Ph.D
Army of Israel

Mary Lee Dazey
Citizens Alert

Robert Deegan
Sierra Club Nuclear Waste Task Force

Gale Dupree
Nevada Wildlife Federation, Inc.

Marvin Einerwold
Nevada Wildlife Commission

Joseph N. Fiore
Community Advisory Board Member

Dale Foust
TRW Environmental Safety Systems

John Gardner II
Nevada Black Chamber of Commerce

Jo Anne Garrett
Citizens Alert

John Goolsby
The Howard Hughes Corporation

Marilynn Hall
Community Advisory Board Member

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Boulder City Chamber of Commerce

James Henderson
Community Advisory Board Member

Daniel Hirsch
Committee to Bridge the Gap

Somer Hollingsworth
Nevada Development Authority

Roger L. Jacobson, Ph.D
Desert Research Institute

Dianne Jett
Sprint Central Telephone

Melinda Kassen
Environmental Defense Fund

Keith Kerner
Town of Beatty Advisory Board

Robert Kessler
Physicians for Social Responsibility

Gerald Kmetz
Int'l Brotherhood of Painters

Joella Krall
Oak Ridge National Laboratory

Dawn Lappin
Wild Horse Organized Assistance

Stephanie Lynnette Lawton
Community Advisory Board Member

Larry Litchfield
Associated Builders/Contractors

Marilyn J. Littlepage
Community College of Southern Nevada

Doug Lombardi
Oak Ridge National Laboratory

James M. Long
Int'l Association of Sheet Metal Workers

Thomas Lorinez
Southern Nevada Federal Community Advisory Board

Mike Maffie
Southwest Gas Corporation

Robert Maichle
Nevada Wildlife Federation

Charles Malone
Environmental Consultant

Bill Martin
Pioneer Citizens Bank

Ben Martinez
Defense Nuclear Agency

Alice Martz
Henderson Chamber of Commerce

Lathia Mc Daniels
MAC/JAG Tech., Inc.

W. Curt McGee
Bechtel Nevada Corporation

Joe McGee
Western Tech

Rose McKinney-James
Corporation for Solar Tech/Renewable Resource

Georgia McDonald
League of Women Voters of Nevada

Brian Meacham
Utah Peace Test

Other Interested Parties

Otto Merida
Latin Chamber of Commerce

Richard Nocilla
Desert West Realty

Robert Norris
Natural Resources Defense Council

Mary O'Brien
Community Advisory Board Member

John O'Reilly
Las Vegas Chamber of Commerce

Margaret Quinn
League of Women Voters of Nevada

Ed Richardson
Bechtel Nevada Corporation

E. Paul Richitt, Jr.
University of Nevada, Las Vegas

A. C. Robison
Robison Seidler, Inc.

Mimi Rodden
Cultural Resource

Wanda Rosenbaum
Boulder City Peace and Social Justice

William Rosse, Sr.
Western Shoshone

Shashi Sathisan
University of Nevada, Las Vegas

Randy Schaefer
Southern Nevada Homebuilders

Dale Schutte
Community Advisory Board Member

Connie Simkins
Lincoln County Record

Stanley Sims
Nye County

Dave Smith
First Security Bank of Nevada

Dave Smith
Lawrence Livermore National Laboratory

Roger Smith
SANDIA/TTR

Vernon F. Sousa
National Association of Atomic Veterans

Joanne S. Stockill
Community Advisory Board Member

Candace Stowell
Comprehensive Planning

Ken Struthers
Nevada Wildlife Federation, Inc.

Shari Thomas
Sprint Central Telephone

Frank Tussing
Community Advisory Board Member

Jeff Van Ee
Sierra Club

William L. Vasconi
Intl Brotherhood of Electrical Workers

Johnny Vaught
Environment Property Services

Troy E. Wade
Nevada Alliance for Defense
Energy & Business

Other Interested Parties

Rebecca Wamsley
Nevada Nuclear Waste

Cari Wells
North Las Vegas Chamber of Commerce

Mike Wolicki
United Transportation Union

Fred Wright
United Brotherhood of Carpenters/Joiners

Robert Young
Asian Chamber of Commerce

Katherine Yuracko
Yuracko and Associates

AHC Enterprises

Science Editor
Arizona Republic

Bureau Chief
Associated Press

Beatty Community Library

Boulder City Library

Director, Land Operations Office
Bureau of Indian Affairs

Business Today

Business Week

Caliente Branch Library

Caliente Library

Carpenters Union Local 1780

Carson City Public Library

Casa Grande Dispatch

Cedar City Spectrum

Churchill County Library

Director
Citizens Alert

Citizens Voice

Citizens Hall

Nevada Appeal

Clark County Library

Community College of Southern Nevada Library

Daily Sentinel

Defense Nuclear Agency

Denver Post

Deseret News

Donald Zhark Associates

Doris Shirkey Library

Douglas Daily Dispatch

El Mundo

Elko County Library

Environmental News Network

Churchill County Library

Fallon Public Library

Floor Coverer Glaziers Allied Trades

Fraternity of the Desert Bighorn

Gateway Gazette

Other Interested Parties

Gloworm Gazette

Goldfield Library

Green Valley Library

Community College of Southern Nevada
Henderson Campus

Editor
Henderson Home News

High Country News

Humboldt County Library

Impact Assessment, Inc.

Business Agent, Local Union No 433
Int'l Assoc Bridge Structural Workers

Int'l Energy Systems

Public Affairs
KCEP

News Director
KDXU Radio

News Director
KELY Radio

Public Affairs
KEYV

Public Affairs
KFMS

Public Affairs
KGLE

Public Affairs
KGYM

Public Affairs
KILA

News Director
KIOQ FM Radio

Public Affairs
KIZS

Public Affairs
KJUL Radio

Director, Public Affairs
KKMR

News Director
KLAS-TV Channel 8

Public Affairs
KLAV

Kleinfelder, Inc.

Public Affairs
KLTN

News Director
KMZQ Radio

Public Affairs
KODS

Public Affairs
KOMP

Public Affairs
KORK

News Director
KOWL

Public Affairs
KPLY

Public Affairs
KPTL

Public Affairs
KRCK 91 FM

Other Interested Parties

Public Affairs
KREC

Public Affairs
KRJC

Public Affairs
KRLT

Public Affairs
KRLV

Public Affairs
KMO

News Director
KROW/KBUL News

Public Affairs
KRRI

Public Affairs
KRXV

News Director, Public Affairs
KRZQ

Public Affairs
KTHO

KTNW Radio

News Director
KTVN-TV

News Director
KUDA-FM

Public Affairs
KUNR

Public Affairs
KUNV

News Director
KVBC-TV Channel 3

News Director
KVLV

Public Affairs
KXEQ

Public Affairs
KXPT

Public Affairs
KZAK

Lake Tahoe Branch Library

Las Vegas Branch Library

Lincoln County Library

Lincoln County Record

Logan Herald Journal

National Desk
Los Angeles Times

News Bureau
McGraw-Hill, Inc.

Mechanical Contractors Association

Mesa Tribune

Mineral County Library

Moapa Valley Library

General Manager
Moapa Valley Water District

National Electrical Contractors Association

National Maritime Union

National Public Radio

Other Interested Parties

Field Director
National Wild Horse Association

Native Nevadan

Nevada Desert Experience

Nevada Government Today

Nevada Highway Patrol

Nevada Senior World Newspaper

Chairman, Economic Adjustment Task Force
Nevada Test Site

Nevada Wildlife Federation, Inc.

North Lake Tahoe Bonanza

Look North
North Las Vegas Chamber of Commerce

North Las Vegas Public Library

Nuclear Waste News

Ogden Standard-Examiner

Oil and Gas Journal

Peavine Branch Library

Petroleum Information

Phoenix Gazette

Plasters and Cement Masons

Director
Pro Video

Prospector/Pennysaver

Rangley Times

Red Rock Audubon Society

Review-Miner

Salt Lake Tribune

Science News

Scottsdale Progress

Senior Citizens Library

Senior Life

Silver Peak Library

Chairman, Environmental
Soroptimist Int'l of Greater Las Vegas

South Fork Band

Sparks Tribune

The Desert Echo Newspaper

The News

The Quest Group/ICF

The Spectrum

Science Writer
The Washington Post

Time-Standard

Tonopah Public Library

Science Writer
Tri-City Herald

Tucson Star

Tulsa World

Other Interested Parties

Bureau Chief
United Press International

Local Union No. 5282
United Steel Workers of America

Noble H Getchell Library
University of Nevada Reno

James Dickinson
Library
University of Nevada, Reno

Valley Times

Washington County Library

Washoe County Library

Community College of Southern Nevada Library
West Charleston Campus

Western Oil Reporter

White Pine Library

Wyoming Eagle-Tribune

Yuma Daily Sun

Dennis Abernathy

Joseph Aceto

Mickey J. Adams

William Albright

Walter Alderson

Kenneth Alkema

Peter Allan

Duane Allen

Jane Allen

Alan Allred

Brian Amme

Rita Anderson

Marina Anderson

Mathew Anderson

Richard Anderson

Tim Anderson

Andy Anderson

Jed Angus

Gary Arbuckle

Maria Ardila-Coulson

Rick Arial

Jake Armor

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Laurence J. Ashbaugh

Cindy Ashley

Keith Ashworth

Ed Atchison

Steven Atkinson

Bob Bailey

Mark Balen

Randy Balice

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Donald Barber
Charles R. Barrett
Max Barrett
Susan Barrow
Jon Barth
Yosef Bartov, Ph.D.
Mike Baughman
Michael Bauser
Mary Bayer
Ben Beaty
Chris Beck
Donna Becker
Dee Beckstead
Kathy Behling
Roger Bell
Herb Bentley
Thomas V. Bentz
Frank Bergwall
Bill Berkey
Robert Bigelow
James Biggs
Randy Black
Cecil Black
Linda Blanco
George Blankenship
Jim and Barbara Blumer
Charles R. Boardman
Paul Bolton
Angelo J. Bomasuto
E. J. Bonano
Lisa Bond
Tony Bonnici
Lou Borghi
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Ted Bowling
Kim Bowman
Jim Boyd
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Steve Bradhurst
Henry Brean
Sonja Breen
Kevin Brennan
Richard Brennen
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Other Interested Parties

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Kelly Bringhurst
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Scott J. Broberg
Susan Brockus
Dr. James Broon
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Suzanne Brown
Jeff Brown
Joseph and Susan Brown
Marcus B. Brown
Betty Brown
Joe Brown
Paula Brown
Lana Buehrer
Grace Bukowski
Saralyn Bunett
Leon Burger
Diane Burger
Ray Burke
Lonnie Burns
Jim Busch
Ward Bushee

Jim Butler
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Judy Calder
Glenn Campbell
Bob Campbell
Michael Cancellier
Andrew Caputo
Christi Carpenter
Luther Carter
Gwen Carter-Bogh
Darlene M. Cartier
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Jon Christensen
Marlin Christensen
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Bruce W. Church

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Joseph Consolo
Sherry Cook
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Patrick Corbett
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Manny Cortez
Dale Costich
Norvin "Pete" Cox
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Bill Craig
Elvin Cramer
Larry Crim
Martha Crossland
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Noralea Dalkin
Jack Dallman
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Patricia Dawson
Jacque De Marquess
James De Meo
Gregory De Sart
Pat De Vore
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Jim Denier
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Dennis Deziel
Dennis Dezwiet
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Carl Di Bella
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Jim Doenges
Dr. John F. Doherty
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Dick Duffey
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Lori Duncan
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Dick Dunning
Rusty Durante
Femi Durosinmi
Joe Dykes
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Merik Edgel
Peter Ediger
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Atef Elzeftawy
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Priscilla Empey
Jerry D. Ennis
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Heather Estes
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Christopher K. Freeman
Bryan D. Friedman
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Bob Furtek
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David Gay
Dot Gayton
Cliff Gentry
Keith Steward Geofon
Gail Gerstner-Miller
Tim Gesner
Richard Getschman
Fred Gibson, Jr.
Lori Gilbert
Maureen Gilgan
Al Gionnotti
Ernest Goitein
C. Carlos Gonzales
David Gonzales
Sydney J. Gordon
Nancy Gosing

Other Interested Parties

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Robert Goudge
Fred Gowers
T. J. Grady
Terry Graves
Susan Greene
Brian L. Greenspun
Wendy Griffin
Jane Gross
James Grosscurth
Clara Groves
Frank Grunstead
Mary Ann Gubler
Dr. Kenny C. Guinn
Rex Gunderson
Becky Gurka
Augie Gurrola
Denny Haas
Scott Hacking
John Hadder
Robert S. Hadfield
Joni S. Hall
Ken Hall
Don Ham
Lawrence F. Hancock
Carolyn Hansen
Glen Hanson
Kevin Harbert
Christopher J. Harbin
Bill Harbour
Andy Hare
Kent Harper
Jack Harpster
Heidi Harr
Billy Harrell
Joan M. Harris
Tom Hart
Randy Hartwig
Larry Hatfield
Jerry Hawe
Mason Hayes
John Hayes
Anthony Hechanova
Clyde Hedin
Doug Henderson
Roger Henning

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Jean Higgens
Kurt Hildebrand
Nick Himaras
Richard L. Hinckley
Joe Hinds
Elaine Hiruo
Bill Hoehn
John Hogan
Mary Holland
John E. Holman
India Holmes
Jeannine Holt
Dalton L. Hooks
Rick Hoover
Marcia Housel
Mark Howard
Dave Howard
Constance K. Howard
Danilie Howe
Patricia Hrrin
Liang Chi Hsu
Eric Hulnick
Stephen Humphries
Richard B. Hunter
Ken Hunter
Dr. Liang-chi Hus
Leonard Hvesties
Carol Infranca
Diane Isbell
Brent Israelsen
Anthony Jackson
Jim Jackson
Nicholas Jahr
Clifford Jarman
Dr. Richard Jarvis
Andrew Jenkins
Jeff Jennings
William S. Jewett
T. W. John
Abby Johnson
Janice Johnson
Harold Johnson
Linda Johnson-Henderson
Ralph Johnston

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Bruce Jones
Robert Jones
Adrian Jueschke
Keith Julian
Mike Kahle
Hank Kahn
Asha Kalia
Alan Kalt
Don Kaminski
Bob Katson
Robert Kaufmann
Andy Kaye
David Kearney
Bill Kelly
Harry Kelman
Robert Kemp
Matt Kennedy
Joan G. Kerschner
Charles R. Kessler
Hank Khan
Mike Kidder
Ginger King

Robert Kinsler
Shirley Kinsler
Mary Kirby
Daniel J. Klaich
Janice Klein
Robert Knudson
Beverly Kohfield
Charles Kondrack
Robin Kosseff
John Kramer
Konrad Krauskopf
Francis Kremer
Peter A. Krenkel
Larry Krenzien
Kimberly Kuehne
Prof. P.K. Kuroda
Susan Lacy
Scott Ladd
Steve Ladnier
Karen Lane
Martin Lane
Larry Lane
Rick Lange

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Dardara Leader
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Dave Lechel
Andrew Leduc
Arnold Leibovit
Jerry Lein
Ted Lempart
Chuck Lenzie
Fred Leonard
Joseph Leone
Marcel Levy
Karen Lewis
Ruth Lindahl
George Lobsenz
Dave Loomis
Johnny Lopez
Larry Lopez
Elwood Lowery
Dan Lowery
Robert Lowes
Ronald C. Lozito

Frankie Lukasko
Karen Lynne
Martin Mackay
Robert Macy
Joseph Mader
John D. Madole
Tom Mahood
H. W. Mallery
James Malone III
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Elisabeth Manning
Mary Manning
Tammy Manzini
Marisa Mardoc
Blair Martha
Joe Martillotti
Charles Martin
John Martin
Lou Martino
Rex Massey
Lloyd Matheson
John R. Mathews
Patricia Mauro

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Earl McGhee

Ed McCann

Bob McClone

Georgia McDonald

Paul McGinnis

Chandler McPherson

Jack McCloskey

Kerry McCombs

Tricia McCracken

Warren L. McCullough

Tom McGowan

John and Alice McGrath

Dee McGuinnes

Claudine McKay

Dennis McKay

Patricia McKinney

Paul McKinney

Judy McMurty

Mary McNabb

Terry McRight

Dr. Paul Meacham

John Meder

Pamela Meidell

Lillian Mendoca

Paul Mercier

Pete Merlin

Dr. Edward P. Michalewicz

William "Bill" Middleton

Christine Milburn

Wanda Mitchell

Dennis Mitchell

William Moffitt

Tiffany Molock

William J. Monahan, Jr.

Fred Monette

Susan Moore

Gilbert Moore

Kim Morgan

Kurt T. Morishige

Philip Moskowitz

David Mullen

J. P. Muntal

Allan Murray

Ronald Myers

Fina Myers

Other Interested Parties

Albert Narath
Robert Nard
John Nash
Robert Nay
Wilma Nay
Paul Newell
Anne Newhouse
Raymond Newman
Robert Nicholsen
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Appendix E

IMPACT ASSESSMENT METHODS

APPENDIX E
IMPACT ASSESSMENT METHODS

E.1 Introduction

Appendix E contains the description of the methods used in preparing the Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (NTS EIS). These methods were designed and implemented to evaluate the potential environmental impacts of the four alternatives addressed in this document. The various analysis methods used to develop this EIS are summarized by resource. Further detail is included in the Technical Resource Document section of the Administrative Record.

E.2 Methods and Assumptions of Analysis

The following sections describe the methods and assumptions used in preparing this EIS. The methods were designed and implemented to evaluate the potential impacts resulting from the four alternatives. The various analysis methods used to develop this EIS are summarized here by resource.

E.2.1 Land Use

The region of influence includes the NTS and land immediately adjacent to the NTS, portions of the Nellis Air Force Range (NAFR) Complex, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

An analysis was conducted to determine the effects of each of the four alternatives on land resources at the NTS and affected portions of the NAFR Complex. Changes in land resource areas resulting from each alternative were compared to existing conditions of the affected environment, and potential impacts were determined. Direct impacts resulting from project-related activities during implementation and operation phases, and indirect impacts resulting from project-related population growth or decline were considered. Impacts were considered negative, and possibly significant, if there was insufficient land available under the U.S. Department of Energy (DOE) control for a proposed activity. Additionally, conflicts with established safety standards; adjacent public or private recreation, religious, or institutional facilities or sites; or local, regional, state, or federal land-use plans, policies, or controls would be considered negative impacts that could be determined as significant. Impacts could be considered beneficial if a proposed project resulted in providing additional land available for use, or if a proposed change resulted in a higher and better use of land resources. Potential mitigation measures have been identified for adverse land-use impacts. Appendix A of the Final NTS EIS provides related land-use information.

E.2.1.1 NTS Site-Support Activities.

This section summarizes the methods of analysis used to assess the potential impacts to site-support activities resulting from the four alternatives presented in this EIS.

E.2.1.1.1 Alternative 1—The methods used for Alternative 1 were based on the assumption that activities and facilities, including the consumption of resources, would continue at the current level. The analysis of environmental conditions was based on the following information and assumptions:

- The availability of usable water at the NTS is adequate and has not exhibited any notable decline
- The current use (pumping from wells) is approximately 20 percent of the maximum capacity
- Existing land capacities for the disposal of solid sanitary waste are available and suitable
- Existing land capacities for the disposal of low-level waste and mixed waste are available and suitable.

Operational assumptions include the following:

- The NTS site-support activities will remain at approximately the existing level for personnel and resources
- Routine maintenance will be provided to keep the existing equipment and utilities functional
- Major construction activities will not occur under Alternative 1.

Operational activities will continue indefinitely under Alternative 1. The total estimated cost for the NTS site-support activities includes the annual cost for operations and maintenance, including labor, utilities, materials, maintenance, and contingency. Ground disturbance for the site-support activities includes equipment, facility and administration buildings, and the parking lots and adjacent roads leading up to the facilities.

It is assumed that 25 percent of the entire NTS will continue to be unused and will provide a buffer zone, as noted in the Fiscal Year 1994 NTS Technical Site Information (RSN, 1994).

The total number of personnel required to operate and manage the NTS site-support activities is based on the number of contractors represented in organizational charts of the U.S. Department of Energy/Nevada Operations Office (DOE/NV) and the August 1994 Report of NTS-Related and Other Nevada-Related Employment.

Building activities are not applicable to this alternative for site-support activities. The water consumption estimate is based on, and related to, the number of personnel needed to operate and manage the site-support activities. The power consumption estimate is also based on, and related to, the number of personnel needed to operate and manage the site-support activities.

The fuel consumption estimate is based on, and related to, the number of personnel needed to operate and manage the site-support activities. The fuel consumption estimate is also based on the estimated number of vehicles to transport communication workers and supervisory personnel to individual site locations (one per day) and back to the originating location (one per day). The originating location for most personnel is Mercury, Nevada. The estimate and impact do not specifically include impacts as a result of personnel travel in Las Vegas.

No industrial wastewater is generated as a result of the site-support operations. No known radiological waste was known to be generated by activities associated with site support. The hazardous materials estimate is based on, and related to, the number of personnel needed to operate and manage the site-support activities.

E.2.1.1.2 Alternative 2—NTS site-support activities would be almost entirely abandoned under this alternative. Only minimal resources would be provided for the monitoring and security functions which would continue at the NTS under this alternative. It was assumed that for this alternative, the remaining monitoring and security functions would be reduced from the Alternative 1 levels by approximately 95 percent. Off-site support would not exist under this alternative.

E.2.1.1.3 Alternative 3—Under Alternative 3, the NTS site-support activities would be modernized and expanded to the extent necessary to provide support for existing activities and the new projects and activities not previously performed at the NTS. In the past, the facilities at the NTS have been capable of supporting a workforce much larger than currently exists, and it is assumed that this capability is mostly intact. Therefore, increases in site-support resource use for Alternative 3 were based on project-specific additions and not on a percentage increase.

E.2.1.1.4 Alternative 4—The NTS site-support activities would be reduced under this alternative. The primary areas of site-support activity reduction would occur in on-site and off-site support. With Environmental Restoration and Waste Management Program activities as the primary focus, a workforce reduction would be anticipated. In reality, this estimate would fluctuate depending on the addition of potential turn-back programs that could be pursued; however, it was assumed that these functions would be run by commercial organizations.

E.2.1.2 Airspace. Airspace is a finite resource that can be defined vertically, horizontally, and temporally for aviation purposes. As such, airspace must be managed and used in a manner that best serves the competing needs of commercial, general, military, and other agency aviation interests. As the primary agency responsible for the management of airspace, the Federal Aviation Administration reviews all airspace user requirements and establishes designated areas based on the degree of protection needed to support these requirements. Rules of flight and air traffic control procedures have been established to govern if and how different segments of the aviation community may operate within each type of designated airspace.

When changes to designated airspace use are planned and/or proposed by the controlling agency, such as increased or reduced operations, mission or flight profile changes, etc., further study is needed to determine if such changes will (1) require modifications to the airspace structure or air traffic control systems/services, or (2) restrict, limit, or impinge in any manner on other aircraft within or adjacent to the airspace under review.

The airspace analysis for this study assesses potential impacts that actions occurring under each of the four alternatives may have on current use of the different airspaces within the region of influence. The region of influence includes the Nevada Test Site, the NAFR Complex (including the Tonopah Test Range), the Las Vegas Class B airspace overlying the Dry Lake and Eldorado Valleys, the Fallon Naval Air Station restricted airspace over the Project Shoal Area in northwestern Nevada, and the uncontrolled airspace over the Central Nevada Test Area. To the extent that data was available, this analysis considered the type and level of activities projected for each alternative and their potential effect on each airspace area. Current and projected use of this airspace by the U.S. Department of Defense (DoD), as part of the NAFR Complex training mission, was also considered. Based on review of cumulative uses under each alternative, a determination was made on the potential impact of these projected uses on each affected airspace area within the region of influence. Any added potentially significant impacts of U.S. Department of Energy/U.S. Department of Defense (DOE/DoD) operations on civil aviation under any one of the alternatives would ultimately require review and action by the Federal Aviation Administration.

E.2.2 Transportation

The methods and assumptions used to analyze transportation risk impacts resulting from the four alternatives are presented in Appendix I, Transportation Study. Analysis results and Nevada route risk comparisons are also presented in the Transportation Study. The following discusses methodologies for on-site and off-site traffic, and transportation of materials and waste.

E.2.2.1 On-Site Traffic. The use-related effects on traffic for the on-site roadway network were assessed by estimating the average number of daily trips generated by each land use, project, or activity for each of DOE's primary programs: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. These trip generation rates were estimated by considering employee distribution, visitors, residents, service vehicles associated with construction, and all other on-site activities for each of the proposed alternatives. An on-site "trip"[1] has both its origin and destination on the NTS, and can be counted as traffic on more than one roadway segment depending on the route traveled. For the purpose of this report, it was assumed that all on-site trips would be uniformly distributed throughout the day, and have an endpoint in Mercury, Nevada. This assumption provides a worst-case situation by focusing the traffic volume on the roadways around Mercury, Nevada. It should be noted that traffic levels on the site would also be subject to many event-related projects and activities which are unique to the NTS.

The on-site traffic analysis used the standard techniques of trip generation, trip distribution, and traffic assignment. The daily trips generated under each alternative were distributed to the areas of the NTS that were most likely to be affected by each of the programs. The traffic was then assigned to the

[1] A "trip" is defined to be a one-way vehicle movement from an origin to a destination; a round-trip would therefore be considered as two trips.

major roadways according to this distribution. To determine how well a section of roadway facilitates vehicular traffic, the operating capacity is generally compared to the volume of traffic carried by the section. The traffic volumes that are used in this report are defined as average daily traffic, the total two-way traffic averaged daily. Traffic effects for the on-site roadways were determined based on a comparison of average daily traffic to the capacity of each key roadway segment on the NTS. Analyses were conducted for each alternative including Alternative 1.

This report presents the estimated number of daily trips that would be generated by each program under each alternative, and provides the deviation from Alternative 1, in order to assess action-related effects on traffic. The contribution by each program to the average daily traffic of each key roadway segment is also provided as an indication of the level of congestion.

E.2.2.2 Off-Site Traffic. The transportation network in the region of influence includes principal road networks leading to the NTS and off-site project locations, with emphasis on the area surrounding each site. Existing travel characteristics for the DOE employees were determined using existing employee survey data, site visits, and existing reports. Historical data on traffic volumes and road capacities were obtained from the Nevada Department of Transportation Annual Traffic Report.

The region of influence includes the access roads and regional highways leading to the NTS, NAFR Complex, Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, and the Solar Enterprise Zones.

The effects on roadway traffic for all alternatives were assessed by estimating the number of trips generated by each program-related activity, considering employees, visitors, residents, and service and delivery vehicles associated with construction and operations. These trips were then assigned to key roadway segments as established in Chapter 4.

The general unit of measure for traffic on a highway is the average daily traffic. Traffic volumes during peak hours better reflect the operating conditions. In general, the thirtieth highest hourly volume of the year is used to represent the daily peak hour and is used for this analysis. On the average, the thirtieth highest hourly volume is about 15 percent of average daily traffic on rural arterials and 8 to 12 percent of average daily traffic in urban areas. On rural highways, when there is unusual or highly seasonal fluctuation in traffic flow and a high percentage of traffic in one direction during the peak hours, the directional distribution of traffic should be considered. This is known as the directional design hourly volume. For example, if the thirtieth highest hourly volume is 15 percent of the average daily traffic, and the directional distribution at that hour is 60:40, the directional design hourly volume is 0.15 x 0.60 x average daily traffic, or 9 percent of the average daily traffic. The key roadway segments analyzed exist in rural and urban areas and generally experience seasonal variations. The Nevada Department of Transportation 1993 Annual Traffic Report (NDOT, 1993) was the source for the thirtieth highest hourly volume used.

The analysis is based on the peak-hour trips, data on roadway capacities, traffic volumes, and standards established by federal, state, and local transportation agencies, and uses the standard analysis techniques of trip generation, trip distribution, and traffic assignment. The vehicle trip generation rate per employee was determined from the number of vehicles observed at the access highway leading to the main entrance to the NTS and correlated to the number of on-site employees. In 1993, the average daily traffic recorded at the main entrance to the NTS was 1,375 vehicles in both directions, or 1,375 vehicle trip ends. During the same period, 2,948 employees worked on site. Therefore, the daily vehicle trip rate was approximately 0.50 vehicle trip ends per on-site employee. This rate accounts for commuters, visitors, trucks, and service vehicles, and it is assumed to remain constant throughout the period of analysis. Typically, the vehicle trip generation rate for office and light industrial land uses is in the range of 3 to 6 vehicle trip ends per employee (ITE, 1991). However, because bus ridership among NTS employees is relatively high (approximately 70 percent of on-site employees use the bus and 30 percent drive their cars or carpool), this rate is only 0.50 vehicle trip ends per on-site employee. This analysis assumes the continuation of the current travel mode choice.

The distribution of trips to and from the site is based on the number and location of access points to the site, the existing travel patterns (mainly for commuters), and the locations of employee residences. It was assumed that the residential choices of project-related employees would correspond to those of the current on-site personnel. The resulting vehicle trips generated by the project during the peak hour analyzed were then added to the peak hour of nonproject-generated traffic (background traffic) projected under Alternative 1. Future traffic volumes on key roadways were projected using previous trends for each segment obtained from available average daily traffic from 1983 to 1993. Currently, NTS employees enter the site from guard station 100 by way of the site access road (State Route 433), which connects U.S. Highway 95 at the Mercury, Nevada interchange. On a daily basis, U.S. Highway 95 east (to the Las Vegas area) carries 98 percent of employee vehicle trips; U.S. Highway 95 west handles the remaining 2 percent (Tetra Tech, Inc., 1995).

Traffic impacts were determined based on level of service changes for each of the key roads analyzed. A summary of average daily vehicle trips generated by each program activity for the years 1996, 2000, and 2005 was generated, and the level of service change was determined. Based on American Association of State Highway and Transportation Officials (AASHTO) 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).

E.2.2.3 Transportation of Materials and Waste. The methods and assumptions used to analyze impacts for transportation of materials and waste resulting from the four alternatives are presented in Appendix I, Transportation Study. Analysis results and Nevada route risk comparisons are also presented in the Transportation Study.

E.2.3 Socioeconomics

A region of influence is defined as the area in which the principal, direct, and secondary socioeconomic effects of site actions are likely to occur and are expected to be of the most consequence for local jurisdictions. The economic activity information presented contains current conditions in a region of influence comprised of Nye and Clark counties, Nevada. This region of influence includes 97 percent of the residential distribution of the employees of the DOE, its contractor personnel, and supporting government agencies. In addition, the region of influence encompasses the probable location of future off-site contractor operations and indirect economic activities.

The regions of influence addressed in this section may vary, as appropriate, from one socioeconomic issue to another. The public finance region of influence includes the cities of Las Vegas and North Las Vegas, the towns of Tonopah and Pahrump, the counties of Clark and Nye, the Clark County School District and the Nye County School District. The pertinent region of influence for different public services also differ. For example, with public education, the region of influence is the Clark County School District and the Nye County School District.

The socioeconomic analysis discusses the potential socioeconomic effects associated with each alternative examined in the NTS EIS. The purpose of the study is to identify and analyze the major socioeconomic issues related to each possible future activity at the sites and to compare the effects of these alternatives with each other. All changes associated with proposed alternatives were considered effects. Alternative 1 was considered equivalent to future baseline conditions without new activities.

Socioeconomic analysis involves two major steps: (1) the characterization and projection of existing social and economic conditions surrounding each of the candidate sites (i.e., the affected environment); and (2) the evaluation of potential changes in socioeconomic conditions that could result from the construction of and operation associated with each alternative.

The description of socioeconomic conditions includes economic indicators (population, civilian labor force, employment, unemployment rate, and income) that provide a basis for comparing regional socioeconomic conditions of the sites with all alternatives. In addition, public finance and public services (public education, police and fire protection, and health) are also described.

The socioeconomic analysis addresses the timing of effects associated with each alternative for future reuses. The analysis covers a period extending 10 fiscal years beyond 1996. Results are usually presented for each alternative for the benchmark years of 1996, 2000, and 2005.

Of particular importance in this analysis are alternative effects, which are the differences of each alternative from Alternative 1. These effects include both direct on-site and indirect secondary effects for each alternative. Direct on-site effects are the changes immediately associated with an alternative, such as employment at a facility. Secondary effects include the indirect and induced changes that may occur either on site or off site. The actual location of secondary effects depends primarily on personal and organizational purchasing choices (i.e., locational decisions). Fiscal effects to local jurisdictions were evaluated based on changes in employment, population, and income and their effects on revenues and expenditures. Effects to key local public services were determined by the change in demand for personnel and facilities arising from project implementation.

The affected environment includes recent socioeconomic trends in Clark and Nye counties. Trends were analyzed for economic activity, population, housing, public finance, and public services. Data were examined for the 1970, 1980, and 1990 census years, as well as the most recent 5-year period for which data were available.

Site-related effects, defined as program-related economic activity, population, housing, public finance, and public services were also discussed. The most recent data were used to determine the trend of site-related effects.

E.2.3.1 Economic Activity, Population, and Housing. A 1994 survey of the NTS worker residential distribution reveals that 90 percent of the workforce lives in Clark County, 7 percent live in Nye County, and the remaining 3 percent reside in other counties or states. Within Clark County, most employees of the DOE/NV reside in the Las Vegas area (DOE, 1994). The Clark and Nye counties' regions of influence were identified based on the distribution of residents for current DOE and contractor personnel working at the sites described in this EIS (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, the county data projections are accomplished separately. Because of the differences 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.

Labor force and employment by place of residence were obtained from the Nevada Employment Security Department. Income data and employment by place of work were obtained from the U.S. Bureau of Economic Analysis Regional Economic Information Systems (DOC, 1992). Historical personal income and per capita income values were converted to constant 1994 dollars using the current U.S. Department of Commerce national income deflator index. Constant dollars are used as a gauge in adjusting the dollars of other years to ascertain actual purchasing power. Historical and current populations for Clark County were obtained from the Center of Business and Economic Research, University of Nevada, Las Vegas (Schwer, 1995). Population figures for Nye County were obtained from the *Baseline Economic and Demographic Projections: 1990-2010 Nye County and Nye County Communities* (Nye County Board of Commissioners, 1993). Baseline housing needs are based on housing unit and population data obtained from the 1990 Census of Population and Housing.

Effects to key local public services are determined by the change in demand for personnel. The ability to accommodate increased demand, or to respond to decreases in demand while maintaining accustomed levels of local public service, is examined based on potential changes in demand for services. Direct effects on public services would arise from changes in levels of employment and corresponding population changes.

Current levels of service discussed in the Public Services section in Chapter 4 were used as standards of service. Potential effects were determined by either the necessary addition or reduction of public service employees needed to serve the alternative-related population increases or decreases.

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.

The future baseline (Alternative 1) 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.

For the Environmental Restoration Program, it was assumed that regulatory requirements would be at the same levels as any Federal National Priority List site, and the most stringent level of analysis and cleanup would be employed. The Remedial Action Cost Engineering and Requirements System, which is used with projects of a similar magnitude and with the same regulatory requirements, shows that salaries for activities to support the remedial investigation/feasibility study phase and remedial design/remedial action range from $120 to $150 per hour. These salaries include other direct costs and more specialized labor categories such as registered chemists. It was assumed that with the size of the sites and their different locations, rental and mobilization costs would be high or the program would require teams to work simultaneously throughout the sites.

Historical trends were determined. Growth projections for Clark County population, labor force, employment, and income were based on projections from the Center of Business and Economic Research, University of Nevada, Las Vegas. The growth projections for Nye County were based on those found in *Baseline Economic and Demographic Projection: 1990-2010 Nye County and Nye County Communities* (1993).

The socioeconomic impact analysis applied total output multipliers for the region of influence, obtained from the U.S. Department of Commerce, Bureau of Economic Analysis Regional Interindustry Multiplier System. These interindustry multipliers were estimated using the United States input/output table in combination with the most recent region-specific information describing the relationship of the regional economy to the national economy. The Regional Interindustry Multiplier System model is based on research by Cartwright et al. (1981). The model includes the following four major components for the analysis:

- A regional interindustry component that produces a regional input/output table and output multipliers for each specified sector of the economy for each economic study area
- A direct-effects component that produces a matrix of final demands (estimated changes in industry and household spending due to project activities) on the basis of direct employment and procurement associated with the alternative
- An employment impact component that calculates regional indirect output, earnings, and employment estimates
- A macroeconomics impact component that calculates regional population impacts on changes in unemployment, the share of the labor force with the necessary skills to take direct project jobs, and the portion of the direct employment that would flow to the region of influence.

Future housing units needed for cities and counties in each region of influence were developed by estimating the household size from the current population and housing unit ratios. The household size-to-population ratios were then applied to the estimated future population trends to obtain the number of housing units needed to accommodate the projected population for the Alternative 1 future baseline.

E.2.3.2 ***Public Finance.*** The financial characteristics of potentially affected local jurisdictions were examined. The local jurisdictions include Clark County, the cities of Las Vegas and North Las Vegas, Clark County School District, Nye County, the towns of Tonopah and Pahrump, and the Nye County School District.

Governmental funds discussed in this EIS are those which fund most governmental functions of the jurisdiction. Governmental fund types include general, special revenues, debt service, and capital projects funds. The general fund accounts are for financial transactions related to revenues and expenditures of services not accounted for in other funds. Special revenues are those funds accounted for in the proceeds of specific revenue sources that are legally restricted for specified purposes. Debt service funds account for the accumulation of resources for, and the payment of, interest and principal on general long-term debt. Capital projects funds are used to account for financial resources for the acquisition or construction of major capital facilities. The fiscal year for all Nevada jurisdictions is the 12-month period from July 1 to June 30.

For many jurisdictions discussed, ad valorem taxes are a major source of revenue. These are taxes which are levied on the assessed valuation of real property. Assessed valuation is a basis for levying real estate taxes. Thirty-five percent of the taxable value of real property is used as the basis for levying property taxes in most Nevada jurisdictions.

The fund balance, as a percentage of current expense, depicts how much reserves would be used if current (due within a year) expenses had to be paid without considering revenues. The lower the percentage, the less is available to pay off current expenses.

Fiscal effects include incremental property tax revenue and associated increases in services. Particular emphasis is placed on changes in revenues and expenditures based on increases and decreases in population, employment, and income. All revenues and expenditures are a combined total of general, special, debt service, and capital project funds.

Generally, the growth or decline of revenues and expenditures experienced in the past five years is expected to continue in the future based on expected population, employment, and income projections. To predict different items in the income statement of each jurisdiction, appropriate methodologies were used depending on the item.

Population levels were used to forecast an item that is generally population-dependent, such as ad valorem taxes. A per capita figure was used based on Fiscal Year 1994. As population levels increased or decreased, the ad valorem taxes reflected this increase or decrease proportionately. Licenses and permits were figured in the same way, using personal income as a benchmark. Employment was used to predict items such as fines and forfeitures.

For some items such as miscellaneous transfers to and from other funds, proceeds from bonds and loans, and transfers to refunding bond escrow agents, a moving average was used. Moving averages are used to compute an average of the most recent data values in a time series. This average is then used as the forecast for each successive period.

For most expenditures, a fixed cost percentage was determined. Regardless of the population increase or decrease, certain fixed costs must be maintained. Variable costs above that percentage are tied to population. The more or less population there is, the greater or fewer corresponding services are required.

With school districts, most revenues and expenditures were correlated with levels of enrollment, which, in turn, corresponded to the population in the particular school district. For the Clark County School District, enrollment was assumed to be 14.74 percent of the population; for the Nye County School District, enrollment was assumed to be 36.91 percent of the population. Both percentages represent the Fiscal Year 1994 enrollment.

Finally, the income statements were tallied, resulting in total revenues and expenditures for Fiscal Year 1995 to Fiscal Year 2005. Projected debt service, current expense, and the fund balance as a percentage of current expense were tallied.

E.2.3.3 Public Services. The key public services examined in this analysis are public education, police and fire protection, and health care. Providers of these services in the region of influence are public school districts, police and fire departments, and hospitals and clinics. Existing conditions for each major public service focus on the providers that are geographically close to the sites and/or maintain the closest relations to the sites. The level of general public service is determined by student-to-teacher ratios at primary and secondary public schools and by the ratio of employees (sworn officers, professional firefighters, and health care personnel) to service population.

Under Nevada law, a single public school district serves each county and is responsible for educating students from kindergarten through twelfth grade. The NTS EIS analysis highlights the Clark County and Nye County School Districts in terms of numbers of students and teachers and the student-to-teacher ratio.

Police protection in the region of influence is provided by the Las Vegas Metropolitan Police Department, North Las Vegas Police Department, and Nye County Sheriff's Office with stations at Tonopah, Pahrump, Beatty, Mercury, and Amargosa Valley. Each provides law enforcement services in conjunction with other law enforcement agencies, including the Nevada Highway Patrol.

No universal standards can be employed to determine proper patrol size considering the duties the patrol force is expected to perform, such as responding to calls for service, conducting preventive patrol, and performing miscellaneous administrative tasks. The amount of time devoted to each of these three broad areas is largely a policy decision that is made locally, based on past experience. Once an acceptable patrol-staffing level has been determined, it is necessary to devise a plan that will provide for the most efficient use of officers' time and the most productive geographic distribution (ICMA, 1982). The NTS EIS describes sworn officer or deputy levels of service per 1,000 population, the number of vehicles, and the number and capacity of holding facilities.

Fire protection for the region of influence is provided by the Clark County Fire Department, Las Vegas Fire Department, North Las Vegas Fire Department, and several volunteer fire departments in Nye County (including Tonopah, Pahrump, Beatty, and Amargosa Valley).

In evaluating the adequacy of fire protection levels in any given area, major consideration must be given to a fire department's ability to handle efficiently any reasonably anticipated workload. This requires an evaluation of the possibility of several simultaneous working fires, weather factors that may contribute to the spread of fire, the delay in response or the possibility of slow operation at the scene, and other demographic or geographic conditions that might affect the frequency of fire occurrence and the response time of initial firefighting units (NFPA, 1986). The NTS EIS discusses the current number of fire stations, level of service per 1,000 population, number of firefighters, and types of equipment.

Health care was analyzed for Clark and Nye counties. Health care levels of service were determined by the number of medical doctors and registered nurses per 1,000 population who are registered to practice in each county.

E.2.4 Geology and Soils

For each alternative being considered, adverse impacts to the geology will be assessed using the systematic approach of (1) identification of credible adverse impacts, (2) identification of factors responsible for these impacts, (3) analysis of the risk (the probability of these factors causing an impact and the consequence of such an impact), and (4) analysis of measures to mitigate determined risk. Potential credible adverse impacts related to the geology of the areas being considered are:

- Contamination of surface deposits
- Contamination of subsurface deposits
- Accelerated erosion

- Accelerated deposition
- Induced seismicity and faulting
- Ground fracturing
- Ground subsidence
- Ground folding
- Ground instability
- Isolation of natural resources
- Exploration for natural resources
- Exploitation of natural resources.

Because the alternatives being considered involve continued use of the areas in a manner more, less, or the same as the present, identification of factors responsible for these impacts was largely through analysis of affected changes associated with past-to-present activities. Impacts under the more-or less-use alternatives were extrapolated. Analyses included review of literature, review of data currently being collected in the many ongoing studies related to geology, and discussions with experts in the field. Risk was analyzed through standard published methodologies. Mitigating measures will be based on the effect of measures taken in the past, in addition to new concepts.

E.2.5 Hydrology

The main source of water is groundwater. Therefore, the methods used to evaluate water resources are presented in the groundwater section. Because the alternatives being considered involve continued use of the areas in a matter more, less, or the same as the present, the factors responsible for impacts were identified largely through analysis of affected changes associated with past-to-present activities. Impacts under Alternatives 2 and 3 were extrapolated. Analyses included review of literature, review of data currently being collected in the many ongoing studies related to hydrology, and discussions with experts in the field. Risk was analyzed through standard published methodologies. Mitigating measures were based on the effect of measures taken in the past, in addition to new concepts.

E.2.5.1 Surface Hydrology. For each alternative being considered, adverse impacts to the surface hydrology were assessed using the systematic approach of (1) identification of credible adverse impacts, (2) identification of factors responsible for these impacts, (3) analysis of the risk (the probability of these factors causing an impact and the consequence of such an impact), and (4) analysis of measures to mitigate determined risk. The potential credible adverse impacts related to the surface hydrology of the areas being considered are:

- Stoppage of surface water flow
- Diversion of surface water flow
- Concentration of surface water flow
- Impoundment of surface water
- Flooding
- Contamination of surface water
- Stoppage or reduction of spring discharge.

E.2.5.2 Water Resources. The potential credible adverse impacts related to the groundwater of the areas being considered are:

- Change in infiltration
- Change in recharge
- Change in the water table
- Change in groundwater flow
- Change in groundwater yield
- Exploration for groundwater
- Exploitation of groundwater
- Contamination of groundwater.

Information needed for impact evaluation was obtained from existing agency files and published data sources. Data were compiled on static and pumping water levels, well and aquifer mechanics, potentially impacted water right owners, environmentally sensitive areas, and documented boundary conditions.

The legal water availability was established through the review of records on file with the Nevada Division of Water Resources. Basin water right abstracts were requested from the Nevada Division of Water Resources and were used to determine the perennial yield, committed water resources, and estimated water use for each hydrographic basin under construction.

Phased water-demand estimates for the Solar Enterprise Zone have already been prepared. For other alternative actions, water demand was either based on conceptual designs or historic water use. For activities for which no water-use estimates are available, independent estimates were through development of a unit resource requirements table. Resource requirement tables were submitted to the DOE for review and concurrence before they were used in impact estimates.

The groundwater resources for a given hydrographic basin were assessed through the use of analytical solutions-solving for the drawdown of hypothetical well fields. Strack's (1989) two-dimensional analytical solutions for steady-state flow were used to calculate discharge potential.

Discharge potentials were computed using Strack's (1989) analytical solutions as they are incorporated into the groundwater flow model, Quickflow (Geraghty and Miller, Inc., 1991). Quickflow uses several of Strack's (1989) solutions to calculate the discharge potential at any given point. Two of these solutions were used in this modeling effort. The first equation modeled discharge potential created as a function of the regional gradient. The second equation modeled discharge potential as a function of stress created by one or more pumped wells. The solutions of the two equations were summed at any given point and then converted to head.

E.2.5.3 Assumptions and Limitations. Several assumptions are inherent in Strack's solutions: aquifers have infinite extent; are homogeneous; isotropic; have a constant thickness with the underlying, completely horizontal, impermeable basement; uniform regional hydraulic gradient; horizontal laminar flow; and are fully penetrated by wells. All of the results for this modeling effort must be qualified by these assumptions. During modeling, these assumptions were translated into the following boundary conditions: regional flow is uniform and unhampered by boundary conditions between and within each basin; recharge from precipitation does not occur; vertical flow does not occur; and leakage between aquifers and aquitards does not occur. The intent of this model is to determine if an idealized version of the most productive formation in each hydrographic basin is capable of sustaining groundwater production under steady-state conditions at rates specified by Nevada's Division of Water Resources State Engineer's Office. It is not to determine the overall groundwater budget for any given basin. Any such attempt would require additional data collection and a much more intensive modeling effort using finite-difference or finite-element models.

The impacts of groundwater withdrawals were estimated through the use of standard hydrologic techniques, specifically the Theis nonequilibrium equation, distance drawdown graphs, and image well analyses. A simple two-dimensional analytical model (King, 1984) was used to perform the calculations, and a standard spreadsheet was used to generate the distance drawdown graphs. Where input data were lacking, reasonable values were selected that led to a reasonable worst-case evaluation and sensitivity analyses were performed to determine a range of impacts rather than a single value.

E.2.6 Biological Resources

Impacts of the DOE activities on biological resources were assessed qualitatively. Because of the large number of projects and sites being evaluated, a systematic method was used to conduct and document this assessment. This process was adapted from Wright and Greene (1987), and was performed by a team of biologists familiar with the biota (local plants and animals) of the affected areas.

Step 1. Identify the Geographic and Temporal Scope of the Evaluation. Biologists first established boundaries to the scope of the evaluation so analyses from all programs and alternatives would be consistent.

Step 2. Identify Potential Impacts of the DOE Activities. The second step taken was to examine project descriptions to determine and categorize the ways that DOE actions might impact biological resources. All phases (e.g., construction, operation, transportation, decommissioning) of each project that would occur over the 10-year timeframe covered by this EIS (1996 to 2005) were evaluated. To ensure that all species were considered and that economically important or rare species and habitats were given special consideration, potential impacts were evaluated on three receptors: habitat, plant, and animal populations (with emphasis given to economics); recreationally important species and candidate species, and individual threatened or endangered species, golden eagles, or migratory birds, and natural springs and their associated biotic communities (the only rare habitat or community in the region). All potential impacts were considered unless they were obviously trivial (e.g., redisturbance of disturbed ground along road shoulders).

Step 3. Classify Significance of Impacts. The third step was to classify the significance of the potential impacts identified in the second step. The following were considered when classifying impacts: direct and indirect effects; cumulative effects; impacts to individuals, populations, communities, and ecosystems; magnitude of the effects (e.g., proportion of the population affected); spatial pattern of effects; duration of effects; probability that effects would occur; human perception of effects; and mitigation possibilities. Impacts were regarded as significant only if they were likely to have substantial, permanent effects on the resource.

To evaluate effects on habitat, the total amount of habitat lost or gained through reclamation of disturbed areas was quantified for each project. To evaluate effects on the other three receptors, the following criteria were established to identify impacts of sufficient significance to warrant discussion in the NTS EIS and the development of mitigation actions. These criteria were defined and used as standards to facilitate comparisons of potential impacts among the many different activities, programs, and alternatives.

Effects on plant and animal populations. An activity was considered to have a significant impact if it was (1) likely to either reduce or increase the viability of any plant or animal population (i.e., the ability of the population to persist through time) or (2) cause a change in the abundance of a plant or animal population that would lead to an increase or decrease in economic or recreational opportunities. The first criterion was chosen to ensure that impacts would be identified and considered if they might increase the risk of extinction of any species, including the most vulnerable of species, such as candidates for listing under the Endangered Species Act. Quantitative population viability analyses were not conducted. The following factors were qualitatively evaluated to determine changes in viability: change in generic diversity, population size and population demographics; changes in size and population demographics; changes in the ecosystem processes required by a species; and barriers to dispersal or other important movements, such as travel to breeding or wintering areas. The second criteria was chosen to ensure that all losses and gains in economic or recreational opportunities would be considered.

Effects on protected species. Individuals of species protected under the Endangered Species Act, Bald Eagle Protection Act, and Migratory Bird Treaty Act received consideration over and above that given to other species. An activity was considered to have a significant negative impact if it was likely to kill or injure protected species. This level was chosen to identify those activities that might result in "take" of the species. Positive effects to these species were considered at the habitat and population scale as defined previously.

Effects on springs. An activity was considered to have a significant impact if it would influence the persistence of springs or their associated biotic communities by causing a change in water quantity or quality or by modifying the ecosystem on which these communities depend. All projects were classified as having one of the following levels of impacts: potential to cause a (1) significant negative impact, (2) nonsignificant negative impact (i.e., having an action identified in Step 2 as potentially impacting biological resources but not meeting the significance criteria identified in Step 3), (3) significant positive impact,

(4) nonsignificant positive impact, or (5) no impact (i.e., having no actions identified in Step 2 that may impact biological resources).

E.2.6.1 List of species names. The common and scientific names of plants and animals mentioned in text and tables of the NTS EIS are provided in Table E-1.

Step 4. Determine if Significant Negative Impacts Could be Mitigated and Propose Mitigation. Biologists attempted to identify mitigation recommendations for each significant negative impact. If mitigation was identified that would reduce the impact to less than significant, the impact was reclassified as a significant negative, but mitigable, impact.

Step 5. Combine Impacts at the Project Level to Facilitate Comparisons Across Alternatives. Following an examination of impacts on a project-by-project basis, the biologists, working as a group, summarized effects of DOE activities across all projects, within each alternative, to facilitate comparisons among alternatives.

E.2.7 Air Quality and Climate

Climatologic and meteorologic information for the region surrounding the NTS was derived from secondary sources. Ambient air quality information for the Nevada Intrastate Air Quality Control Region 147, which contains the NTS, the NAFR Complex, the Project Shoal Area, and the Central Nevada Test Area, were obtained from the State of Nevada Department of Conservation and Natural Resources, Division of Environmental Protection. This information was compared to applicable National Ambient Air Quality Standards and Nevada Ambient Air Quality Standards. With the exception of radionuclides, ambient air quality at the NTS is not currently monitored for criteria pollutants. However, temporary monitoring stations were in operation in August and September of 1990, and results of this monitoring were used to determine an estimated ambient concentration contribution of criteria pollutants from existing sources at the NTS.

Each of the four alternatives was analyzed to discover the potential effects that the five programs and the site-support activities of the NTS may have on regional air quality. In particular, the results of assessments on the impacts of construction and operation of facilities associated with each program in terms of expected pollutant emissions and concentration levels were analyzed. The types of emissions assessed are the criteria pollutants (carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and respirable particulate matter when the particulate diameter is equal to or less than 10 micrometers [PM_{10}]). Volatile organic compounds, which can lead to the formation of ozone, are also assessed. The categories of sources assessed include stationary sources (such as stacks and vents), fugitive sources (such as construction and demolition activities), and mobile sources (such as vehicles) associated with NTS activities. The assessments focus on conditions or impacts, that might result at off-site locations from the release of contaminants from various categories of sources.

The impacts of existing and proposed sources of fugitive dust from construction activities were estimated using the U.S. Environmental Protection Agency (EPA) emission factor of 1.2 tons per acre per month. The particulate matter, PM_{10} was assumed to be 50 percent of the total dust loading. It was also assumed that the application of water reduces PM_{10} emissions by 50 percent. Pollutant emissions resulting from NTS bus fleet operations, NTS fleet light- and heavy-duty vehicles, privately owned vehicles, and heavy-duty commercial vehicles servicing the NTS site facilities were quantitatively predicted using emission factors obtained from the EPA Mobile Source Emission Factor Model, MOBILE 5a. The ambient air quality assessment did not include methods for quantifying impacts related to ozone formation because (1) emissions of volatile organic compounds (which are precursors of ozone formation) are below the significance level designated by the state of Nevada, (2) no simple defined method exists to assess ozone formation potentials, and (3) ozone is not recognized as a problem in the region. The region of influence for this air quality analysis includes Nye and Clark counties, Nevada, where the impacts of the project would likely occur.

E.2.8 Noise

Noise is defined as sound that is undesirable because it interferes with speech communication

Table E-1. Common and scientific names of plants and animals mentioned in text and tables (Page 1 of 4)

Common Name	Scientific Name
Plants	
acacia, catclaw	*Acacia greggii*
baccharis, Emory	*Baccharis emoryi*
bear poppy, golden	*Arctomecon Californica*
blackbrush	*Coleogyne ramosissima*
brome, red	*Bromus rubens*
bursage, white	*Ambrosia dumosa*
budsage	*Artemisia spinescens*
cactus, beavertail, pricklypear	*Opuntia basilaris*
cattail	*Typha spp.*
cheatgrass	*Bromus tectorum*
cheesebush	*Hymenoclea salsola*
cholla Blue Diamond	*Opuatia Whipplei var. Multigeniculata*
creosote bush	*Larrea tridentata*
egg-vetch, Clokey's	*Astragalus oopherus var clokeyanus*
ephedra, green	*Ephedra viridis*
ephedra, Nevada	*Ephedra nevadensis*
filaree, red-stemmed	*Erodium cicutarium*
galleta grass	*Hilaria jamesii*
globemallow, desert	*Sphaeralcea ambigua*
goosefoot	*Chenopodium spp.*
greasewood	*Sarcobatus vermiculatus*
green molly	*Kochia americana*
halogeton	*Halogeton glomeratus*
hopsage	*Grayia spinosa*
horsebrush	*Tetradymia glabrata*
indigo bush, Fremont	*Psorothamnus fremontii*
indigo bush, glandular	*Psorothamnus polyadenius*
juniper, Utah	*Juniperus osteosperma*

Table E-1. Common and scientific names of plants and animals mentioned in text and tables (Page 2 of 4)

Common Name	Scientific Name
menodora, spiny	*Menodora spinescens*
milkvetch, Beatley	*Astagalus beatleyae*
milkvetch, Geyer	*Astragalus geyeri var. triquetrus*
milkvetch, Needle Mountains	*Astragalus eurylobus*
pine, pinyon	*Pinus monophylla*
prince's plume, desert	*Stanleya pinnata*
rabbitbrush, punctate	*Chrysothamnus paniculatus*
ratany, range	*Krameria parvifolia*
ricegrass, Indian	*Oryzophsis hymenoides*
rushes	*Juncus spp.*
sagebrush	*Artemisia spp.*
sagebrush, big	*A. tridentata*
sagebrush, black	*A. nova*
saltbush, four-winged	*Atriplex canescens*
saltcedar	*Tamarix ramosissima*
saltgrass	*Distichlis spicata*
sedges	*Carex spp.*
seep weed	*Suaeda torreyana*
shadscale	*Atriplex confertifolia*
snowberry	*Symphoricarpos spp.*
tansy mustard	*Descurainia spp.*
thistle, Russian	*Salsola tragus*
willow, desert	*Chilopsis linearis*
winterfat	*Ceratoides lanata*
wolfberry	*Lycium andersonii, L. pallidum, and L.*
yucca	*Yucca spp.*
yucca, Mohave	*Yucca schidigera*

Table E-1. Common and scientific names of plants and animals mentioned in text and tables (Page 3 of 4)

Common Name	Scientific Name
Birds	
chukar	*Alectoris chukar*
dove, mourning	*Zenaida macrura*
eagle, bald	*Haliaeetus leucocephalus*
falcon, peregrine	*Falco peregruinus*
flicker, northern	*Colaptes auratus*
hawk, red-tailed	*Buteo jamaicensis*
ibis, white-faced	*Plegadis chihi*
jay, scrub	*Aphelocoma coerulescens*
kingbird, western	*Tyrannus verticalis*
lark, horned	*Eremophila alpestris*
owl, western burrowing	*Athene cunicularia Lypugea*
phoebe, Say's	*Sayornis saya*
plover, mountain	*Charadrius montanus*
quail, Gambel's	*Callipepla gambelii*
raven, common	*Corvus corax*
shrike, loggerhead	*Lanius ludovicianus*
sparrow, black-throated	*Amphispiza bilineata*
sparrow, Brewer's	*Spizella breweri*
Fishes	
dace, Oasis Valley speckled	*Rhinichthys asculus ssp.*
pupfish, Devils Hole	*Cyprinodon diabolis*
Mammals	
bobcat	*Felis rufus*
chipmunk, cliff	*Eutamias dorsalis*
cottontail, desert	*Sylvilagus audubonii*
cottontail, Nuttall's	*S. Nuttallii*
coyote	*Canis latrans*
deer, mule	*Odocoileus hemionus*

Table E-1. Common and scientific names of plants and animals mentioned in text and tables (Page 4 of 4)

Common Name	Scientific Name
fox, kit	*Vulpes velox*
horse, wild	*Equus caballus*
jackrabbit, black-tailed	*Lepus californicus*
kangaroo mouse, dark	*Microdipodops megacephalus*
kangaroo rat, chisel-toothed	*Dipodomys microps*
kangaroo rat, desert	*Dipodomys deserti*
kangaroo rat, Merriam's	*Dipodomys merriami*
lion, mountain	*Felis concolor*
pocket mouse, Great Basin	*Perognathus parvus*
pocket mouse, long tailed	*Perognathus formosus*
pronghorn	*Antilocapra americana*
sheep, bighorn	*Ovis canadensis*
squirrel, white-tailed antelope	*Ammospermophilus leucurus*
woodrat, desert	*Neotoma lepida*
Reptiles	
chuckwalla	*Sauromalus obesus*
gila monster, banded	*Heloderma suspectum cinctum*
lizard, desert horned	*Phrynosoma platyrhinos*
lizard, desert night	*Xantusia vigilis*
lizard, side-blotched	*Uta stansburiana*
lizard, western fence	*Sceloporus occidentalis*
rattlesnake, speckled	*Crotalus mitchellii*
sidewinder	*Crotalus cerastes*
snake, gopher	*Pituophis melanoleucus*
snake, western shovelnose	*Chionactis occipitalis*
toad, Amargosa	*Bufo nelsoni*
tortoise, desert	*Gopherus agassizii*
whipsnake, striped	*Masticophis taeniatus*

and hearing, is intense enough to damage hearing, or is otherwise annoying. The characteristics of sound include parameters such as amplitude, frequency, and duration. Noise levels often change with time; therefore, to compare levels over different time periods, several descriptors were developed that account for time variance. These descriptors are used to assess and correlate the various effects of noise on man, including land-use compatibility, sleep and speech interference, annoyance, hearing loss, and startle effects.

The decibel (DB), a logarithmic unit that accounts for the large variations in amplitude, is the accepted standard unit measurement of sound.

When measuring sound to determine its effects on the human population, A-weighted sound levels (dBA) are typically used to account for the response of the human ear (ANSI/ASME, 1983). Human response to sounds are lowest at low and high frequency levels and greatest in the middle frequency level. A-weighted sound levels represent adjustments to sound levels that are made according to the frequency content of the sound.

The day-night average sound level was developed to evaluate the total community noise environment. The day-night average sound level is the average A-weighted sound level during a 24-hour period with 10 DB added to nighttime levels (between 10 p.m. and 7 a.m.). This adjustment is added to account for the increased sensitivity of nighttime noise events. The day-night average sound level was endorsed by the EPA and is mandated by the U.S. Department of Housing and Urban Development, the Federal Aviation Administration, and the DoD for land-use assessments. The day-night average sound level is sometimes supplemented with the equivalent sound level. The equivalent sound level is the dBA level of a steady-state sound, which has the same dBA sound energy as that contained in the time-varying sound being measured over a specific time period.

The region of influence includes the NTS, portions of the NAFR Complex, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, Coyote Spring Valley, and the regions surrounding these sites. Special attention was paid to sensitive receptors that are near the boundaries of these sites.

The impact analysis section discusses the potential effects of the five programs and site-support activities on noise at all sites and in the surrounding area. Impacts of noise on workers are discussed in the occupational and public health and safety sections.

Because of its large size, 3,496 square kilometers (km^2) (1,350 square miles [mi^2]), noise generated on the NTS site does not propagate offsite at audible levels. The closest sensitive receptors to the site boundary are residences located 1.3 miles to the south in the unincorporated town of Amargosa Valley. Noise generation was estimated for construction and operational activities through the year 2005.

The calculation of noise levels at various distances from construction equipment sources assumed noise levels decreased with distance according to the inverse square law of noise propagation. Noise levels produced by various types of construction equipment at a reference distance of 15 meters (m) (50 feet [ft]) were obtained from the EPA document entitled *Noise Construction Equipment and Operation Building Equipment and Home Appliance* (EPA, 1971).

Railroad and aircraft noise were considered. Infrequent helicopter and small fixed-wing aircraft operations occur on the site. Supersonic aircraft operating from Nellis Air Force Base may overfly the site, producing sonic booms. Subsonic low-level flights may also create significant noise patterns over the site during training exercises.

The Central Nevada Test Area is located in Hot Creek Valley, north of U.S. Highway 6, approximately 129 km (80 mi) east of Tonopah. There are no sensitive receptors close to the site.

E.2.9 Visual Resources

A description of the existing visual resource conditions was prepared based on existing information, field visits, and photographs.

The affected environment visual resources evaluation was based on the U.S. Bureau of Land

Management Visual Resource Management Program. Visual resources include the natural and manmade physical features that give a particular landscape its character and value as an environmental factor. The physical feature categories which form the overall impression a viewer receives of an area include landform, vegetation, water, color, adjacent scenery, scarcity, and manmade (cultural) modification (BLM, 1980). Criteria used in the analysis of visual resources include scenic quality, visual sensitivity, and distance/visibility zones from key public viewpoints.

There are three scenic quality classes. Class A includes areas that combine the most outstanding characteristics of each physical feature category. Class B includes areas in which there is a combination of some outstanding characteristics and some that are fairly common to the region. Class C includes areas in which the characteristics are fairly common to the region.

Visual sensitivity for this analysis was based solely on the volume of travel on public highways, since this provides the only key public viewpoint of the study areas. Volume of travel was obtained from the Nevada Department of Transportation (NDOT, 1993). Study areas that are visible from highways with 3,000 or more average annual daily traffic were assigned a high sensitivity level. Study areas that are visible from highways with 1,000 to 2,999 average annual daily traffic were assigned a medium sensitivity level. Study areas that are visible from highways with average annual daily traffic below 1,000 were assigned a low visual sensitivity level.

Visual quality and sensitivity may be magnified or diminished by the distance or visibility of the landscape from key viewpoints (BLM, 1980). The landscape scene can be divided into three basic distance zones: foreground, from 0 to 0.8 km (0.5 mi); middleground, from 0.8 km (0.5 mi) to 8 km (5 mi); and background or seldom-seen views, from 8 km (5 mi) to infinity. Seldom-seen views also include those portions of the landscape that cannot be seen from a key viewpoint because the viewer's line of sight is blocked by terrain, vegetation, or some other physical feature.

The region of influence chosen for the visual resources analysis includes the NTS, portions of the NAFR Complex, the Tonopah Test Range, the Project Shoal Area, the Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. Of particular consideration are the portions of these sites that can be viewed from key public viewpoints, usually public highways.

An analysis of impacts was conducted to determine the effects of each of the four alternatives on visual resources. Visual impacts were assessed on the potential of each alternative to alter or conflict with the existing landscape character. The significance of visual impacts was determined by assessing scenic quality (Class A = outstanding features, Class B = a mix of outstanding and common features, and Class C = common features); the degree of visual contrast that the proposed project-related activities would create during implementation and operation phases; and whether the activities would be seen from low, medium, or high visually sensitive viewpoints that would be accessible to the public. These viewpoints would include areas such as public roadways, recreation areas, and residential areas. An impact to visual resources would be considered adverse and potentially significant if the combination of scenic quality, contrasts, and sensitivity levels of the viewpoints was unacceptably high. Potential mitigation measures have been identified for significant adverse visual impacts. Land-use sections and Appendix A provide related information regarding proposed facilities and activities that would impact visual resources.

E.2.10 Cultural Resources

This section summarizes the methods of analysis used to provide an assessment of potential impacts to the cultural resources considered in this EIS. Cultural resources generally consist of three types: (1) archaeological sites, (2) historic sites and structures, and (3) American Indian traditional cultural properties. Archaeological and historical sites contain artifacts and/or features that resulted from past human activities on the landscape. These sites are prehistoric, historic, or multicomponent. These categories refer to time. Prehistoric sites were formed before written records and historic sites date to times when written records were kept.

Multicomponent sites have both historic and prehistoric components. American Indian traditional cultural properties can include these sites as well as other areas and materials that are important to American Indians for religious, historical, or cultural reasons. Traditional resources are areas, features, habitats, plants, animals, minerals, or archaeological sites that contemporary American Indians consider valuable for the continuation of their traditional culture and religion. Cultural resources of primary concern include properties that are eligible for or listed on the National Register of Historic Places and are sacred American Indian sites and areas.

Considerable legislation has been enacted over the years which delineate federal agencies' obligations for cultural resources. Those most pertinent to this EIS include, but are not limited to:

- The Antiquities Act of 1906 (Public Law 59-209)
- The National Historic Preservation Act of 1966 (Public Law 89-665 as amended)
- The National Environmental Protection Act of 1969 (Public Law 91-190)
- The Archaeological and Historic Preservation Act of 1974 (Public Law 94-291 as amended)
- The American Indian Religious Freedom Act of 1978 (Public Law 95-341)
- The Archaeological Resources Protection Act of 1979 (Public Law 96-95)
- The Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601).

These laws can be divided into three categories. First are the laws which regulate who can conduct archaeological studies and the penalties for people who do not abide by these laws. The Antiquities Act of 1906 was the first law to require that archaeological work on federal land be conducted by professional archaeologists, who are obliged to obtain permits to undertake fieldwork. The law also sanctioned people who conducted illicit undertakings. While this law established a federal policy towards archaeological remains, it was not strong enough to curtail the looting of archaeological sites. The Archaeological Resources Protection Act of 1979 along with its regulations (43 CFR Part 7) instituted a stronger permitting system for archaeological work on federal land, standards for the conduct of archaeological investigations, and established the framework as well as substantial penalties for violation of the law. Therefore, it ensures that only qualified archaeologists will conduct work on federal land and that their work must meet the guidelines provided by the Secretary of the Interior.

Second are the laws which require federal agencies to understand and plan for the effects of their actions on cultural resources. These laws are the National Historic Preservation Act of 1966 (as amended), the National Environmental Policy Act of 1969, and the Archaeological and Historic Preservation Act of 1974. The National Historic Preservation Act is a landmark legislation which requires federal agencies to identify significant resources and mitigate adverse effects to the cultural resources which are eligible to be listed or are listed on the National Register of Historic Places. The National Environmental Policy Act of 1969 requires federal agencies to prepare a detailed statement on the environmental effects of proposed major federal actions that may significantly affect the quality of the human environment. This legislation usually results in the generation of an EIS, which defines the impacts of such planned actions.

Sections 106 and 110 of the National Historic Preservation Act are the main drivers. Section 106 requires agencies to establish procedures for identifying cultural resources, evaluate their significance based on National Register of Historic Places criteria, assess effects, preserve or mitigate affected National Register of Historic Places or National Register of Historic Places-eligible resources, and coordinate and consult with the State Historic Preservation Office and the Advisory Council on Historic Preservation. Section 110, on the other hand, is intended to ensure that historic preservation is fully integrated into the ongoing programs and missions of federal agencies. The Archaeological and Historic Preservation Act of 1974 followed the National Historic Preservation

Act with similar requirements and has a specific focus on projects related to dam construction.

Third are the laws which are directed toward ensuring the rights of American Indians. The American Indian Religious Freedom Act protects the rights of American Indians to practice traditional religions. It ensures the right to access sites, to use and possess sacred objects, and to initiate ceremonials and traditional rites. The Native American Grave Protection and Repatriation Act responded to concerns of American Indians regarding the custody and disposition of American Indian remains and American Indian cultural objects. This Act requires federal agencies and museums to prepare inventories and summaries of various kinds of cultural materials in order to initiate a repatriation process. Items affected by the Act include human remains and associated funerary objects, sacred objects, and objects of cultural patrimony.

The DOE has conducted surveys for the identification of cultural resources on a sustained basis since 1978 with the recording of over 2,000 sites in the area under its jurisdiction. Since 1988, the DOE has consulted with concerned American Indians in an effort to determine cultural resources that they believe are important. These consultations involve members from 17 different groups, representing three federally recognized tribes. These include the Southern Paiute, the Western Shoshone, and the Owens Valley Paiute whose membership encompasses parts of Nevada, California, Utah, and Arizona. These groups were identified as having prehistoric or historic ties to lands within and in the vicinity of the NTS. Consultations resulted in the publication of two documents that focus on the Yucca Mountain Site Characterization Project area (Stoffle et al., 1990) and on Pahute and Rainier Mesas (Stoffle et al., 1994). The DOE currently is in the process of conducting consultations with American Indians regarding the Native American Grave Protection and Repatriation Act.

The data used to compile information on these resources were obtained from the database which the Desert Research Institute maintains for the DOE. This database contains a complete set of files, maps, and computerized information which summarizes all of the work completed on the NTS since 1978. This is the most complete set of documentation in existence for the NTS, and was consulted for each hydrographic region within the DOE jurisdiction. These files document areas that have been surveyed and list the number and location of sites discovered during each survey. They also identify areas where no sites were located during archaeological survey and therefore may have a lower archaeological sensitivity.

For those areas outside of the DOE jurisdiction, a Class I literature review was conducted at the Harry Reid Center and Marjorie Barrick Museum of Natural History at the University of Nevada, Las Vegas. A Class I review involves a professional study of existing data that includes a compilation, analysis, and interpretation of all available archaeological, historic, and paleoenvironmental data (BLM, 1990). The Harry Reid Center is the official state repository for site records, reports, and maps that document cultural resources found in Clark, Lincoln, Nye, and Esmeralda counties. This review involved examination of all records pertinent to identification of previously recorded cultural resources. These records provide locations of previous surveys, identify negative surveys, and characterize archaeological sites recorded for each area. Additional information was obtained from published sources.

Consultations with American Indians are an integral part of the NTS EIS process. All 17 tribal groups have been consulted, and their concerns and comments are included in this document. This information was obtained through ethnographic work, as well as meetings and discussions between the DOE and the tribal representatives.

This EIS contains the most up-to-date information on the importance of cultural resources within the areas addressed by the NTS EIS. Cultural resources site data were compiled based on existing records and summarized by site type and eligibility for the National Register of Historic Places as determined through consultation with the State Historic Preservation Officer (SHPO). Cultural resources recorded prior to 1980 have not been formally evaluated through SHPO consultation. The eligibility of these sites is based on recommendations of the project archaeologists.

According to the National Register of Historic Places criteria (36 CFR Part 60.4), the quality of significance is present in districts, sites, buildings, structures, and objects that:

- Are associated with events that have made a significant contribution to the broad patterns of history
- Are associated with the lives of persons significant in the past
- Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic value; or represent a significant and distinguishable entity whose components may lack individual distinction
- Have yielded, or may be likely to yield, information important in prehistory or history.

To be listed in or considered eligible for listing in the National Register of Historic Places, a cultural resource must meet at least one of the above criteria and must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. Integrity is defined as the authenticity of a property's historic identity, as evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric occupation or use. If a resource retains the physical characteristics it possessed in the past, it has the capacity to convey information about a culture or people, historic patterns, or architectural or engineering design and technology.

These criteria result in determination of eligibility for listing on the National Register of Historic Places. Applicable research domains in Nevada which establish eligibility for prehistoric sites are defined in documents published by the state of Nevada (Lyneis, 1982) and U.S. Bureau of Land Management (BLM, 1990). Similarly, research domains for historic sites are identified (White et al., 1991).

Compliance with requirements of cultural resource laws and regulations ideally involves four basic steps: (1) identification of cultural resources that could be affected by the proposed action and alternatives, (2) assessment of the impacts or effects of these actions, (3) determination of significance of potential historic properties, and (4) development and implementation of measures to eliminate or reduce adverse impacts. The latter is usually achieved through the establishment of a site-specific data recovery program.

Adverse effects that may occur are those that have a negative impact on characteristics that make a resource eligible for listing on the National Register of Historic Places. Actions that can diminish the integrity, research potential, or other important characteristics of historic property include the following (36 CFR Part 800.9):

- Physical destruction, damage, or alteration of all or part of the property
- Isolating the property from its setting or altering the character of the property's setting when that character contributes to the property's qualification of the National Register of Historic Places
- Introduction of visual or auditory elements that are out of character with the property or that alter its setting
- Transfer or sale of a federally owned property without adequate condition or restriction regarding its preservation, maintenance, or use
- Neglect of a property, resulting in its deterioration or destruction.

Regulations for implementing Section 106 of the National Historic Preservation Act indicate that the transfer, conveyance, lease, or sale of a historic property are procedurally considered to be adverse effects, thereby ensuring full regulatory consideration in federal project planning and execution. However, effects of a project that would otherwise be found to be adverse may not be considered adverse if one of the following conditions exists:

- When the historic property is of value only for its potential contribution to archaeological, historical, or architectural research, and when such value can be substantially preserved through the conduct of appropriate research, and such research is conducted in accordance with applicable professional standards and guidelines

- When the undertaking is limited to the rehabilitation of buildings and structures and is conducted in a manner that preserves the historical and architectural value of the affected historic property through conformance with the Secretary of Interior's Standards for Rehabilitation and Guidelines for Rehabilitation of Historic Buildings

- When the undertaking is limited to the transfer, conveyance, lease, or sale of a historic property, and adequate restrictions of conditions are included to ensure preservation of the property's significant features.

This EIS assumes that site-specific cultural resource evaluations will be conducted for future actions. However, for the purposes of this EIS, probable mitigative actions are summarized for both archaeological and architectural manifestations and are based on standard data recovery procedures established for the NTS.

Both direct and indirect adverse impacts are likely to result from current and proposed DOE activities as defined in this EIS. Direct impacts include ground-disturbing activities as well as alterations to existing, potentially significant historic structures. Indirect impacts may result from increased visitation and vehicular traffic within sensitive areas. While most adverse impacts to cultural resources can be negated through avoidance or mitigation, unavoidable impacts will be incurred at sites where contamination levels preclude archaeological survey, testing, or data recovery. Any cultural resources in these areas would be lost to surface and subsurface disturbance during remediation activities. Unavoidable impacts may also be incurred as a result of illegal artifact collecting. Such impacts may be minimized through educational programs involving NTS workers.

Another way that mitigative projects are made includes comparing a typical year's effort with what might likely occur under the alternatives. During Fiscal Year 1994 (October 1993 to September 1994), 42 cultural resource reconnaissance surveys were conducted and more than 67 archaeological sites were recorded as a result. Data recovery plans were generated for three previously recorded sites and one data recovery project was executed. This level of effort is estimated to be typical under Alternative 1. For alternatives involving increased use of the NTS, no matter what that use might be, the level of effort is likely to be much greater than that documented for Fiscal Year 1994. For Alternative 2, the level of effort is estimated to be much less, although some impacts are still anticipated. These estimates cannot always predict the type or number of sites which may be encountered. Therefore, cultural resource survey and site characterization should be a necessary step for planned activities.

E.2.11 Occupational and Public Health and Safety/Radiation

The methods and assumptions used to analyze human health and risk impacts resulting from the four alternatives are presented in Appendix H. Human health and safety analysis results are also presented in this Appendix.

E.2.12 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.

Demographic analysis is the first step in the determination of disproportionately high and adverse human health or environmental effects to low-income and minority populations. This analysis sets the stage for impact analysis.

All program activities described in this EIS are located in Clark, Nye, or Lincoln counties; therefore, the region of influence for Environmental Justice includes these three counties for this sitewide EIS. Census block groups, which are clusters of blocks within the same census tracts, have been delineated for Clark, Nye, and Lincoln counties. Census block groups do not cross county or census tract boundaries and generally contain between 250 and 550 housing units (U.S. Bureau of the Census, 1993).

For the purpose of analysis, low-income populations are individuals living within a census block group whose income is below the poverty level. Households are classified as being below the poverty level if the total family income or unrelated individual income is less than the poverty threshold specified for the applicable family size. For example, the weighted average threshold for a 4-person family is $12,674 for the 1990 census. This reflects the different consumption requirements of families based on their size and composition (U.S. Bureau of the Census, 1994).

The U.S. Bureau of the Census identifies four racial classifications, including (1) white; (2) black; (3) American Indian, Eskimo, or Aleut; and (4) Asian or Pacific Islander. Hispanic is not considered a race by the U.S. Bureau of the Census; it is considered an origin. To determine the number of minorities for each census block group for the purpose of analysis, the white race category, less whites of Hispanic origin, were subtracted from the total census block group population (U.S. Bureau of the Census, 1994).

Within each census block group, percentages are calculated of low-income and minority communities. The denominator used is the tri-county (Clark, Nye, and Lincoln counties) total population of 763,015. To determine whether a census block group percentage is meaningfully larger than other census block group percentages, thresholds (the average absolute deviation from the mean) for low-income and minority communities are determined. To calculate a threshold, the percentage of low-income or minority communities (as compared to the tri-county population) in all census block groups is averaged. The deviation from this mean is determined for each census block group. The absolute value of this deviation is summed for all census block groups and averaged. This becomes the upper and lower limit of the mean. For the purpose of this analysis, the upper limit is the one of interest. If a census block group percentage is larger than the threshold, it is considered a low-income or minority community census block group and is shaded in the figures in Chapter 4.

The mean percentage of minorities in each census block group is 0.07 percent. The deviation from this 0.07 percent is figured for each census block group, the absolute value is determined, and this absolute value for all census block groups is averaged. The absolute value average of the deviation from the mean is 0.06 percent. Therefore, the upper limit for minorities in a census block group is 0.07 percent plus 0.06 percent, or 0.13 percent. Any census block group above 0.13 percent for minorities is considered a minority community.

The same methodology is used for low-income communities. The average of the percentage of low-income population in all census block groups is 0.03 percent. The absolute value average (of the deviation from the mean) is 0.01 percent. Therefore, the upper limit for low-income communities in a census block group is 0.03 percent plus 0.01 percent, or 0.04 percent. Any census block group above 0.04 percent for low-income population is considered a low-income community.

Clark County is subdivided into 318 census block groups. Ninety-one of the census block groups are made up of low-income populations, and 57 census block groups constitute minority communities census block groups. Nye County is divided into 25 census block groups. One census block group has a low-income community above the threshold level percentage, and four census block groups have minority communities above the threshold level percentage. Lincoln County contains eight census block groups. No census block groups in Lincoln County have low-income or minority communities above the threshold level percentages.

Once the locations of areas of low-income and minority communities are determined, the next step is to determine whether the programs discussed in this EIS have disproportionately high and adverse human health or environmental impacts on low-income and minority communities. Environmental Justice analysis involves two types of investigation. One is the determination of significant and adverse impacts. 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 it follows that 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 are 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 cumulative 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 are 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 or low-income populations that appreciably exceeds or are likely to appreciably exceed those of the general population or other appropriate comparison group
- Whether the environmental effects occur in a minority population or low-income population affected by cumulative or multiple adverse exposure from environmental hazards.

To determine where the impacts are located with respect to areas of low-income and minority populations, areas of significant and adverse impacts are in the Chapter 4 census block group maps and placed in the Chapter 5 Environmental Justice analysis section. The resulting maps identify where low-income and minority populations and significant and adverse impacts are located. With a geographic information system, an overlay analysis is performed to determine whether the impacts disproportionately affect low-income and minority populations. Disproportionate has been determined to mean 50 percent or more. In other words, if the overlay analysis determines that a significant adverse impact affects 50 percent or more of the areas of low-income populations or 50 percent or more of the areas of minority populations, then this impact is said to disproportionately affect these groups.

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Appendix F

PROJECT-SPECIFIC ENVIRONMENTAL ANALYSIS

APPENDIX F
PROJECT-SPECIFIC ENVIRONMENTAL ANALYSIS

This project-specific environmental analysis is intended to complete the National Environmental Policy Act requirements for the Big Explosives Experimental Facility. It evaluates the potential environmental, health and safety impacts of Alternative 3, "Expanded Use of the Facility," and Alternative 1, "Continue Current Operations."

F.1 Introduction

Lawrence Livermore National Laboratory and Los Alamos National Laboratory act for the U.S. Department of Energy (DOE) under the aegis of the Nevada Test Site (NTS) Joint Test Organization. These laboratories are involved in bunker certification activities in support of the proposed hydrodynamic and pulse power testing at the Big Explosives Experimental Facility at the NTS. These tests are currently limited to the aboveground detonations of conventional high explosives and munitions with charges up to 3,629 kilograms (kg) (8,000 pounds [lb]) each. Lawrence Livermore National Laboratory and Los Alamos National Laboratory propose to expand the use of this facility to include testing of advanced technologies in support of the DOE Defense Program's stockpile stewardship, counter-proliferation, and work for others efforts. The expanded use of the Big Explosives Experimental Facility would involve large experimental systems and high-explosive charges up to 31,751 kg (70,000 lb) each. Experiments could contain potentially hazardous materials, such as beryllium, depleted uranium, deuterium, and tritium. No experiment that contains special nuclear materials as defined by the Atomic Energy Act of 1954 would be performed at the facility.

Alternative 3 (Expanded Use) and Alternative 1 (Continue Current Operations) and their associated potential impact are addressed in this project-specific environmental analysis. Under Alternative 1, the Big Explosives Experimental Facility would continue to be used for ongoing certification tests and shaped charge research, development, and demonstration activities with high-explosive charges up to 3,629 kg (8,000 lb) each; no beryllium, depleted uranium, deuterium, or tritium would be used.

F.2 Purpose and Need for Action

With the end of the Cold War, the DOE's Defense Program efforts are shifting from the development of new nuclear weapons to the difficult problem of maintaining the safety, reliability, and performance of the enduring stockpile, as well as the challenging task of developing the technologies for rendering safe potentially stolen United States stockpile nuclear weapons, nuclear weapons fielded by proliferant states, and nuclear threats from terrorist organizations. With the moratorium on underground nuclear testing, the Nation is pursuing alternative, science-based approaches to stewarding the enduring stockpile. As the numerically reduced stockpile ages, new issues emerge that are different, and in many ways more challenging than those involved in designing and testing the systems in the first place. Computational tools, appropriate for the initial design of nearly ideal systems, must be improved to address these new challenges. Further, experimental data from a variety of high energy density physics experiments are needed to validate the improved computational models.

The complement to effective stewardship of the United States' enduring stockpile is the ability to safely address the worldwide threat posed by stolen, proliferated, or improvised nuclear devices. Modern United States' nuclear weapons have sophisticated safety features and are small in size compared to nuclear weapons of 50 years ago. Consequently, their disablement is straightforward and certain in most cases. Proliferant countries and terrorist organizations, however, are likely to produce nuclear weapons that are large, unstable and, therefore, difficult to render safe with certainty. The purpose of this DOE action is to develop technologies that provide experimental data for validation of modern computer codes and technologies that could safely neutralize the nuclear weapons that could be produced by proliferant countries and terrorist organizations. The Big Explosives Experimental Facility would fulfill this need by providing a facility for very large explosively powered physics experiments, and the capacity to conduct hydrodynamic testing of proposed render-safe technologies against simulated nuclear devices where large amounts of conventional high explosives might be involved. The facility currently has diagnostic equipment sophisticated enough to provide this scientific data and a sufficient proof of destruct in the absence of underground nuclear testing.

F.3 Description of the Alternatives

Alternative 3, Expanded Use, and Alternative 1, Continue Current Operations, are described in the following sections.

F.3.1 Alternative 3

Alternative 3 would allow for the expanded use of the Big Explosives Experimental Facility to include hydrodynamic testing and pulse power experiments using high-explosive charges up to 31,751 kg (70,000 lb) each. These experiments would contain potentially hazardous materials such as beryllium, depleted uranium, deuterium, and tritium. Such testing would further the technologies required to support the DOE Defense Program's stockpile stewardship, counterproliferation, and work for others efforts. No experiment that contains special nuclear materials (as defined by the Atomic Energy Act of 1954) would be performed at the Big Explosives Experimental Facility.

F.3.1.1 Location. The Big Explosives Experimental Facility is located in north-central Area 4 of Yucca Flat, a site associated with atmospheric nuclear testing and nonexplosive nuclear research at the NTS (Figure F-1). The site contains seven underground structures associated with atmospheric testing, one set of unidentified stanchions that might have been associated with atmospheric testing, the Bare Reactor Experiment Nevada Tower foundations and stanchions, and a "Japanese Village" mock-up. Although these structures were abandoned when aboveground nuclear testing was halted, two of the underground structures, bunkers 4-300 and 4-480, are currently being used as part of the complex.

F.3.1.2 Bunkers 4-300 and 4-480. Bunkers 4-300 and 4-480 are part of the Big Explosives Experimental Facility. The bunkers house modern hydrodiagnostic testing equipment for use during detonations of very large, conventional high-explosive charges and devices (Wobser, 1994). The bunkers have upgraded electrical, lighting, and ventilation systems; optical ports; and electronic control conduits. The facility has the capability to support many of the sophisticated diagnostics techniques needed for the evaluation of hydrodynamic and pulse power experiments containing large amounts of high explosives. The facility is designed and has been modified in full compliance with applicable building codes and DOE orders and requirements (Bevers, 1994).

Bunker 4-480 is designed to contain up to five helium or nitrogen-gas-driven rotating-mirror framing cameras, one (or more) laser-illuminated image-converter camera, one (or more) continuous-rotating-mirror framing camera, one (or more) streaking camera, and one (or more) infrared imaging camera in various combinations. This bunker is equipped with five camera stands and five corresponding optical ports with access to the 20-meter (m) x 20-m (66-foot [ft] x 66-ft) area gravel firing pad. Bunker 4-300 contains three rooms: the control room, the laser room, and the utility room. The control and utility rooms were modified to house the diagnostic and firing control electronics, digitizers, electronic recording equipment, and other electronic equipment necessary for hydrodynamic and pulse power experiments. The laser room was modified to accommodate a pulsed Ruby laser for image-converter camera illumination and a laser for multibeam Fabry-Perot velocimetry. Both bunkers are shown in Figure F-2.

In the future, experiments of larger scale and more complexity may be proposed in support of both the stockpile stewardship and render-safe missions. These experiments would require sophisticated, advanced diagnostic techniques and may involve

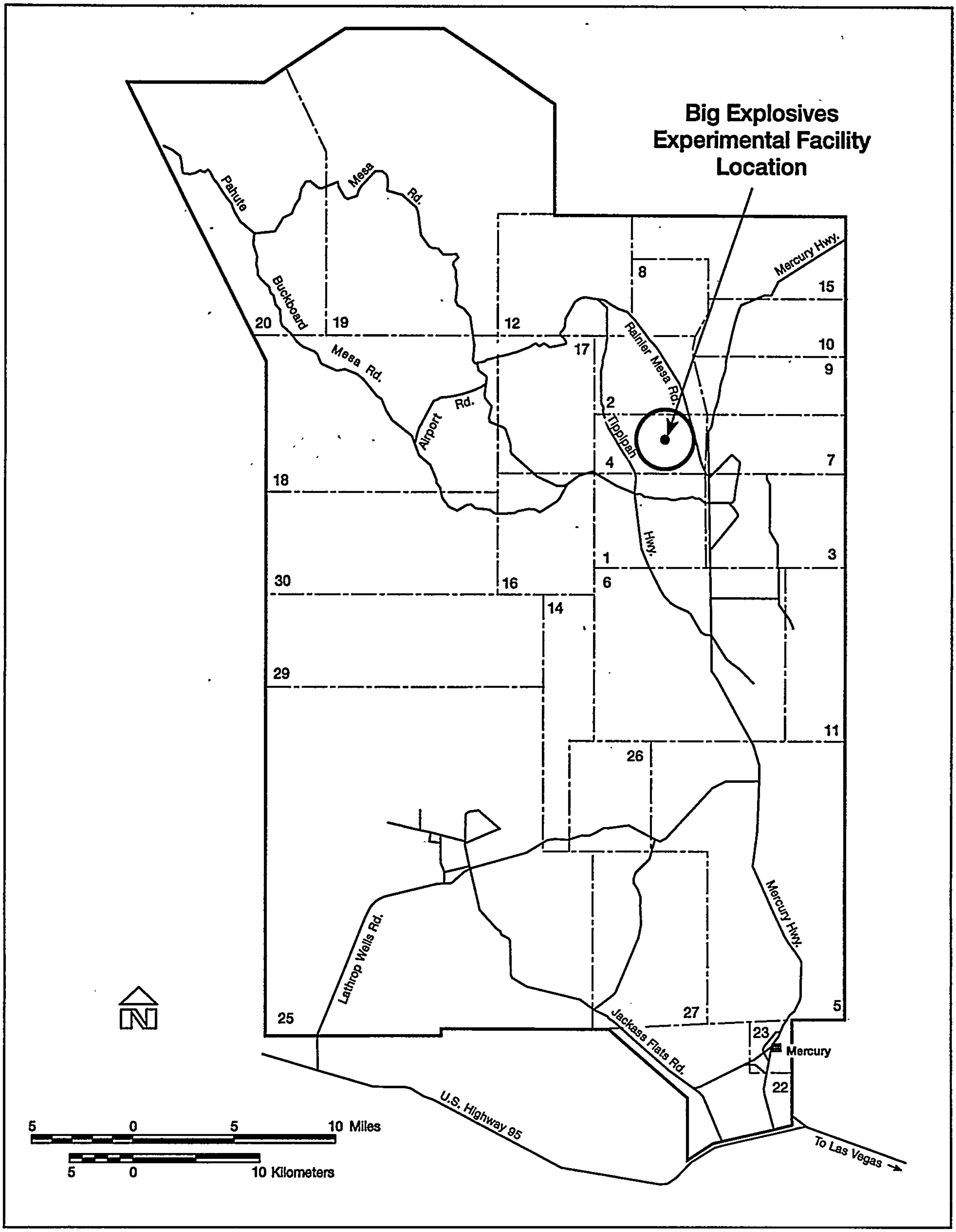

Figure F-1. Location of Area 4 at the NTS showing the Big Explosives Experimental Facility location

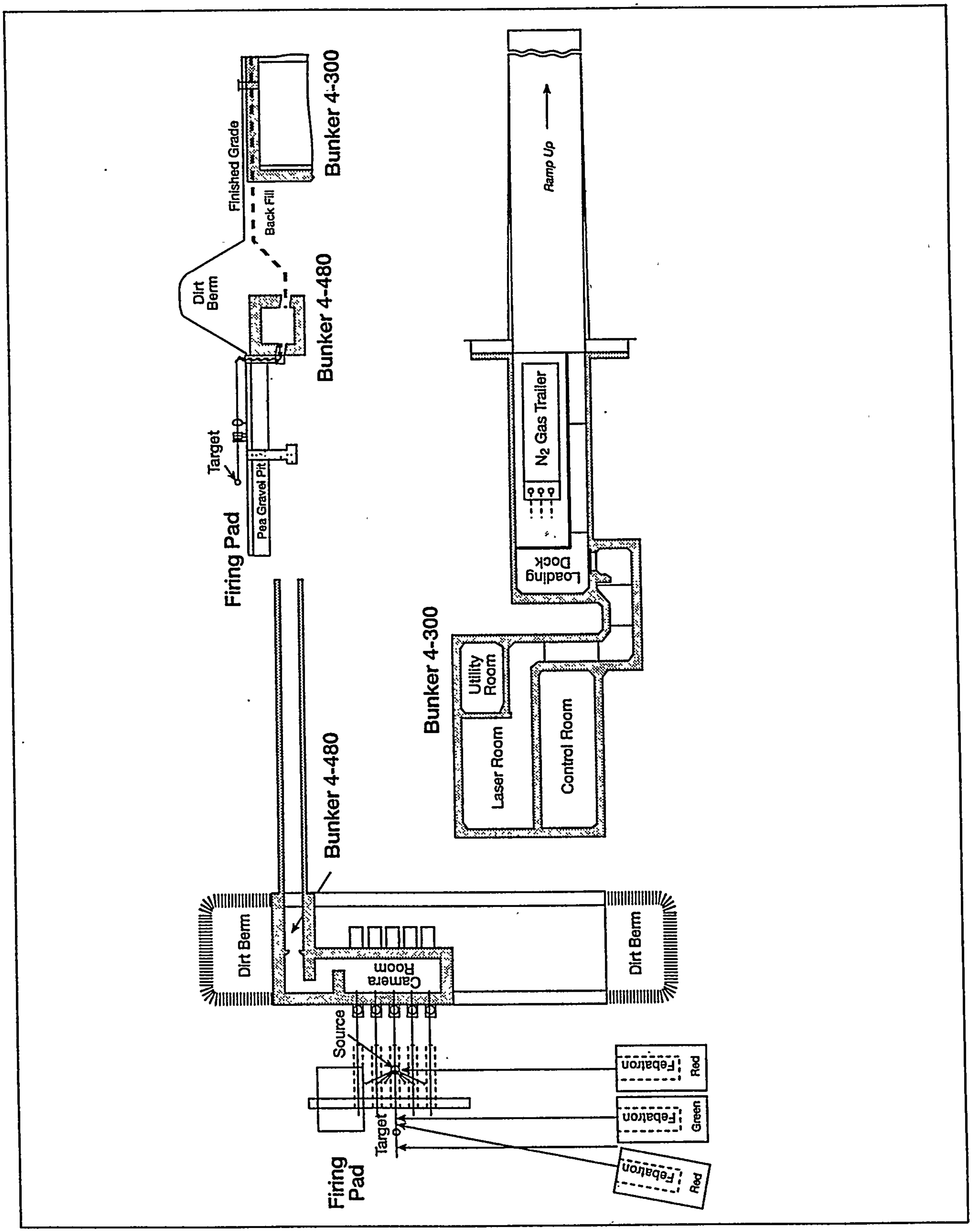

Figure F-2. Layout and orientation of the Big Explosives Experimental Facility, including bunkers 4-480 and 4-300 and firing pad advanced pulse power techniques as well. Specific diagnostic and pulse power equipment may require additional bunker/shelter space near the firing location. Future experiments may also require recording to a large number (several hundred) of electronic and optical data channels; an expanded, suitably sheltered recording station may also be required. Additional shelters and blast-shields may be temporary or permanent and constructed of native soil as earth berms or steel and sandbag structures. Additional bunker space, if needed, would be reinforced concrete construction, buried or earth covered, in a manner virtually identical to bunkers 4-480 and 4-300.

F.3.1.3 Firing Table and Surroundings. The Big Explosives Experimental Facility contains an approximately 20-m x 20-m (66-ft x 66-ft) firing table within the graded area west of the bunkers. The firing table consists of pea gravel 1.8 m (6 ft) to 2.4 m (8 ft) deep. Three large (3 m [10 ft] in diameter and 6-m [20-ft] long) steel cylinders are placed outside the bunkers near the firing pad to house 2.3-million-electron volt Febetron X–ray sources for high-energy X-ray radiography. Hycam recorders and video monitors are placed around the firing area to monitor aboveground activity and the experimental performance of the test devices. The area surrounding the bunkers is graded with new earthen berms that provide blast protection and shield from radiation, and with a downrange projectile stop. The Big Explosives Experimental Facility has a perimeter security fence, approximately 222 m x 480 m (728 ft x 1,575 ft), with a guardhouse to provide security and access control.

F.3.1.4 Operation. Approximately 100 research and diagnostic experiments would be conducted annually at the Big Explosives Experimental Facility. Quantities of high explosives expended in tests would range from 0.5 kg (1 lb) each to 31,751 kg (70,000 lb) each. The firing table configuration may be modified (i.e., extended or deepened) for certain experiments that involve very large high-explosive masses or unusual circumstances. The experiments would continue ongoing hydrodynamic testing and include applications of shaped-charge technology. Advanced technologies would also be pursued. Some of these tests would typically involve some components of beryllium and depleted uranium. Some tests would involve deuterium and or tritium. However, the quantities of these potentially hazardous and radioactive materials would be limited. The maximum quantities of these materials would be 120 kg/yr (265 lb/yr) of beryllium; 1,202 kg/yr (2,650 lb/yr) of depleted uranium; 200 milligram (mg) per year (mg/yr) (4.4 x 10^{-4} lb/yr) of deuterium; and 200 mg/yr (2,000 curies per year [Ci]/yr) of tritium. Tritium would be used in approximately 10 of the 100 tests per year; but no more than 100 mg (1000 Ci) per test would be used.

Table F-1 shows the estimates of annual material usage during Big Explosives Experimental Facility operations. Most of this material would be dispersed in the form of solid debris that either would be recovered after the test or would be deposited in the firing table gravel (which is periodically removed and replaced) (Section F.5.2.5). Because the experiments would be conducted outdoors, the remainder of the material would be, for the most part, dispersed to the environment (primarily as metal or oxides). The materials listed on Table F-1 are, therefore, an indication of what would constitute the maximum annual source terms for waste streams and/or emissions that would likely result from conducting approximately 100 tests per year.

F.3.1.4.1 Pretest and Test Activities—Storage and assembly of high-explosives charges for the Big Explosives Experimental Facility Operations would be provided in Sandia National Laboratories' Warehouse No. 8, located in Zone 2, Area 6 of the NTS (or its equivalent). Warehouse No. 8 is an approved facility for the storage of high-explosive charges used in support of the DOE-laboratory testing activities. The high-explosive device would be assembled at the Baker Site in Area 27, an NTS high-explosive and nuclear assembly area.

High-explosive devices would be transported from Warehouse No. 8 to the Baker Site, and then to the Big Explosives Experimental Facility. Under security guard, high-explosive charges would likely remain on the firing table at the facility until preparations for the experiment were completed and the high explosive was detonated.

Table F-1. Estimated materials usage for the Big Explosives Experimental Facility operations

Material	Estimated usage per year			
	Alternative 1 (Continue Current Operations)[a,b]		Alternative 3 (Expanded Use)[a,b]	
	kg	lb	kg	lb
Barium[c]	0.022	0.044	0.022	0.044
Beryllium[d]	0	0	120	265
Chromium[c,e]	6.9	15.2	6.9	15.2
Cobalt	0.01	0.02	0.01	0.02
Copper[f]	1,200	2,650	7,200	15,900
Fluoride salts	3.6	7.9	3.6	7.9
Lead[c]	4.1	9.0	4.1	9.0
Molybdenum	1,200	2,650	1,200	2,650
Nickel[e]	8.6	19.0	8.6	19.0
Silver[c]	120	265	120	265
Vanadium	3.6	7.9	3.6	7.9
Zinc	0.1	0.2	0.1	0.2
Lithium salts	22.6	49.8	22.6	49.8
Depleted uranium[d,g]	0	0	1,200	2,650
Explosives	226,800	500,000	453,600	1,000,000
Deuterium[d,h]	0	0	0.0002	0.0004
Tritium[d,h]	0	0	0.0002	0.0004
Tantalum	120	265	120	265

[a] Projected usage based on the estimated composition of 100 tests

[b] Only a very small fraction of the weights of the metallic materials and salts listed in this table would be expected to be volatilized as gaseous or aerosol products

[c] These materials are potentially hazardous and their use could lead to the generation of mixed waste when radiological materials are also present. These materials would be used only in those rare instances where suitable replacement materials cannot be found to meet programmatic requirements

[d] Beryllium, depleted uranium, deuterium, and tritium would be present in experiments only under Alternative 3; they would be absent under Alternative 1

[e] Chromium and nickel sources are primarily alloy materials and nickel on test hardware, such as nuts and bolts. Following an experiment, most of this material would be large enough to be retrieved by hand and can be either disposed of in a managed waste stream or recycled

[f] Copper source is partially electrical leads and wire. Most pieces of this material would be large enough to be retrieved by hand following an experiment and can be either disposed of in a managed waste stream or recycled

[g] In rare instances, thorium may be used in place of depleted uranium

[h] This projection is based on an estimated maximum of 10 tests per year.

Transport, handling, and testing of high-explosive devices would be conducted by trained and experienced NTS, Los Alamos National Laboratory, and Lawrence Livermore National Laboratory personnel in accordance with all federal and state regulations, DOE orders, *The DOE Explosives Safety Manual* (DOE, 1991), and the DOE-approved test plans and procedures to ensure safe handling and testing of high-explosive materials.

Nonexplosive support fixtures and apparatus needed for the test assemblies would be assembled at the facility and set up on the firing table. This apparatus often includes heavy foundations or shot stands to support the explosive experiment, armored radiographic film cassettes, heavy-steel momentum-transfer plates, mild-steel and wooden shrapnel shields, glass optical turning mirrors and mounting hardware, expendable capacitor discharge units, high-pressure gas-filled devices, and other special diagnostic equipment. Much of this apparatus is expended in the test. Motor-driven cranes and forklifts may be used to move both the inert apparatus and the explosives, if needed. Strict administrative controls would be applied to restrict personnel movement and location while certain of these set-up operations are conducted.

When other equipment has been readied, the explosives-containing assembly would be brought by truck to the firing table from its assembly point at the Baker Site or from an explosives storage magazine and carefully set in position; only essential personnel would be in attendance. System checks, in the form of "dry runs," would be performed to show that all electrical and mechanical systems had been properly installed and connected and to verify that proper time delays between individual events had been programmed.

When all dry-run testing is complete, the site would be secured. Personnel would be assembled and accounted for ("mustered") within the protected control room (bunker 4-300), and the experiment would be conducted. During testing, the muster control distance for any noninvolved worker could be up to 8,534 m (28,000 ft) from the firing table, depending on the size of the high-explosive charge.

F.3.1.4.2 Post-Test Activities—Experiments would be electronically and optically monitored by the Big Explosives Experimental Facility bunker supervisor and test personnel from the protected control room in bunker 4-300. After an experiment that does not involve radioactive materials, television cameras would survey the firing table for burning debris. Fires would be quenched by a short-duration water washdown or allowed to self-extinguish. When entry to the firing table is permissible, qualified explosives handlers (using breathing protection, if necessary) would reenter. Any smoldering materials or unreacted explosives would be rendered safe so that others could enter. Diagnostics data would be collected, and the firing table would be cleaned in preparation for the next experiment.

Tests involving components containing tritium would be administratively limited to 100 mg (1,000 Ci) tritium each; it is estimated that a maximum of 10 such tests per year would be performed (a maximum of 200 mg [2,000 Ci] of tritium per year). After an experiment, re-entry to the firing table would be delayed until tritium levels were deemed acceptable for re-entry. Re-entry scheduling would also depend on the levels of any other residual radiation, the intensity of which would be monitored during and after an experiment.

F.3.2 Alternative 1

Under Alternative 1, the DOE Defense Program would continue ongoing certification tests and shape charge research, development, and demonstration activities with aboveground detonations of high explosive charges up to 3,629 kg (8,000 lb) each. The facility configuration (Sections F.3.1.1 through 3.1.3), pretest and test activities (Section F.3.1.4.1) and post-test activities (Section F.3.1.4.2) would also apply to Alternative 1, except no beryllium, depleted uranium, deuterium, or tritium would be used. Estimates of annual material usage at the Big Explosives Experimental Facility under Alternative 1 are presented in Table F-1. The DOE would continue to develop render-safe technologies. However, without the use of beryllium, depleted uranium, and tritium to provide realistic threat-nuclear-device and without the ability to develop and test technologies requiring greater than 3,629 kg (8,000 lb) of conventional high explosives, the confidence in the proof of destruct and, therefore, the efficacy of new render-safe technologies might be seriously degraded.

F.4 Description of the Affected Environment

A brief description of the affected environment surrounding the Big Explosives Experimental Facility as it relates to the scope of Alternative 3 is presented in this section. Detailed descriptions can be found in Chapter 4 of this Environmental Impact Statement (EIS).

F.4.1 Topography, Geology, and Soils

Area 4 is located within the northern half of Yucca Flat, an (350-square kilometers [km^2] [135 square mile (mi^2)]) oval-shaped bolson (a basin with no outlet) located in the northeastern corner of the NTS. The area is mostly flat and gently slopes upward from east to west. Average elevation is approximately 1,280 m (4,200 ft). Sediments in this area are mostly alluvial because tributary streams erode the surrounding mountains and deposit sediments in Yucca Flat. The majority of these sediments in this area have been disturbed by human use.

F.4.2 Seismicity

The Big Explosives Experimental Facility is located in a region that has experienced seismic activity within historical times. Yucca Fault in Yucca Flat has been active within the last few thousand to tens of thousands of years.

F.4.3 Climate and Air Quality

Area 4 has a desert climate. Annual mean precipitation is approximately 152 millimeters (mm) (6 inches [in.]), most of which falls between October and April during major winter storms. Strong, persistent winds are characteristic of the site. In Yucca Flat, the average annual wind speed is 11 kilometers per hour (kph) (7 miles per hour [mph]). The prevailing wind direction during the winter months is north-northeasterly, and during the summer months is south-southeasterly.

The NTS region is designated as attainment for criteria pollutants under the National Ambient Air Quality Standards. Criteria pollutants include carbon monoxide, lead, oxides of nitrogen, ozone, particulate matter 10 microns or smaller (PM_{10}), and oxides of sulfur. Fugitive dust (PM_{10}) generated from the various programmatic construction activities at NTS includes 1,422 tons/yr from Defense Program activities, 4 tons/yr from waste management activities, 219 tons/yr from environmental restoration activities, and 180 tons/yr from site support activities. The total Nye County fugitive dust emissions are 866,400 tons/yr.

The NTS criteria pollutant emissions from mobile sources include 240 tons/yr carbon monoxide, 33 tons/yr volatile organic compounds, and 43 tons/yr nitrogen oxides. The Nye County criteria pollutant emissions from mobile sources include 571 tons/yr carbon monoxide, 82 tons/yr volatile organic compounds, and 135 tons/yr nitrogen oxides.

F.4.4 Hazardous Air Pollutants

Toxic air contaminants are subject to the National Emission Standards for Hazardous Air Pollutants. National Emission Standards for Hazardous Air Pollutants standards pertaining to operations at the Big Explosives Experimental Facility are those for beryllium and radionuclides.

Using the 1993 data for release of radionuclides from NTS operations, the maximum boundary dose to a hypothetical individual who remains continuously during the year at the NTS boundary located 60 km (37 mi) south-southeast of Area 12 tunnel ponds would have an effective dose equivalent of 4.8×10^{-3} millirem (mrem). This is below the National Emission Standards for Hazardous Air Pollutants standard of 10 mrem per year, and well below the natural background radiation to individuals of 382 mrem per year.

F.4.5 Surface and Groundwater Hydrology

No surface sources of water exist at the site. The depth to the water table under Yucca Flat is approximately 366 m (1,200 ft) (see Chapter 4, Section 4.1.5 of the NTS EIS). The Big Explosives

Experimental Facility firing table gravel is periodically removed and replaced (Section F.5.2.5); the percolation of metal residue to groundwater is not expected.

F.4.6 Vegetation

Vegetation of the area is dominated by rabbitbrush, cheatgrass, and other grasses. Desert thorn is an important associate. No plants that have been listed as threatened or endangered are known to occur at the NTS.

F.4.7 Wildlife

Fauna observed in the field is limited to jackrabbits, lizards, and various birds. The area is approximately 26 km (16 mi) north of the desert tortoise habitat (see Section 4.1.6 of this EIS).

F.4.8 Cultural Resources

Bunkers 4-300 and 4-480 are identified as historic structures and are potentially eligible for the National Register of Historic Places because of their association with the atmospheric nuclear testing period at the NTS. Coordination with the State Historic Preservation Officer (SHPO) and an evaluation of potential effects that would result from the modification and operation of the bunkers have been conducted. This evaluation showed that the modifications done on the bunkers and their ongoing operations would not adversely impact the bunkers.

One additional property exists that has been identified as a potential historic structure because of its association with the Bare Reactor Experiment Nevada Tower. This property consists of a grouping of three wood-frame structures and is referred to as the "Japanese Village." The village is located approximately 676 m (2,218 ft) east of the bunkers along Road 4-04. These structures have experienced severe weather-related deterioration; however, they have been hardened with steel structural plates to withstand a peak over-pressure of 70 g/cm^2 (1 $lb/in.^2$). The tower has since been relocated to Area 25 of the NTS. Further details concerning the cultural, archaeological, and biological resources of the site are provided by Johnson et al. (1994).

F.4.9 Floodplains and Wetlands

No floodplains or wetlands exist within or near the Big Explosives Experimental Facility.

F.4.10 Noise

Existing chronic noise sources at or near the Big Explosives Experimental Facility include vehicular traffic, heating, ventilating, and air conditioning equipment. Acute sources are limited to explosives testing (up to 140 decibels [dB] at the bunkers). Background noise levels are generally low, ranging from 50 dB to 70 dB.

F.5 Potential Effects of Alternative 1 and Alternative 3

In the sections that follow, the environmental impacts of Alternative 1 and Alternative 3 are described and compared.

F.5.1 Alternative 1

Under Alternative 1, the Big Explosives Experimental Facility would continue to be used for certification tests and shaped-charge research, development, and demonstration activities with high-explosive charges up to 3,629 kg (8,000 lb) each. A total of 100 shots per year would consume approximately 226,796 kg (500,000 lb) of high explosives. No beryllium, depleted uranium, deuterium, or tritium would be used. There would be no increased levels of generation of low-level or mixed wastes. Because Alternative 1 represents the levels of current ongoing operations, the facility would not contribute any incremental emissions or waste generation. The DOE would continue its present level of ongoing missions to support development of render-safe technologies.

F.5.2 Alternative 3

The following section describes the potential environmental impacts that would occur under Alternative 3. These impacts have been included in determining the cumulative impacts associated with Alternative 3.

F.5.2.1 Construction-Related Effects. Potential construction-related impacts associated with modification of the firing table and construction of bunkers would include increased fugitive dust, noise, and temporary on-site traffic disruptions from the use of earth-moving equipment. Fugitive dust emissions would be mitigated by spraying water on the roads and on the exposed piles of excavated soils. Workers would wear appropriate ear protection to reduce noise impacts. Traffic disruptions would be kept to a minimum by limiting other nonconstruction-related activities. The area within the perimeter of the Big Explosives Experimental Facility has previously been disturbed, and there are no foreseeable cultural or natural resources that would be impacted by the construction activities.

F.5.2.2 Noise and High-Explosive Weight Limits. Meteorological conditions at the Big Explosives Experimental Facility are monitored before each test so that noise levels can be projected and a minimum "stay-out" zone surrounding the firing table for safe operation can be determined. On previous tests performed at the facility, noise levels were monitored for each detonation at stations placed at various distances from the high-explosive charges and at stations within the bunkers (Bevers, 1994). The results of these noise-monitoring activities demonstrated that noise levels from explosives testing for up to 3,538 kg (7,800 lb) of trinitrotoluene (TNT) placed 8 m (27 ft) from bunker 4-480 did not exceed 140-dB within bunker 4-300, which would be manned during normal operations. The 140-dB limit has been adopted by the U.S. Department of Defense Explosives Safety Board *(Air Force Design Manual)* and is also an Occupational Safety and Health Administration limit. Traffic and NTS personnel would be prevented from entering within a radius between 500 m and 8,534 m (1,640 ft and 28,000 ft) from the high-explosive charges; the size and predicted noise levels of the test would determine the radius of exclusion.

All explosive experimental testing at the Big Explosives Experimental Facility would be carried out on the 20-m x 20-m x 1.8-m to 2.4-m (66-ft x 66-ft x 6-ft to 8-ft) deep gravel firing table in order to minimize dust uplift, dispersal of soil contaminants, and coupling of ground shocks to the surrounding structures. A 31,751 kg (70,000 lb) high-explosive detonation could form a crater 15 m (50 ft) in diameter and 3 m (10 ft) in depth. Therefore, the firing table would be modified (extended beyond 20 m [66 ft] from bunker 4-480) so that detonation of this size would not penetrate ground soils.

Additionally, high-explosive charge-weight versus distance limits would be established for safe, manned operation of the facility. Testing of a given high-explosive charge size and configuration would be performed while keeping the blast over-pressure, ground shock, and noise levels well within the envelope of the facility design criteria. Within a large margin of safety, the facility is designed to withstand the effects of 454 kg (1,000 lb) of high-explosives detonated 4.6 m (15 ft) from the outer wall of bunker 4-480, or 2,268 kg (5,000 lb) of high explosive detonated 8.2 m (27 ft) from the outer wall of bunker 4-480. Based on standard engineering principles, these design criteria, and the size of the firing table, an effective upper limit can be determined for the size of the high-explosive charge that could be detonated at the Big Explosives Experimental Facility. If the maximum distance from the outer wall of bunker 4-480 to the end of the gravel firing table is 20 m (65 ft), then the largest high-explosive charge that could be detonated at the Big Explosives Experimental Facility in its present configuration would be 31,751 kg (70,000 lb).

F.5.2.3 Air Emissions. Air emissions from the Big Explosives Experimental Facility were estimated based on material usage data (Table F-1), the total quantities of high explosives detonated, and applicable emission factors. Most of these materials would be dispersed as solid debris that could be recovered after the test or would be deposited in firing table gravel. Because the experiments would be conducted outdoors, some fraction of these materials would be dispersed to the environment as metal or oxides. Detonation products of the high explosives and high-explosive binders, however, would be dispersed to the air.

These projected emissions of high-explosive detonation products are presented in Table F-2. These emissions from the Big Explosives Experimental Facility are small when compared to the overall NTS and Nye County emission levels. In order to estimate a percentage increase from ongoing NTS and Nye County emissions due to the expanded Big Explosives Experimental Facility operations, it was assumed that Alternative 1 represents no increase above current levels of emissions (those from ongoing NTS operations). Therefore, increase in air emissions under the expanded use would be the difference between columns 2 and 4 of Table F-2. For example, incremental carbon monoxide emissions would be the difference between 3,311 kg/yr (7,300 lb/yr) and 1,678 kg/yr (3,700 lb/yr), or 1,633 kg/yr (3,600 lb/yr). This incremental increase in carbon monoxide emissions (due to proposed facility operations) of 1,633 kg/yr (3,600 lb/yr) is small compared to the NTS carbon monoxide emissions of 217,724 kg/yr (480,000 lb/yr) and Nye County carbon monoxide emissions of 517,095 kg/yr (1,140,000 lb/yr). Therefore, Alternative 3 represents less than an approximate 1-percent increase in NTS carbon monoxide emissions and an approximate 0.3-percent increase in Nye County carbon monoxide emission levels. Similarly, the incremental 1,633 kg/yr (3,600 lb/yr) volatile organic compound emissions represents a 7-percent increase in NTS volatile organic compound emissions and a 3-percent increase in Nye County emission levels. The carbon dust and soot increment of 1,451 kg/yr (3,200 lb/yr) would be small compared to the NTS and Nye County emissions of fugitive dust of approximately 1,825 tons/yr and 866,400 tons/yr, respectively. Hence, the expected emissions from proposed activities in the facility would represent a minor increase in air emission levels from the NTS site. Beryllium and radionuclide emissions are subject to National Emission Standards for Hazardous Air Pollutants standards. Most of the beryllium would be contained within the firing table as metal or oxide. Most of the depleted uranium, however, would be volatilized as metal oxide. It is conservatively estimated that the depleted uranium peak concentrations after a detonation would be 2.5×10^{-4} micrograms per cubic meter ($\mu g/m^3$) (1×10^{-5} micrograms per cubic foot [$\mu g/ft^3$]). In contrast, the Derived Concentration Guide (a calculated concentration of radionuclides that could be continuously consumed or inhaled and not exceed the DOE primary radiation protection standard to the public of 100-mrem-per-year effective dose equivalent) for depleted uranium is 0.3 $\mu g/m^3$ (0.01 $\mu g/ft^3$).

The radioactive air emission of potentially greatest impact is tritiated water. On approximately 10 tests per year, tritium may be used. On some of these 10 tests, the tritium content may be as high as 100 mg (1,000 Ci). The total tritium usage would be administratively limited to 200 mg (2,000 Ci) per year. It is assumed that, as a worst case, all tritium would be converted to tritiated water. Of the maximum of 1,000 Ci of tritium that could be present on the firing table, 99 mg (990 Ci) (99 percent) is expected to result in tritiated water vapor, and 1 mg (10 Ci) (1 percent) would condense on the steel supports, gravel, equipment, and debris at the firing table. (See Section F.5.2.4 for discussion of exposures to ionizing radiation.) Airborne emissions of radionuclides and hazardous air pollutants would comply with the National Emission Standards and Hazardous Air Pollutants compliance and reporting requirements.

F.5.2.4 Exposure to Radionuclides. Detonations at the Big Explosives Experimental Facility could involve radioactive materials such as tritium, depleted uranium, and, on some tests, thorium. Furthermore, certain test configurations could occasionally generate small quantities of neutrons, which could result in radioactive neutron-activation products. To estimate the radionuclide exposure to the workers and the public, a worst-case scenario was assumed for considering dispersal of the airborne tritium (tritiated water), depleted uranium, and neutron activation products. This scenario is defined by the use of only 2,268 kg (5,000 lb) of high explosives. This amount of high explosives will give the smallest plume height and, therefore, the largest dose closest to the firing point. The high explosive is assumed to be TNT, which is less energetic than many other forms of high explosives and, therefore, produces the least plume rise. It is further assumed that the firing of the high explosives would be done under relatively calm

Table F-2. Estimated air emissions from detonation of high explosives at the Big Explosives Experimental Facility

Material	Estimated emissions[a]			
	Alternative 1 Continue Current Operations		Alternative 3 Expanded Use	
	kg/yr	lb/yr	kg/yr	lb/yr
Carbon monoxide	1,678	3,700	3,311	7,300
Volatile organic compounds	1,633	3,600	3,266	7,200
Nitrogen oxides	998	2,200	1,950	4,300
Fugitive emissions[b]	1,451	3,200	2,903	6,400

[a] Projected air emission dispersals per year is based on the estimated composition of 100 tests/yr

[b] Carbon dust and soot.

wind-speed conditions, which result in less dispersion and higher plume centerline radiological concentration as the detonation cloud moves downwind.

The dose versus downwind distance results from the application of the HOTSPOT code are given in Table F-3. This worst-case scenario gives the maximum potential effects from the airborne radionuclides. All other scenario conditions would yield doses that are less than those given in Table F-3. Based on the collective effective dose equivalent for 10 shots per year for 30 years, the excess cancer fatality rate to the on-site maximally exposed individual would be 1.7 x 10^{-4} (approximately 2 in 10,000 chance of fatal cancer per year over a 30-year exposure). An off-site maximally exposed individual at a distance of 50 km (31 mi) from the Big Explosives Experimental Facility would have an excess cancer fatality rate of 4.6 x 10^{-7} (approximately 5 in 10 million chance of fatal cancer per year over a 30-year exposure).

It is assumed that after each such test, as many as 3 involved facility-area workers would spend 2 to 6 hours per day and up to 2 days at the firing table. To obtain the worst-case potential exposure estimate, it was assumed that 10 Ci of tritium and all activated products would be evenly distributed in an area of 0.5 km (0.31 mi) in radius. The workers would wait until residual radiation levels are safe for reentry (1 to 7 days). Maximum potential exposure to facility-area workers is presented in Table F-4. Based on this analysis, the collective dose to workers at 0 km (0 mi) and workers at a 3.5-km (2.2-mi) distance would result in a probability of excess cancer fatality of 4.3 x 10^{-4} (4 in 10,000 chance of fatal cancer per year over a 30-year exposure). Any airborne dispersal of activated products would be minimal and well below the DOE guideline of 5 rem per year and natural background radiation of 382 mrem per year.

F.5.2.5 Waste Effluents. The proposed action would result in the generation of low-level waste and/or mixed waste. Conservative estimates are that one 36 m^3 (1,280 ft^3) transportainer of shot or test debris and four 2.5 m^3 (90 ft^3) gravel boxes would be generated as low-level waste from each test. This estimate assumes that low-level waste would be generated from all tests, including tests without any radiological components, because of some activation products remaining from previous tests with radionuclides. Mixed waste generation is expected from the proposed action because of the use of hazardous materials and radionuclides listed in Table F-1. Conservative estimates are that 4.5 m^3 (160 ft^3) of mixed waste would be generated from

Table F-3. Potential impacts from maximum potential exposure to tritium emissions

Distance		CEDE[a] (rem/test)[b]	Excess cancer fatalities to an MEI per year[c]
km	mi		
3.5	2.2	7.06×10^{-3}	1.7×10^{-4}
50	31.1	1.53×10^{-5}	4.6×10^{-7}

[a] Collective effective dose equivalent
[b] Rem (roentgen equivalent man)
[c] Based on the DOE dose-to-risk conversion factor of 4×10^{-4} (4 in 10,000) latent cancer fatalities per person-rem for workers and 5×10^{-4} (5 in 10,000) for the general public. Maximally exposed individuals would be on-site workers at 3.5 km (2.2 mi), and members of the public at 50 km (31.1 mi). Calculations assume 10 shots per year and 30-year exposure, and tritium usage of 200 mg/yr (2,000 Ci/yr).

Table F-4. Maximum potential exposure to Big Explosives Experimental Facility-area workers

Distance		CEDE[a] (rem/yr)[b]	Excess cancer fatalities to an MEI[c] per year[d]
km	mi		
0	0	1.08×10^{-2}	2.6×10^{-4}
3.5	2.2	7×10^{-3}	1.7×10^{-4}
Total workers[e]		1.78×10^{-2}	4.3×10^{-4}

[a] Collective effective dose equivalent
[b] Rem (roentgen equivalent man)
[c] Maximally exposed individual
[d] Based on the DOE dose-to-risk conversion factor of 4×10^{-4} (4 in 10,000) latent cancer fatalities per person-rem for workers and 5×10^{-4} (5 in 10,000) for the general public. Assumes maximally exposed individual exposure from 10 shots per year for 30 years
[e] Collective dose to three workers at the firing table (0 km [0 mi]) and workers at 3.5 km (2.2 mi).

each test. Mixed waste generation would be minimized by the use of nonhazardous substitutes for hazardous materials to the extent possible.

Table F-5 shows the amounts of mixed, hazardous, and radioactive waste generated annually from the Big Explosives Experimental Facility operations. The facility data in this table are based on the assumption that 10 tritium tests and 90 nontritium tests would be conducted annually at the Big Explosives Experimental Facility. These amounts of waste generation represent a small increase in the amounts of waste handled by the NTS. Although the amounts of low-level waste and mixed waste generated annually at the NTS are small, the amounts of waste handled by the NTS are large because the NTS receives, stores, and disposes of waste from throughout the DOE complex, as well as from its own operations.

F.5.2.6 *Accident Scenarios.* The reasonably foreseeable accident scenarios that could produce the greatest potential impacts would be (1) accidental detonation from a test with a 31,751-kg (70,000-lb) charge of high explosives at the Big Explosives Experimental Facility firing table and (2) accidental detonation of a high-explosive charge containing up to 100 mg

Table F-5. Comparison of annual Big Explosives Experimental Facility waste-generation rates with NTS waste-handling levels

Waste Type	Solids from Big Explosives Experimental Facility[a]		NTS waste-handling totals (1994) (cubic feet per year)	
	m^3	ft^3	m^3	ft^3
Hazardous waste[b]	0	0	303	10,695
Low-level waste	4,644	164,000	21,312[c]	752,644[c]
Mixed waste	46	1,640[d]	76[e]	2,698[e]
Transuranic waste[f]	0	0	NA[g]	NA[g]

[a] This is an estimate based on 100 shots per year

[b] No hazardous waste generation is anticipated from the Big Explosives Experimental Facility. If any is generated, quantities would be so small as to be an insignificant impact to hazardous waste operations at the NTS

[c] The amount of low-level waste generated at the NTS in 1994 was 91 m^3 (3,208 ft^3). However, the total volume of low-level waste disposal at the NTS in 1994 was 21,313 m^3 (752,644 ft^3). Existing disposal capacity available at the NTS is approximately 283,170 m^3 (1.0×10^7 ft^3)

[d] Mixed waste generation would be minimized by the use of nonhazardous substitutes to hazardous materials, when possible.

[e] Generation of mixed waste at the NTS is minimal. Most of the mixed waste at the NTS is from historical activities that are no longer conducted. Currently, there are 76 m^3 (2,698 ft^3) of stored mixed waste. The remaining capacity of the NTS for mixed waste is 90,614 m^3 (3.2×10^6 ft^3)

[f] No transuranic waste would be generated by Big Explosives Experimental Facility operations

[g] Not applicable.

(1,000 Ci) of tritium. In either case, the involved workers would probably be fatally injured from peak over pressure and debris due to blast effects, but there would be no injury to off-site members or the general public. No damage to current buildings off site or in other areas of the NTS would be expected.

Assuming the noninvolved worker is located approximately 3.5 km (2.2 mi) from the facility, that individual would have a committed effective dose equivalent of 7.0×10^{-3} rem. Hence, either accident scenario would result in a fatality to an involved worker, but there would be minor impacts to the structures and noninvolved workers. This projected radiation dose to the noninvolved worker is still lower than the DOE guideline limits for workers and for the general public; thus, the greatest effect would be fatalities or injuries to workers due to primary blast effects, as noted above.

F.5.2.7 ***Cultural Resources.*** Testing at the Big Explosives Experimental Facility would be done so that the blast over-pressure, shock, and noise would be less than or equal to design criteria for bunkers 4-300 and 4-480 (Section F.5.2.2). Thus, the proposed testing would not adversely impact these bunkers. Additional calculations were done to estimate the potential over-pressure at the Japanese Village remains approximately 683 m (2,240 ft) from the facility. These calculations show that these structures might experience an over-pressure from a blast of 0.024 kg/square centimeter (cm^2) (0.34 lb/square inches [$in.^2$]) for 90 milliseconds. It is unlikely that such a short-duration pulse would have an adverse effect on the remnants of the Japanese Village. Forces from naturally occurring phenomena (e.g., winds) at the NTS could reach speeds that apply equivalent forces. Coordination with the SHPO was conducted to determine the historical value of the properties at the two sites. The remaining structures of the

Japanese Village were strengthened with wood screws and shoring planks. No adverse impacts on these structures are expected from operations of the Big Explosives Experimental Facility.

F.5.2.8 *Natural Resources.* Operations at the Big Explosives Experimental Facility would not impact the groundwater. The firing table gravel is periodically removed and replaced, and any percolation of metal residue to groundwater is not expected. Facility operations would not impact the desert tortoise habitat, located at least 26 km (16 mi) to the south. Also, no impacts are expected to sensitive natural resources because there are no known threatened, endangered, or candidate plant species near the facility.

F.5.2.9 *Cumulative Impacts.* The Big Explosives Experimental Facility operations would result in an approximate 4-percent increase in Nye County carbon monoxide emissions, a 3-percent increase in volatile organic compound emissions, and an approximate 0.002-percent increase in fugitive dust emissions. The cumulative exposure to radionuclides for a hypothetical individual at the site boundary would be 3.1×10^{-2} mrem per year. This would be well below the National Emission Standards and Hazardous Air Pollutants standard of 10 mrem per year, and well below the natural background radiation to individuals of 382 mrem per year. Based on a 30-year exposure at the fenceline, the maximally exposed individual would have a probability of an excess cancer fatality of 4.6×10^{-7} (i.e., the off-site maximally exposed individual would have a 5 in 10 million chance of fatal cancer per year over a 30-year exposure). Wastes generated from facility operations would be small compared to the existing disposal capacities at the NTS.

F.5.2.10 *Conformity.* The proposed expanded use of the Big Explosives Experimental Facility would not result in levels of emissions of precursor organic compounds (carbon monoxide and volatile organic compounds) that would place the facility above Environmental Protection Agency conformity thresholds. The operations would not cause or contribute to any violation of the national Ambient Air Quality Standards. The facility would be operated in conformance with all rules and regulations of the Environmental Protection Agency, which are included as part of the State Implementation Plan.

F.5.2.11 *Environmental Justice.* Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order [EO] 12898), requires that federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs and activities on minority and low-income populations. The DOE is developing official guidance on the implementation of this executive order. However, the analysis in this project-specific environmental analysis indicates that there would be insignificant or no potential for differential or disproportionate impacts from Alternative 3 (or from Alternative 1) to off-site populations that could be characterized as predominantly minority or low income.

F.6 Persons and Agencies Contacted

Consultation and notification of Alternative 3 and its environmental analysis were conducted as part of the NTS EIS National Environmental Policy Act process. Details of consultations can be found in Chapter 8 of this EIS.

F.7 References

REGULATION, ORDER, LAW

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