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

Summary

August 1996

DOE/EIS 0243

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

THE NEVADA TEST SITE

The U.S. Department of Energy (DOE) coordinates and administers the energy functions of the federal government, including the nuclear weapons program, research and development of energy technologies, and basic science research. The Nevada Test Site (NTS) has been the continental location of the U.S. nuclear weapons testing program for over 40 years, because following World War II, a suitable site was needed to conduct nuclear weapons tests. The NTS occupies 3,496 square kilometers (1,350 square miles) in southern Nevada and is located approximately 105 kilometers (65 miles) northwest of Las Vegas.

The DOE also manages several other sites located in central Nevada. The sites include the Tonopah Test Range, Central Nevada Test Area, and Project Shoal Area located southeast of Fallon, Nevada. The Central Nevada Test Area and Project Shoal Area were nuclear underground test sites in the 1970s. The Tonopah Test Range is an active research facility managed by the DOE and operated by Sandia National Laboratories. This facility is jointly used by the DOE and U.S. Air Force.

Most work on the NTS has been and continues to be related to national defense; however, there is growing emphasis on environmental restoration and waste management programs. Current NTS missions are:

- Support the Threshold Test Ban Treaty and the Peaceful Nuclear Explosives Treaty verification mission, and support the ongoing Comprehensive Test Ban Treaty negotiations
- Provide the capability to respond to nuclear emergencies, such as lost or stolen nuclear weapons and special nuclear materials, nuclear bomb threats, and radiation dispersal threats
- Demonstrate the capability to provide alternate energy sources, including solar energy, to meet power needs for the southwestern United States
- Maintain a state of readiness to conduct underground nuclear testing through the conduct of treaty compliance and permitted experiments and activities
- Maintain the nation's stockpile of nuclear weapons in a safe and secure manner, and fulfill other nonproliferation and national security related missions
- Manage wastes generated on the NTS and at other DOE-approved facilities across the United States
- Perform site characterization and environmental restoration activities required to minimize or eliminate the impacts of past operations
- Supervise operations of non-DOE entities performing research and development 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.

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Dear Interested Party

The Final Environmental Impact Statement (EIS) for the Nevada Test Site (NTS) and Off-Site Locations in the State of Nevada has been completed. This Summary is provided to familiarize the reader with the EIS and its content. The entire document is available and may be obtained by calling (702) 295-4652. The EIS examines existing and potential impacts to the environment that have resulted, or could result, from current and future Department of Energy activities in southern Nevada. The EIS analyzes four alternatives for managing the activities of Department of Energy programs at the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex, the Central Nevada Test Area, and the Project Shoal Area. In addition, proposed Solar Enterprise Zone facilities in Dry Lake Valley, Eldorado Valley, Coyote Spring Valley and the NTS are also examined.

The EIS identifies the Preferred Alternative as the Expanded Use Alternative (Alternative 3) plus the public education activities from Alternative 4, Alternate Use of Withdrawn Lands. This Preferred Alternative is the most comprehensive alternative in supporting statutory mission responsibilities while providing for a diversification of use to include nondefense, interagency, public, and private uses of the resources and capabilities available. Details on this preferred alternative can be found in the Summary and in Volume 1, Section 3.6, of this EIS. A framework for a Resource Management Plan is included as Volume 2 of this EIS and represents the development of an ecosystem management-based planning process closely integrated with the National Environmental Policy Act process.

The Department of Energy appreciates your participation in the development of this EIS and looks forward to your continued participation in the development of the Resource Management Plan and other activities of the Department of Energy.

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Acting Manager

Final
Environmental Impact Statement

for
the Nevada Test Site and Off-Site Locations
in the State of Nevada

Summary

U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

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COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy

COOPERATING AGENCIES: Federal: U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, Defense Nuclear Agency, and U.S. Air Force; Local Governments: Nye County, Nevada

TITLE: Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (DOE/EIS-0243)

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ABSTRACT: This sitewide EIS evaluates the potential environmental impacts of four possible land-use alternatives being considered for the Nevada Test Site (NTS), the Tonopah Test Range, and the formerly operated DOE sites in the state of Nevada: the Project Shoal Area, the Central Nevada Test Area, and portions of the Nellis Air Force Range Complex. Three additional sites in Nevada—Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley—are evaluated for colocation of solar energy production facilities. The four alternatives include **Continue Current Operations** (No Action, continue to operate at the level maintained for the past 3 to 5 years); **Discontinue Operations** (discontinue operations and interagency programs); **Expanded Use** (increased use of NTS and its resources to support defense and nondefense programs); and **Alternate Use of Withdrawn Lands** (discontinue all defense-related activities at NTS; continue waste management operations in support of NTS environmental restoration efforts; expand nondefense research). Environmental impacts were assessed for each alternative by analyzing, to the extent possible, the discrete and cumulative environmental impacts associated with Defense Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others Programs. A framework for a Resource Management Plan is included as Volume 2 of this EIS and represents the development of an ecosystem based planning process closely integrated with the National Environmental Policy Act process. This EIS, among other things, analyzed the impacts of transportation of low level waste, and site characterization activities related to the Yucca Mountain Project but did not analyze the suitability of the site as a repository. This EIS does not analyze the suitability of the Yucca Mountain site as a repository as this is an action beyond the scope of the EIS. The **Preferred Alternative** is identified as **Expanded Use** plus the public education activities from **Alternate Use of Withdrawn Lands.** Volume 3 of this EIS contains the public comments and the responses to the comments.

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SUMMARY

Introduction

The U.S. Department of Energy (DOE) proposes to continue managing the Nevada Test Site (NTS) and off-site locations in Nevada and their resources, in a manner that meets evolving DOE missions and responds to the concerns of affected and interested individuals and agencies. The DOE has prepared this Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act of 1969, the Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and the DOE National Environmental Policy Act Implementing Procedures (10 CFR Part 1021).

This Environmental Impact Statement (EIS) analyzes the impacts from DOE programs at the following sites: the NTS, the Tonopah Test Range, portions of the Nellis Air Force Range Complex (NAFR Complex), the Central Nevada Test Area, and the Project Shoal Area. These programs include ongoing activities for the stewardship of the nation's nuclear weapons stockpile, management of radioactive waste, and environmental restoration. Also examined in this EIS are newer programs, such as the proposed Solar Enterprise Zone facility sites at the NTS, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

A key element of DOE's decisionmaking is a thorough understanding of the environmental impacts that may occur during the implementation of a proposed action. This EIS examines existing and potential impacts to the environment that have resulted, or could result, from current and future DOE operations in Nevada during the next 10-year period. The DOE prepared this EIS to assess various management alternatives and to provide the necessary background, data, and analyses to help decisionmakers and the public understand the potential environmental impacts of each alternative considered. This Summary presents a brief overview of these important points from this EIS.

In addition to the NTS EIS, the DOE is preparing several other program-level National Environmental Policy Act documents. Decisions made on these programs may affect the NTS since it is considered as an alternative site for the actions under consideration. These National Environmental Policy Act documents, along with NTS-specific Environmental Assessments, are listed in the information box on page S-5.

No sooner than 30 days after this Final EIS is issued, the DOE will issue a Record of Decision that explains all factors considered in reaching its decision and specifies which alternative or alternatives are considered to be environmentally preferable. If mitigation measures, monitoring, or other conditions are adopted as part of the DOE's decision, these actions will be summarized in the Record of Decision and will be included in a Mitigation Action Plan that will be prepared following the issuance of the Record of Decision. These documents will be made available to interested parties and be placed in public reading rooms.

It is a regulatory requirement of the DOE (10 CFR Part 1021) to review a sitewide EIS of multi-facility sites at least every 5 years. The DOE/NV proposes to accomplish this review in conjunction with the *Resource Management Plan* process. Although a framework for the *Resource Management Plan* is included as Volume 2 of this EIS, the *Resource Management Plan* will take longer to complete than this EIS. In the future, the Plan will be an integral part of the National Environmental Policy Act process on the NTS. The DOE is committed to completing the *Resource Management Plan* within 2 years. The 5-year sitewide review required by DOE policy will utilize the *Resource Management Plan* as part of the review of the NTS EIS and in determining whether (1) the existing NTS EIS remains adequate, or (2) a new NTS EIS should be prepared or the existing NTS EIS supplemented. A more detailed discussion on the relationship between the *Resource Management Plan* and the NTS EIS is presented in the *Framework for the Resource Management Plan* (Volume 2, Section 1.4 of the NTS EIS).

This Final NTS EIS is organized into three volumes. Volume 1 contains the main text of the analysis and the appendices that contain the technical support information. Volume 2 is the framework for a *Resource Management Plan* for the NTS. Volume 3 is the compilation of comments received on the Draft NTS EIS and comment responses.

Public Comment Process on the Draft NTS Environmental Impact Statement

The Draft NTS EIS was developed after a series of public scoping meetings. The scoping process and issues raised during the scoping phase are described in the Final Implementation Plan (DOE/NV, 1995). The Draft NTS EIS was distributed for review and comment to congressional members and committees, the State of Nevada; tribal governments; several county governments, other federal agencies; and the general public. During the 90-day comment period (February 2 to May 3, 1996), the DOE invited comments to correct factual errors or to provide insights on any other matter related to this environmental analysis. Public hearings were held in St. George, Utah; Reno, Pahrump, and Las Vegas, Nevada; and additional workshops were held in Caliente, Tonopah, Boulder City, and North Las Vegas, Nevada during the period March 26 to April 30, 1996. In addition, the public was encouraged to provide comments via mail, fax, e-mail, and telephone (toll-free 800 number).

In response to public feedback critical of the DOE's traditional hearing format, the public hearings and workshops held on the Draft NTS EIS were conducted using various formats selected by representatives of the host community. The formats chosen allowed for a two-way interaction between the DOE and the public; increased public awareness and understanding on project-related impacts discussed in the Draft NTS EIS; and encouraged informed public input and comments on the document. Community facilitators were present at the workshops to direct and clarify discussions and comments.

All public hearing and workshop comments received by mail, fax, e-mail, or telephone during the public comment period are presented in Volume 3 of this EIS, the Public Comment Response Document. Volume 3 describes the public comment process in detail, presents broad issue summaries and responses, and includes copies of all comments received.

The DOE provided the Draft Appendix J, "Classified Supplement: Project-Specific Environmental Impact Analysis (Lyner Complex)," for review by appropriately cleared staff of the Environmental Protection Agency and the State of Nevada. Neither party had any recommendations for changes to the classified supplement.

Summary of Significant Public Comments

A total of 1,784 comments were received from federal, state, and local agencies; members of the public and other stakeholders, and American Indian tribes on the Draft NTS EIS. Although the comments covered a range of topics, most comments can be summarized as falling into 12 issues of broad concern. The following discussions, although not all inclusive, are representative of the majority of comments received during the public comment period.

1. Exclusion of the Yucca Mountain Project: Many comments questioned the exclusion from the NTS EIS of the possible disposal of spent nuclear fuel and high-level radioactive waste in a deep geologic repository at Yucca Mountain. Concern was expressed over the separation of the analysis of DOE actions at Yucca Mountain and the NTS, especially waste disposal and transportation issues. Commentors strongly urged that these impacts be evaluated and included as part of the NTS EIS. Yucca Mountain-related transportation issues included routing and notification of waste shipments.

2. General Anti-Nuclear Sentiments: Many comments expressed a general opposition to nuclear weapons, weapons testing, the generation of electricity by nuclear power, and the land disposal of nuclear waste. Some comments opposed the proposed conduct of subcritical experiments and expressed concern about the relationship between subcritical experiments and the successful completion of

the ongoing negotiations of the Comprehensive Test Ban Treaty. Other comments reflected support for the testing program, for the positive economic benefit to the surrounding rural communities from NTS activities, and for future stockpile activities to be located at the NTS.

3. American Indian Claims to Withdrawn Lands - Ruby Valley Treaty: Many comments referenced the long-standing claims, by the Western Shoshone Indians, to 24 million acres of land in Nevada, including the western half of the NTS. Some comments asserted that these lands should be returned to the Western Shoshone Indians, and that the federal government has no right to use the land for any purpose whatsoever, including those potential uses addressed in the NTS EIS.

4. Use of Lands Withdrawn from the Public Domain: Several comments questioned the inclusion and consideration of potential activities and operations on the NTS that are viewed as inconsistent with the original purpose and use of the withdrawn lands. These comments expressed the concern that because the land withdrawals for the NTS are for the purpose of nuclear testing, other activities such as waste management, the construction and operation of solar power generating facilities, and the defense and heavy industrial facilities described in the NTS EIS are inconsistent with the Public Land Orders.

5. Land Use under Interagency Memorandums of Understanding or Agreements: Some comments asked about the interagency and intra-agency land-use agreements that cover use of lands discussed in the NTS EIS. These comments focus more directly on the interrelationship and significance of the agreements between the Department of Defense and between the DOE/NV and the Yucca Mountain Site Characterization Office. Some comments questioned the authority of the DOE to enter into such agreements; others argued that the DOE cannot authorize the use by other federal agencies of lands under its jurisdiction.

6. Route Selection for Radioactive Waste: Many comments raised issues relating to the transport of radioactive wastes from other DOE facilities and operations to the NTS. These comments range from demands for the DOE to select transportation routes in the NTS EIS to the suggestion that the DOE should contractually obligate selected carriers to specific rest stop locations along specified routes. Transportation comments included requests for additional institutional interaction and communication. State, county, and municipal governments also recommended specific mitigations regarding enhanced communication and training, and provision and maintenance of equipment.

7. Role and Authority of the Resource Management: Several comments requested additional information on the role and authority of the NTS *Resource Management Plan* in shaping the future use of the NTS. Comments included questions on how the *Resource Management Plan* will be developed and the public's ability to provide input in its formulation, challenges to DOE's concept of the principles of "ecosystem management," and suggestions that the *Resource Management Plan* would have little or no authority to protect natural resources on the NTS.

8. Release of Withdrawn Lands: Several comments suggested that all DOE activities and operations at the NTS should cease and the withdrawn lands which comprise the NTS, or portions of the site, should be returned to the state of Nevada, the public, the Western Shoshone, or Bureau of Land Management. Many comments emphasized that environmental restoration should occur prior to release.

9. Perception Based Impacts on Regional Prosperity and Economic Development: Several comments alleged a direct link between the public's perception of activities conducted at, or in relationship to, the NTS and regional prosperity and economic development. These activities included shipment of waste to Nevada and especially through Las Vegas, disposal of radioactive waste, and defense related nuclear activities. Many comments asserted adverse

impacts, such as loss of jobs for Las Vegas and the state of Nevada, while others concluded that beneficial impacts, as the result of economic diversification and increased employment opportunities, were likely.

10. Residual Radioactive Contamination - Source Term: Several comments questioned the accuracy of estimated levels of residual radioactive contamination on the land surface, in the underground environment, and in groundwater resources beneath the NTS. Challenges were raised concerning the methodology and data used to make these estimates, alleging that the low values used resulted in an underestimate of potential risks to public health and safety. Many comments indicated that confidence in the estimates provided in the NTS EIS could be developed if the DOE released classified information on historical nuclear weapons testing.

11. Hydrology and Water: Several comments expressed concern about the impacts of the proposed action on the regional groundwater flow system especially with respect to drinking water supplies in Amargosa Valley and the environmentally sensitive areas of Ash Meadows, Devils Hole, and Death Valley. Other comments requested clarification of water rights issues concerning actions that are not perceived to be within the DOE's mission.

12. Radioactive Waste Shipments and Waste Types: Several commentors noted differences between the radioactive waste volumes and resulting waste shipment estimates presented in the Draft Programmatic Waste Management EIS, the Baseline Environmental Management Report, and those presented in the Draft NTS EIS. Comments noted that these differences in the data also resulted in different risk assessment results. Commentors also questioned the relationship between various terms used to refer to low-level waste in the Draft NTS EIS. Commentors were confused by the terms "greater-than-Class C," "similar to greater-than-Class C," "inappropriate for shallow land disposal," and "special case waste," and questioned whether the Draft NTS EIS had devoted adequate attention to waste represented by these terms. In particular, commentors criticized the Draft NTS EIS for its lack of any mention of special case waste, and the lack of analysis of disposal of greater-than-Class C waste, in view of a recent announcement that the DOE is studying the co-disposal of greater-than-Class C waste with DOE special case waste that is similar to greater-than-Class C waste.

Chapter 1 of Volume 3 summarizes the DOE's responses to these broad issues.

Summary of Significant Changes

Volume 3 of this EIS, the Public Comment Response document, contains copies of the comments on this EIS and the DOE's responses. Below is a summary of changes made in Volumes 1 and 2 as a result of the comments and other considerations cited above[1]:

With regard to the defense program, the rationale for conducting subcritical experiments, as well as the basis for inclusion of subcriticals in the No Action Alternative has been clarified. Information has been added to explain the historical basis for having conducted the tests in the past and to better define the program for the future. The relationship to current Comprehensive Test Ban Treaty negotiations is also clarified. Changes have been made in various sections of Chapters 2, 3, and 4 to clarify the nature of these experiments.

With regard to waste management, the waste volume and shipment numbers have been updated and clarified. Although some numbers have changed in the Final NTS EIS, overall conclusions are not affected. Questions about waste categories and what is disposed of on the NTS have been addressed and clarifying language has been added to the text. Changes have been made in various sections of Chapters 2, 3, 4, and 5 and Appendices A, H, and I of this EIS to clarify numbers used and discussions of the impacts.

Additional information has been provided about the development of the source term and the models used

[1]Sidebar notation indicates a change to the text.

in the evaluation of groundwater contaminant transport. This information has also been referenced in the Human Health Risk Assessment (Appendix H) to better clarify the results of impact assessments in the public environment off the NTS/NAFR Complex controlled lands. These changes have been made in Sections 4.1.4.2 and 4.1.5.2 of this EIS.

Comments regarding the impacts to biological resources have been addressed by adding clarifying information to the text. The recently completed Biological Opinion provided by the U.S. Fish and Wildlife Service has been referenced as well. These changes have been made in the text in various sections of Chapters 5 and 8 of this EIS.

The Consolidated Group of Tribes and Organizations has continued its evaluation of the NTS EIS and development of information pertaining to the DOE activities and conclusions. Appendix G has been revised and additional assessments have been incorporated. These assessments have been added, in italics, to the text of the NTS EIS.

There were many comments on the cumulative impacts assessment. Chapter 6 has been revised to incorporate more information and to better reflect the role of DOE activities as contributing to the overall impacts of the region.

Waste transportation activities and transportation-related issues have been addressed through revisions to the Transportation Study, incorporating the transportation of defense program materials as well as hazardous materials in relation to activities at the NTS. The concerns of the local governments and the public have been addressed as well. American Indian concerns will be identified and addressed through a recently initiated American Indian Transportation Study and continued government-to-government consultation.

Purpose and Need

As a result of the changing mission priorities, the DOE has focused on new national security, energy, and environmental issues challenging the nation, and a redefined role for the NTS within the DOE complex.

Planned, ongoing, or recently completed National Environmental Policy Act actions related to the NTS EIS:

- **Draft Programmatic EIS for Waste Management (August, 1995)**
- **Draft Programmatic EIS for the Stockpile Stewardship and Management (February, 1996)**
- **Draft Programmatic EIS for the Storage and Disposition of Weapons-Usable Fissile Materials (February, 1996)**
- **Draft EIS for the Continued Operations of the Pantex Plant and Associated Storage of Nuclear Weapons Components (March, 1996)**
- **Disposition of Surplus Highly Enriched Uranium Final EIS (June, 1996)**
- **Sitewide EIS for the Los Alamos National Laboratory (in preparation)**
- **Medical Isotopes Production Project: Molybdenum 99 and Related Isotopes Final EIS (May, 1996)**
- **EIS for a Potential Repository at Yucca Mountain, Nevada (proposed)**

Ongoing or recently completed National Environmental Policy Act actions for specific activities at the NTS and surrounding areas:

- **Draft Environmental Assessment for Double Tracks Test Site, Nye County, Nevada**
- **Draft Environmental Assessment for the Liquid Waste Treatment System at the NTS, Nye County, Nevada**
- **Environmental Assessment for the Solid Waste Disposal, NTS, Nye County, Nevada**
- **Environmental Assessment for the Device Assembly Facility Operations, NTS, Nye County, Nevada**
- **Environmental Assessment for the Sewage Lagoon System Area 5, NTS, Nye County, Nevada**
- **Environmental Assessment for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility, Frenchman Flat, NTS (currently called the Spill Test Facility)**

The NTS has a long history of supporting national security objectives through the conduct of underground nuclear tests and other nuclear and non-nuclear activities. In recent years the nuclear testing policies have changed, causing significant changes in NTS programs. Since October 1992, there has been a moratorium on underground nuclear testing. Presently, the primary mission of the DOE at the NTS is to maintain a readiness to conduct tests, and, in an unlikely circumstance, to conduct tests if so directed by the President.

In addition to its primary mission, and because of its favorable environment and infrastructure, the NTS supports DOE national security related research, development and testing programs, and waste management activities. The NTS also provides opportunities for various environmental research projects. The underground nuclear testing moratorium has resulted in the need for the DOE to redefine mission priorities and manage land use at the NTS to support current and future activities mandated by statute, Presidential direction, and Congressional authorization and appropriation.

The DOE manages all of its lands and facilities as valuable national resources with stewardship based on the principles of ecosystem management and sustainable development. This has resulted in the need for a comprehensive plan for the NTS to guide land- and facility-use decisions and integrate mission, economic, ecologic, social, and cultural factors.

Programs Considered

The projects and activities at the NTS are categorized into five programs: Defense, Waste Management, Environmental Restoration, Nondefense Research and Development, and Work for Others. Services such as common utilities, fire protection, and communications for each of these programs are provided through the NTS support services infrastructure. Brief summaries of each program are presented in the following discussion.

Defense Program. The primary mission of the Defense Program is to help ensure the safety and reliability of the nation's nuclear weapons stockpile. Stewardship of the stockpile includes maintaining the readiness and capability to conduct underground nuclear tests, and conducting such tests, if so directed by the President. Other aspects of the program include treaty compliant and permitted conventional high-explosive tests, dynamic experiments, including subcritical experiments and hydrodynamic testing. Although the term "subcritical" is not used in previous EISs for the NTS, some tests or experiments conducted over the past decades as well as the impacts of those tests or experiments, are substantially the same as those contemplated by the new terminology. The term "subcritical experiments," rather than defining a new form of activity, is intended instead to clarify and emphasize the fact that such experiments involving the use of special nuclear material would not achieve the condition of criticality. The nation's nuclear emergency response capability, its ability to respond to nuclear emergency, and search and identification tasks have also been a part of the Defense Program mission of the NTS.

Waste Management Program. The NTS presently serves as a disposal site for low-level waste generated by DOE-approved generators and also as a storage site for a limited amount of transuranic mixed wastes. Managed radioactive waste disposal operations began at the NTS in the early 1960s, and low-level, transuranic, mixed, and classified low-level wastes have been disposed of in selected pits, trenches, landfills, and boreholes on the NTS.

Environmental Restoration Program. The goal of the Environmental Restoration Program is to ensure that risks to human health and safety, and to the environment, posed by inactive and surplus facilities and sites, are either eliminated or reduced to protective levels. Achieving this goal includes characterizing and cleaning up contaminated sites and facilities to minimize the impacts of past activities on the NTS and other DOE locations within Nevada. The Environmental Restoration Program for the NTS and off-site locations under Nevada Operations Office responsibility has been formally established as the Nevada Environmental Restoration Project.

Nondefense Research and Development Program. Historically, the DOE has supported a

variety of research and development activities in cooperation with universities, industry, and other federal agencies. The National Environmental Research Park program, research on the safety aspects of handling hazardous fluids and liquids, and evaluation of solar energy options are examples of this kind of activity.

Work for Others Program. Historically, the DOE has hosted projects by other federal agencies, especially the Department of Defense, that require the large, remote, and secured areas offered by the NTS. These activities include the shared use of certain facilities and resources for co-use of NTS airspace, training exercises, and research and development projects. Support is also provided in the areas of nonproliferation and verification of international treaties.

Alternatives

Four alternatives are evaluated in this Final NTS EIS: (1) Continue Current Operations (No Action Alternative), (2) Discontinue Operations, (3) Expanded Use, and (4) Alternate Use of Withdrawn Lands.

These alternatives have been designed to analyze and compare the potential effects of a wide range of use options. The alternative (development scenario) the DOE ultimately selects, however, may not be one of the alternatives in its entirety, but rather a hybrid created by selecting specific options from among the various alternatives.

As part of the planning process related to each alternative, land-use maps have been developed to illustrate the general zoning that would be implemented for each alternative and the selected activities within the alternative. The land-use maps indicate existing land status to the extent that past or present activities might influence future land use.

Alternative 1 - Continue Current Operations (No Action). The U.S. Department of Energy, Nevada Operations Office (DOE/NV) and interagency programs, activities, and operations in the five mission categories would continue in the same manner and degree as they have during the past 3 to 5 years.

The Environmental Restoration Program would continue in the form of characterization and remediation of contaminated areas and facilities; these activities would continue in the Project Shoal Area, the Central Nevada Test Area, the NAFR Complex, and the Tonopah Test Range. Current institutional controls would remain in force.

Two nuclear testing scenarios for the Defense Program are analyzed under Alternative 1. In the first scenario, the President would not direct any nuclear testing, and the DOE's nuclear testing-related activities would be limited to maintaining a readiness to test. This scenario emphasizes the NTS's science-based stockpile stewardship experiments and operations. These experiments include dynamic experiments and hydrodynamic tests; some of the former involve special nuclear material (so-called "subcritical" experiments). See Volume 1, Section 2.4 for a discussion of these terms. In the second scenario, which the DOE believes unlikely but consistent with the site's historical mission, there is 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 tests in order to achieve a high level of confidence in the safety and reliability of the weapon type in question. These types of stockpile tests would be conducted on Pahute Mesa or on Yucca Flat, which are the only locations considered for future nuclear testing in this EIS. All Defense Program activities at the Tonopah Test Range would continue at the current level of effort. The Work for Others Program and the Nondefense Research and Development Program would continue as it has during the past 3 to 5 years.

Alternative 2 - Discontinue Operations. Under Alternative 2, DOE/NV and interagency programs, activities, and operations at the NTS would be discontinued. Only those environmental monitoring and security functions necessary for human health, safety, and security would be maintained. Control of the NTS would be maintained by the DOE. All facilities would be placed in cold standby after operations have ceased. Defense Program activities associated with stockpile stewardship would continue at the Tonopah Test Range.

Alternative 3 - Expanded Use. The Expanded Use Alternative would include support for ongoing DOE/NV mission categories as described under Alternative 1 and provide for increased use of the NTS and its related resources and capabilities. The NTS and Tonopah Test Range Defense Program activities associated with stockpile stewardship would proceed at an increased level of effort. Waste management activities would be increased to a level consistent with those identified in the centralized alternative for low-level waste and a regionalized alternative for mixed waste of the Draft Waste Management Programmatic EIS. Environmental Restoration projects at all DOE/NV sites would continue and would be accelerated. The NTS would be more available to both public and private institutions for purposes of demonstrating and testing new environmental remediation technologies. Solar Enterprise Zone facilities would be constructed at the NTS and at least at one of the three other sites in southern Nevada: Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. Use of the NTS and Tonopah Test Range airspace and certain lands by the military for training and defense-related research and development would increase as part of the Work for Others Program. Other defense-related projects also would be located at the NTS and the Tonopah Test Range.

Alternative 4 - Alternate Use of Withdrawn Lands. All defense-related activities and most Work for Others Program activities would be discontinued at the NTS except for possible increased use of airspace by the U.S. Air Force. Current radioactive waste management operations would continue, with the restriction that wastes would only be accepted from DOE sites within Nevada. The Environmental Restoration Program would continue at current or accelerated rates at all DOE/NV sites. Certain portions of the NTS could be returned to the public domain and portions of the NTS would be available for purposes of public education and recreation. As in Alternative 3, Solar Enterprise Zone facilities would be constructed at the NTS and at one of the other three southern Nevada sites. The Defense Program associated with stockpile stewardship would continue at the Tonopah Test Range.

Specific projects and activities associated with all four alternatives are presented in Tables S-1 through S-4.

Preferred Alternative. The DOE Preferred Alternative is Alternative 3, Expanded Use, plus the public education activities from Alternative 4. The Expanded Use Alternative represents a continuation of the multi-purpose, multi-program use of the site and further represents a continuation and diversification of the DOE/NV and interagency programs and operations at the NTS. The Expanded Use Alternative includes support for ongoing DOE/NV program categories defined in the Continue Current Operations (No Action Alternative), and also provides for increased use of the NTS and its related resources and capabilities. This alternative would also make the NTS more available to both public and private institutions for purposes of demonstrating new technologies.

Public education activities from Alternative 4 include establishing educational tour routes on the NTS and promoting the concept of creating a nuclear era museum that highlights the NTS testing activities. Tours would allow the public to see firsthand some of the history and impacts of past nuclear testing. These activities would be an important contribution to public understanding of the nation's nuclear testing and Cold War Era history.

Other Projects and Alternatives. Prior to the public scoping period, the DOE determined that a number of projects outside the 5 to 10 year timeframe or potential projects that are not yet sufficiently developed for meaningful review, would not be considered in this EIS. The potential Yucca Mountain repository construction, operation, and closure is an example of such a project.

A number of site management alternatives and options were suggested during public scoping for this Draft NTS EIS. The DOE considered these alternatives and dismissed them as unreasonable for such reasons as taking too long to implement, being prohibitively expensive, being too speculative in

Table S-1. Comparison of Defense Program Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Stockpile Stewardship - Maintain Readiness to Test - Conduct Underground Nuclear Weapons Testing (if directed) - Conduct Dynamic Experiments, including Subcritical Experiments, and Hydrodynamic Tests - Conduct Conventional High-Explosive Testing - Destroy Damaged Nuclear Weapons **Nuclear Emergency Response** - Nuclear Emergency Search Team - Federal Radiological Monitoring and Assessment Center - Aerial Measuring System - Accident Response Group - Radiological Assistance Program - Internal Emergency Management Program **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Discontinue All Activities **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Maintain Readiness to Test - Conduct Underground Nuclear Weapons Testing (if directed) - Conduct Dynamic Experiments, including Subcritical Experiments and Hydrodynamic Tests - Conduct Conventional High-Explosive Testing - Construct Nuclear Weapons Simulators - National Ignition Facility (if selected in Stockpile Stewardship and Management Programmatic EIS) - Destroy Damaged Nuclear Weapons **Stockpile Management** - Store Nuclear Weapons - Disassemble Nuclear Weapons - Assemble Nuclear Weapons - Modify and Maintain Nuclear Weapons - Test Weapons Components for Quality Assurance - Provide Interim Storage of Pits **Nuclear Emergency Response** - Nuclear Emergency Search Team - Federal Radiological Monitoring and Assessment Center - Aerial Measuring System - Accident Response Group - Radiological Assistance Program - Internal Emergency Management Program **Storage and Disposition of Weapons-Usable Fissile Materials** - Store Weapons-Usable Fissile Material - Disposition Weapons-Usable Fissile Material - Construct New or Modify Tunnel Complexes - Increase Robotic Technology Experiment - Construct New or Modify Existing Structures - Heavy Industrial Facility **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests	**Stockpile Stewardship** - Discontinue All Activities **Tonopah Test Range** - Impact Tests - Passive Tests - Chemical Tests

Table S-2. Comparison of Waste Management Program Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Area 3 Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at **Area 5** Disposal - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste - Nevada Generated Mixed Waste - Greater Confinement Waste Storage: - Nevada Generated Mixed Waste - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units **Area 6** Storage Activities: PCB Waste Disposal Activities: Hydrocarbon Landfill **Area 11** Treatment Activities: Explosive Ordnance Disposal Unit	No Activity	**Area 3** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at Construction: - Future Low-Level Waste Disposal Pit - Building 3-302 (expansion) - Area 3 Truck Decon Station **Area 5** Disposal: - Nevada Generated Low-Level Waste - Non-Nevada Generated Low-Level Waste - Nevada Generated Mixed Waste - Greater Confinement Waste Storage: - Nevada Generated Mixed Waste - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Facility Construction Activities: - Breaching and Sampling Facility - Real-Time Radiography - Transuranic Waste Certification Facility - Transuranic Waste Handling and Loading Facility - Mixed Waste Storage Pad - Mixed Waste Disposal Units - Low-Level Waste Disposal Units - Greater Confinement Disposal Units - Hazardous Waste Storage Pad (expansion) - Water Supply Line - Access Control Building - Maintenance Building - 5-01 Road Reconstruction (may not be necessary) - 5-07 Road Reconfiguration (may not be necessary) - 500-Year Flood Protection - Low-Level Waste Storage Facility - Fire Protection Utilities - Telephone System Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units Treatment Facility: - Cotter Concentrate Mixed Waste **Area 6** Storage Activities: - PCB Waste Treatment Activities: - Low-Level Liquid Waste Treatment Facility - Mixed Liquid Waste Treatment Facility Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit	**Area 3** Disposal: - Nevada Generated Low-Level Waste Closure: - Disposal Crater Complex UE3ax/bl - Disposal Crater Complex UE3ah/at **Area 5** Disposal: - Nevada Generated Low-Level Waste Storage: - Transuranic Waste - Mixed Transuranic Waste - Hazardous Waste Closure Activities: - Close Designated Low-Level Waste Disposal Units - Close Designated Mixed Waste Disposal Units - Close Designated Greater Confinement Disposal Units Facility Construction Activities: - Water Supply Line - Access Control Building - Maintenance Building - 5-07 Road Reconfiguration - 500-Year Flood Protection - Fire Protection Utilities - Telephone System Treatment Facility: - Cotter Concentrate Mixed Waste **Area 6** Storage Activities: - PCB Waste Treatment Activities: - Low-Level Liquid Waste Treatment Facility Disposal Activities: - Hydrocarbon Landfill **Area 11** Treatment Activities: - Explosive Ordnance Disposal Unit

Table S-3. Comparison of Environmental Restoration Program Activities for the Alternatives

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Underground Test Area Corrective Action Unit - Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures - Remove Contaminated Soils on NTS and Nellis Lands Dispose of Contaminated Soils in Permitted Facilities Select Alternate Remedial Action Method and Implement **Industrial Sites Corrective Action Unit** - Characterize and Dispose of Environmental Restoration Sites - Continue Field Program to Identify Sites - Dispose of Waste in Approved Facilities - Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites **Decontamination and Decommissioning Facilities** - Continue Remediation Action and Planning **Defense Nuclear Agency Sites** Continue Operations to Stop Contaminant Migration Characterize and Remediate Contaminated Muck Piles and Ponds - Select and Implement Alternate Remedial Action or Redesign **Tonopah Test Range** - Continue Characterization and Remediation **Central Nevada Test Area** Continue Characterization and Remediation **Project Shoal Area** Continue Characterization and Remediation	No Activity	**Underground Test Area Corrective Action Unit** - Continue Groundwater Monitoring - Continue Drilling Characterization Wells Evaluate and Implement Remediation Strategies - Intensify Groundwater Monitoring Accelerate, Evaluate, and Implement Remediation Strategies Alternate Uses May Require Stricter Cleanup Levels **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures Remove Contaminated Soils on NTS and Nellis Lands Dispose of Contaminated Soils in Permitted Facilities - Activities Would Accelerate Above Present Levels - After Studies, Select Alternate Remedial Action Method and Implement - Alternate Uses May Require Stricter Cleanup Levels **Industrial Sites Corrective Action Unit** - Characterize and Disposition Environmental Restoration Sites Continue Field Program to Identify Sites Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites Activities Would Accelerate Above Present Levels - Alternate Uses May Require Stricter Cleanup Levels **Decontamination and Decommissioning Facilities** Accelerate Remedial Actions Alternative May Require Clean Closure, Not Closure In Place **Defense Nuclear Agency Sites** Accelerate Operations to Stop Radiation and Hazardous Contaminated Migration - Select and Implement Alternate Remedial Action or Redesign Alternate Uses May Require Stricter Cleanup Level Characterize and Remediate Contaminated Muck Piles and Ponds **Tonopah Test Range** Accelerate Characterization and Remediation of Site **Central Nevada Test Area** Accelerate characterization and remediation **Project Shoal Area** Continue Characterization and Remediation Accelerate Characterization and Remediation of Site	**Underground Test Area Corrective Action Unit** Continue Groundwater Monitoring - Continue Drilling Characterization Wells - Evaluate and Implement Remediation Strategies - Intensify Groundwater Monitoring Accelerate, Evaluate, and Implement Remediation Strategies Alternate Uses May Require Stricter Cleanup Levels **Soils Media Corrective Action Unit and Part of NAFR Complex** - Continue Studies to Identify, etc. Alternate Remedial Measures Remove Contaminated Soils on NTS and Nellis Lands Dispose of Contaminated Soils in Permitted Facilities - Activities Would Accelerate Above Present Levels - After Studies, Select Alternate Remedial Action Method and Implement - Alternate Uses May Require Stricter Cleanup Levels **Industrial Sites Corrective Action Unit** - Characterize and Disposition Environmental Restoration Sites Continue Field Program to Identify Sites Continue to Characterize and Remediate the Resource Conservation and Recovery Act Industrial Sites - Activities Would Accelerate Above Present Levels - Alternate Uses May Require Stricter Cleanup Levels **Decontamination and Decommissioning Facilities** Accelerate Remedial Actions Alternative May Require Clean Closure, Not Closure In Place **Defense Nuclear Agency Sites** - Accelerate Operations to Stop Radiation and Hazardous Contaminated Migration - Select and Implement Alternate Remedial Action or Redesign - Alternate Uses May Require Stricter Cleanup Levels Characterize and Remediate Contaminated Muck Piles and Ponds **Tonopah Test Range** - Accelerate Characterization and Remediation of Site **Central Nevada Test Area** Accelerate characterization and remediation **Project Shoal Area** Continue Characterization and Remediation - Accelerate Characterization and Remediation of Site

Table S-4. Comparison of Nondefense Research and Development, Work for Others, and Site Support Activities for the Alternatives

Nondefense Research and Development Program			
Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
- Establish Solar Enterprise Zone - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles) - Technology Development (normal) - Environmental Research Park	- No Activity	- Establish Solar Enterprise Zone - Construct and Operate Solar Production Facilities - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles plus fueling station) - Technology Development (expanded) - Environmental Research Park	- Establish Solar Enterprise Zone - Construct and Operate Solar Production Facilities - Spill Test Facility - Alternate Fuel Demonstration Project (16 vehicles) - Technology Development (expanded) - Environmental Research Park
Work for Others Program			
Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Treaty Verification - Threshold Test Ban Treaty - Peaceful Nuclear Explosion Treaty - Chemical Weapons Convention Treaty - Treaty on Open Skies **Nonproliferation Projects** **Counterproliferation Research and Development** - Dipole Hail - Big Explosives Experimental Facility - Cut and Cover **Conventional Weapons Demilitarization** **Nondefense Research and Development** - Conduct Munitions Research and Development - Training Exercises	- No Activity	**Increased activity levels for:** **Treaty Verification** - Threshold Test Ban Treaty - Peaceful Nuclear Explosion Treaty - Chemical Weapons Convention Treaty - Treaty on Open Skies **Nonproliferation Projects** **Counterproliferation Research and Development** - Dipole Hail - Big Explosives Experimental Facility - Cut and Cover **Conventional Weapons Demilitarization** **Nondefense Research and Development** - Conduct Munitions Research and Development - Training Exercises	**Treaty Verification** - Treaty on Open Skies No Activity - Increased Use of Airspace by DoD
Site Support Activities			
Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
No change in: - Facilities - Services - Utilities - Communications	- Facilities (cold standby) - Services (minimal) - Utilities (minimal) - Communications (minimal) **Tonopah Test Range** - Maintain Site Support for Stockpile Steward-ship	**Expand as necessary:** - Facilities - Services - Utilities - Communications	**Modify as Necessary:** - Facilities - Services - Utilities - Communications

nature, or being encompassed by the four alternatives analyzed in the Draft NTS EIS. A description of these alternatives is provided in Chapter 3 of Volume 1 of this EIS.

Affected Environments

The existing environments are described for the NTS and other locations in Nevada considered in the Final NTS EIS (Figure S-1). The environmental resources discussed include land use, geology and soils, hydrology, biology, air quality, noise, and visual and cultural resources. Existing waste management activities and other resource elements—including airspace, site-support activities, transportation, socioeconomic, occupational and public health and safety, radiological conditions, and Environmental Justice—also are included in the descriptions of environmental conditions. Major elements of the affected environment are summarized in the following discussion.

Land Use. The NTS encompasses 3496 square kilometers (km^2) (1,350 square miles [mi^2]) of land area reserved to the jurisdiction of the DOE. The majority of the NTS is located in Nye County, Nevada, 105 kilometers (km) (65 miles [mi]) northwest of Las Vegas. Area 13 is located partially within Lincoln County. This land area has been withdrawn from all forms of appropriation under public land laws. Mineral leasing is withdrawn or reserved to the discretion of the Secretary of the Interior. The NTS is surrounded by the NAFR Complex on the north, east, and west, and land managed by the U.S. Bureau of Land Management on the south and southwest. The NAFR Complex is used for military training; the U.S. Bureau of Land Management lands are used for grazing, mining, and recreation. Near the eastern boundary of the NTS, the NAFR Complex shares the use of land with the U.S. Fish and Wildlife Service's Desert National Wildlife Refuge.

The Tonopah Test Range was withdrawn for military use in the 1940s. Since 1956, the Tonopah Test Range has been managed by the DOE and its predecessors under a Memorandum of Understanding with the U.S. Air Force. The Tonopah Test Range encompasses 1606 km^2 (620 mi^2) of land located in Nye County, 64 km (40 mi) east of the town of Tonopah. The Tonopah Test Range is used for Defense and Work for Others-related research, design, and testing activities.

The Project Shoal Area was withdrawn from public use for purposes of underground nuclear testing. The Project Shoal Area is a 4-square mile area located in the northern part of the Sand Springs Mountain Range in Churchill County, 48 km (30 mi) southeast of Fallon, Nevada. The site is surrounded by unimproved rangeland. The Project Shoal Area was completed on October 26, 1963. The site is still under withdrawal from the U.S. Bureau of Land Management.

The Central Nevada Test Area is located in the north-central part of Hot Creek Valley, 95 km (60 mi) northeast of Tonopah, in Nye County, Nevada. The Central Nevada Test Area was obtained from the U.S. Bureau of Land Management by the Atomic Energy Commission to develop alternative sites for underground nuclear testing activities. The Project Faultless underground nuclear test occurred on January 19, 1968. Subsequent to the test, the withdrawal of public lands for the Central Nevada Test Area has remained unchanged and under control of the DOE. Cattle grazing and recreation are the main uses in the areas around the site.

Eldorado Valley is southwest of Boulder City, Nevada. The city of Boulder City has annexed 80,000 acres of Eldorado Valley, and has designated 6,000 acres of this land for a Solar Enterprise Zone facility site.

The Dry Lake Valley site is near the Apex Industrial Area, near the intersection of U.S. Highway 93 and Interstate 15 in Clark County, about 40 km (25 mi) northeast of Las Vegas. The Nevada Power Company has identified 3,600 acres for a Solar Enterprise Zone facility site, adjacent to a proposed 21,000-acre industrial-use park.

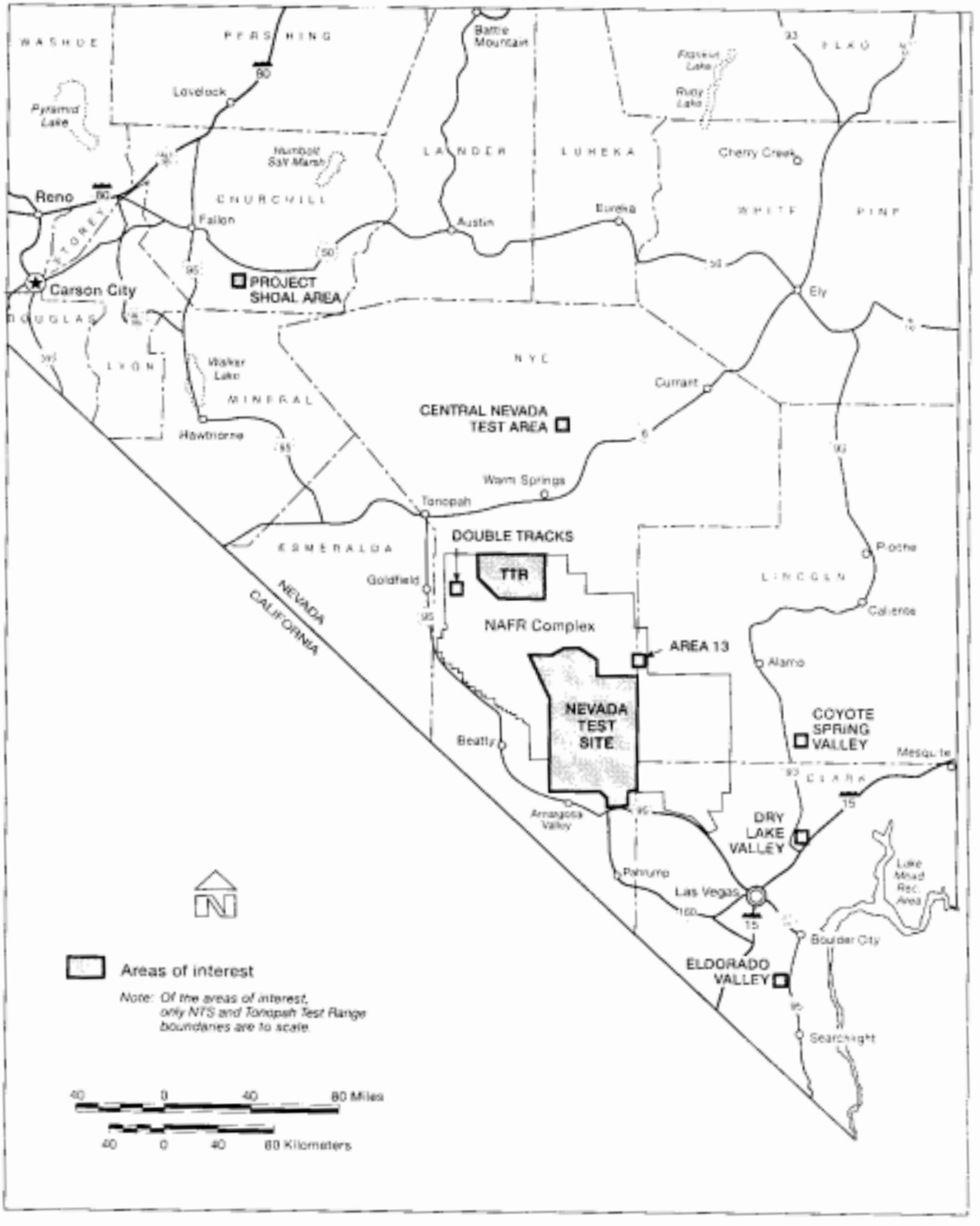

Figure S-1. NTS and selected areas of interest

The Coyote Spring Valley site would be located on 2,760 acres of an over 41,000-acre parcel of private land in the southern portion of Lincoln County, Nevada. The proposed location is east of U.S. Highway 93, 24 km (15 mi) north of State Route 168 and 72 km (45 mi) north of Las Vegas. The site is near or adjacent to U.S. Bureau of Land Management wilderness study areas, portions of which are proposed for wilderness designation by Congress. The U.S. Bureau of Land Management manages several wilderness study areas in this region.

Transportation. Baseline transportation activities are discussed in this EIS with respect to on-site traffic, off-site traffic, transportation of materials and wastes, and other transportation modes such as air and rail.

Defense, Waste Management, and Environmental Restoration Programs contribute most of the activities associated with the transportation of material and waste. All transportation activities associated with materials and waste are conducted in accordance with applicable federal and state regulations.

The Defense Program activities include the transportation of special nuclear materials, high explosives, and other associated materials for the NTS mission. The transportation of these materials is done by safe and secure trailers that have accumulated more than 1.2×10^8 km (7.5×10^7 mi) of over-the-road experience in transporting DOE-owned nuclear material without an accident that resulted in a release of radioactive material.

The Waste Management and Environmental Restoration Programs primarily transport low-level radioactive waste to the NTS for disposal. Other wastes that are transported include hazardous wastes that are being transported on site for storage and off site for ultimate disposition. As of June 1996 there are 14 off-site generators that transport low-level waste to the NTS for disposal. Municipal solid waste generated on the NTS is transported by trucks to permitted on-site landfills for disposal.

Waste Management. Several waste materials are managed at the NTS, including radioactive, mixed (including transuranic), hazardous, non-hazardous and Toxic Substances Control Act types of waste. 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 local, state and federal regulations and DOE pollution prevention policies.

Low-level wastes generated at the NTS and at DOE approved off-site generators are disposed of at either the Area 3 or Area 5 Radioactive Waste Management Site. Mixed waste generated on site is disposed of at the Area 5 Radioactive Waste Management Site, which has Resource Conservation and Recovery Act interim status to accept such waste. No off-site generated mixed waste is currently accepted or disposed of at the NTS.

Transuranic, mixed transuranic, mixed waste, hazardous waste, and Toxic Substances Control Act wastes are stored at the NTS. Currently, transuranic waste is stored on the Transuranic Waste Storage Pad or in the classified storage area. Mixed transuranic waste is stored inside the transuranic waste building and mixed waste is stored outside the building on the Transuranic Waste Storage Pad in accordance with a mutual agreement between the State of Nevada and the DOE. These wastes may be stored at this location until the Waste Isolation Pilot Plant in Carlsbad, New Mexico, or another DOE site is available as a treatment, storage, or disposal destination for transuranic waste.

Hazardous waste is stored at the Hazardous Waste Storage Unit before being shipped to off-site treatment, storage, or disposal facilities. The only Toxic Substances Control Act waste generated at the NTS is polychlorinated biphenyl (PCB) waste. PCB waste is temporarily stored at the Area 6 Toxic Substances Control Act waste accumulation unit before being shipped to off-site treatment, storage, or disposal facilities. In addition, there is some radioactively contaminated PCB waste currently in storage on the Transuranic Waste Storage Pad in Area 5.

Under a Resource Conservation and Recovery Act permit, the Explosive Ordnance Disposal Unit at the

NTS treats reactive hazardous wastes (explosives) by detonation. No other hazardous wastes are treated at the NTS. There are no low-level or mixed waste treatment facilities at the NTS.

Waste generated at the Tonopah Test Range from ongoing activities is stored and transported off site for ultimate disposition. No waste management facilities exist in either the Project Shoal Area or the Central Nevada Test Area. Waste generated during the course of environmental restoration activities would be transported either to the NTS or a permitted hazardous waste treatment, storage, and disposal facility.

Socioeconomics. Ninety percent of the NTS workforce resides in Clark County; seven percent resides in Nye County. The remaining three percent reside in other counties or states. Within Clark County, most of the NTS workforce resides in the Las Vegas area.

Eldorado Valley and Dry Lake Valley are located within Clark County, and workforce characteristics would be similar to those for the NTS. Coyote Spring Valley is located in Lincoln County.

Geology and Soils. The topography of the NTS has been altered by historic DOE actions, particularly underground nuclear testing. The principal effect of testing has been the creation of numerous craters in Yucca Flat and on Pahute and Rainier Mesas. Lesser alterations have occurred as a result of road building, sand and gravel mining, and the construction of waste disposal areas, and flood control and drainage improvements.

Underground nuclear testing has resulted in impacts on the physical environment in terms of ground motion, disruption of the geologic media, surface subsidence, and contamination of the subsurface geologic media and surficial soils. Waste disposal operations have also contributed to surface disturbances and placement of materials having long-term impacts on the environment. Table S-5 summarizes baseline information on the remaining radionuclide inventory at the NTS.

Surface Hydrology and Groundwater. Except for the off-site solar enterprise sites, the areas considered in this Final NTS EIS are located within the Great Basin, an area from which no surface water leaves except by evaporation. Streams in the area are ephemeral. Because of the ephemeral nature of surface waters, only limited water quality data are available. Although precipitation is very low in the region, during extreme precipitation events there is some risk of flooding along arroyos and around playa lakes. Throughout the region, springs are the only natural sources of perennial surface water. Surface waters of the NTS, the Tonopah Test Range, and the NAFR Complex are not used for human consumption.

Surface water sources, which include open reservoirs, natural springs, containment ponds or effluents, and sewage lagoons, are routinely sampled for radiological substances at the NTS. With the exception of containment ponds, no annual average concentration in surface waters was found to be statistically different from any other at the five percent significance level. The analytical results from the Area 12 containment ponds showed measurable quantities of radioactivity and displayed identifiable trends.

All water discharges from sanitary sewers at the NTS, the Tonopah Test Range, and the NAFR Complex are regulated by the state of Nevada.

The NTS, Tonopah Test Range, and portions of the NAFR Complex are within the Death Valley Groundwater Flow System. Groundwater under the eastern part of the NTS and under Area 13 of the NAFR Complex flows southward toward the Ash Meadows Discharge Area. It is believed that groundwater under the western NTS and eastern Tonopah Test Range flows toward the Alkali Flat-Furnace Creek discharge area. Groundwater under the western part of the Tonopah Test Range and under the Double Tracks test area of the NAFR Complex is believed to flow toward the Oasis Valley and Sarcobatus Flats discharge areas.

The depth to the water table under the NTS varies from about 160 meters (m) (525 feet [ft]) below the land surface in portions of Frenchman Flat and Yucca Flat to more that 610 m (2,000 ft) under the

Table S-5. Summary of radioactivity on the NTS as of January 1996

Source of Radioactivity	Type of Area	Environmental Media	Major Known Isotopes or Wastes	Depth Range	Amount (curies)
Atmospheric & Tower Tests	Above Ground Nuclear Weapon Proving Area	Surficial Soils & Test Structures	Americium Cesium Cobalt Plutonium Europium Strontium	At Land Surface	Approximately 20
Safety Tests	Above Ground Experimental Areas	Surficial Soils	Americium Cesium Cobalt Plutonium Strontium	Less than 0.9 m (3 ft)	Approximately 35
Nuclear Rocket Development Area	Nuclear Rocket Motor, Reactor, & Furnace Testing Area	Surficial Soils	Cesium Strontium	Less than 3 m (10 ft)	Approximately 1
Shallow Borehole Tests	Underground Nuclear Testing Areas	Soils & Alluvium	Americium Cesium Cobalt Europium Plutonium Strontium	Less than 61 m (200 ft)	Approximately 2,000 at land surface; unknown at depth
Shallow Land Disposal	Waste Disposal Landfills	Soils & Alluvium	Dry Packaged Low-level & Mixed Wastes	Less than 9 m (30 ft)	Approximately 500,000[a]
Crater Disposal	Test induced subsidence crater with sidewalls, cover, & drainage	Soils & Alluvium	Bulk contaminated soils & equipment	Less than 30 m (100 ft)	Approximately 1,250[a] (Approximately 205,000 m³ [7,250,000 ft³])[b]
Greater Confinement Disposal	Monitored Underground Waste Disposal Borehole	Soils & Alluvium	Tritium Americium	37 m (120 ft)	Approximately 9.3 million[a] (Approximately 300 m³ [10,000 ft³])[b]
Deep Underground Tests	Underground Nuclear Testing Areas	Soils, Alluvium, & Consolidated Rock	Tritium, fission, & activation products	Typically less than 640 m (2,100 ft), but may be deeper	Greater than 300 million

[a] Inventory at time of disposal (not corrected for decay).
[b] Amount of waste that was considered for inventory.

upland portions of Pahute Mesa. At the Tonopah Test Range, the depth to the top of the water table ranges from zero in the Antelope Mine area, and Antelope, Cactus, and Silverbow Springs, to greater than 180 m (590 ft) in the center portion of Cactus Flat.

A considerable amount of groundwater, estimated at 2.7×10^9 cubic meters (m^3) (2.2×10^6 acre-feet [ac-ft]), is held in recoverable storage beneath the NTS and surrounding region. Currently, drinking water at the NTS is provided by 11 wells. Construction and fire-suppression water is supplied by other non-potable wells. In 1993, the NTS used about 1.9×10^6 m^3 (1,530 ac-ft) of water; 1.7×10^6 m^3 (1,400 ac-ft) for drinking water and the remainder for construction and industrial use. All hydrologic units that supply drinking water to the NTS are Class II.

Underground nuclear testing has resulted in contamination of groundwater in the immediate

vicinity of a number of tests. The quality of the groundwater has been impaired, but is limited to those areas where tests have occurred. No radioactive contamination attributable to DOE activities has been detected in monitoring wells off the NTS. Detection of significant contamination is limited to underground testing areas on the NTS. Potable supply wells on the NTS utilize high quality groundwater, meeting Safe Drinking Water Act Standards.

In addition to the historic and ongoing monitoring, the DOE has developed groundwater models, which continue to be refined, for addressing the concerns for potential groundwater transport of radionuclides. Health effects to the public from subsurface radioactivity have been modeled, based on predictions of future tritium concentrations in well water, even though predicted concentrations are well below current regulatory limits. Any public exposure to elevated tritium concentrations resulting from underground nuclear testing would necessarily occur outside the boundaries of DOE/DoD controlled areas.

At the Project Shoal Area, groundwater occurs about 290 m (951 ft) below ground surface. The Long-Term Hydrologic Monitoring Program samples one spring in the Sand Springs Range and five wells in the adjacent valleys. No contamination related to the Project Shoal Area nuclear test has been detected in these samples. No wells supply potable drinking water in the vicinity of the Project Shoal Area.

At the Central Nevada Test Area, the water table occurs within the alluvium, and groundwater flow is believed to follow the general direction of surface flow. The Project Faultless test in 1968 caused groundwater levels to fall. Water levels began to rise again in 1974. The pre-event water-table level is predicted to be reached by the year 2018. Although radionuclide transport from the chimney was not expected until the water reaches its original level, modeling suggests that transport could be already occurring. The Long-Term Hydrologic Monitoring Program includes sampling of five wells and one spring in Hot Creek Valley outside of the Central Nevada Test Area. No contamination related to the Project Faultless test has been detected in samples from those wells.

All off-site Solar Enterprise Zone facility sites are located in subsystems of the regional Colorado River Flow System. In each of the valleys considered for Solar Enterprise Zone facilities, surface water runoff is very infrequent, occurring as ephemeral flow in streambeds and, even less often, as ponded water on the playas. Surface water is discharged from Coyote Spring Valley into the upper Muddy Springs area through Pahranagat Wash. No surface discharge occurs from the other valleys. Shallow flash flooding occurs over large areas in all three valleys.

Eldorado Valley is situated within the Las Vegas Flow subsystem. Groundwater under Eldorado Valley occurs at depths ranging from 83 to 98 m (275 to 320 ft) below land surface in the north-central part of the basin. Mining is by far the largest water user in Eldorado Valley. Small quantities of water have been appropriated for municipal, stock watering, and industrial use. Water supplies in Eldorado Valley can be augmented by water from Boulder City. Historic analyses of the groundwater from wells in Eldorado Valley indicate that concentrations of total dissolved solids, sulfate, and chloride exceed drinking water standards in some areas.

Dry Lake Valley is situated within the California Wash Flow subsystem. Groundwater under Dry Lake Valley occurs at depths ranging from 70 m (230 ft) to 87 m (285 ft). The only available water resource in Dry Lake Valley is groundwater. There are currently only 6 water supply wells in the valley; however, there are at least 16 applications for either mining or stock-watering water rights. Well yields within the basin are low. The groundwater in Dry Lake Valley exceeds the primary drinking water standard for dissolved solids and sulfate.

Coyote Spring Valley is situated within the California Wash Flow subsystem. Groundwater under Coyote Spring Valley occurs at depths ranging from 3 m (10 ft) below land surface in a perched aquifer in the vicinity of Coyote Spring to 107 to 183 m (350 to 600 ft) below land surface for

the water table aquifer throughout the valley floor area. Groundwater quality exceeds the Primary Drinking Water standard for particulates. Samples of water taken from the alluvium have been found to have concentrations of iron and manganese that exceed drinking water standards, and elevated concentrations of fluoride have been reported for wells completed in the carbonate aquifer.

As of 1994, there were no groundwater rights within the Coyote Spring Valley basin. However, there are many existing applications for groundwater appropriations within the basin. These applications have not been acted upon, and there is considerable uncertainty regarding the potential for obtaining approval of any new applications for groundwater to support a Solar Enterprise Zone facility.

Biological Resources. The NTS and the NAFR Complex are located along the transition zone between the Mojave Desert and the Great Basin Desert. As a result, this area exhibits a diverse and complex mosaic of plant and animal communities representative of both deserts, as well as some communities common only in the transition zone. The Tonopah Test Range is within the Great Basin Desert. Plant and animal species occurring in these areas are typical for the identified biomes.

No endangered plant or animal species are known to inhabit the NTS, the Tonopah Test Range or the NAFR Complex. The desert tortoise, which inhabits the Mojave Desert plant communities in the southern half of the NTS, is listed as a federally listed threatened animal. No threatened animal or plant species are known to occur on the Tonopah Test Range or in Area 13 of the NAFR Complex. Two plant species are candidates for the threatened or endangered list near these areas. No animals are listed as candidates.

The Project Shoal Area and Central Nevada Test Area are within the Great Basin Desert. No federally listed threatened, endangered, or candidate species are known to occur at either site.

The Eldorado Valley is within the Mojave Desert. The threatened desert tortoise is the only federally protected species that occurs at the site. However, the site is not designated critical habitat for the desert tortoise. No candidate plant or animal species are known to occur in the area. The banded gila monster, a state-protected reptile, is known to be present at the Eldorado Valley site.

Dry Lake Valley is within the Mojave Desert. The threatened desert tortoise is the only federally protected species in this area. Densities of tortoises there are generally low. No candidate plants or animals are known to occur within the area. Two plant species classified by the state of Nevada as "fully protected" are known to occur in the vicinity of the Dry Lake Valley site.

Coyote Spring Valley is within the Mojave Desert. There are no federally listed threatened, endangered, or candidate plant or animal species within the area designated for consideration as a Solar Enterprise Zone site. The only federally listed animal species known to inhabit Coyote Spring Valley is the threatened desert tortoise. The valley is within the critical habitat for the species. The banded gila monster, a state-protected reptile, may be present in the valley.

Air Quality and Climate. The climate at all of the areas considered in this Final NTS EIS is characterized by limited precipitation, low humidity, and large diurnal temperature ranges. Variations in temperature and precipitation generally follow elevation and latitude. The summers are generally hot, and the winters are mild. Winds are generally out of the north in the winter months and from the south in the summer. Severe weather that may occur in the area includes thunderstorms, lightning, sandstorms, and, infrequently, tornados. Severe thunderstorms may cause flash flooding.

The NTS, the NAFR Complex, and the Tonopah Test Range are located within the Nevada Intrastate Air Quality Control Region, which has been designated attainment with respect to the National Ambient Air Quality Standards.

The Project Shoal Area and the Central Nevada Test Area are located in Air Quality Control Region 147. There are no air-quality monitoring stations in the region. Because there are no

significant sources of pollutant emissions in the region, the air quality is good.

Eldorado Valley and Dry Lake Valley are located in Clark County. Except for the Las Vegas Valley, Clark County is a Class II Prevention of Significant Deterioration area. Coyote Spring Valley, located in Lincoln County, is also a Class II area. All three valleys border the Las Vegas Valley Air Quality Nonattainment Area. Because these areas are largely undeveloped, there are few emission sources within these basins.

Cultural Resources. All of the areas considered in this EIS are located within a region with a prehistory that may span the past 10,000 years or more. Known properties range from the early prehistoric period to historic mining and ranching sites. To date, over 2,000 archaeological and historic sites have been identified on the NTS, and 424 sites have been identified on the Tonopah Test Range. Sites determined to be historic properties are described in this EIS.

Numerous sites, areas, and resources also have been identified within the NTS that are culturally important to American Indian people, particularly the Western Shoshone, Owens Valley Paiute, and Southern Paiute people. The lands were shared for religious ceremony, resource use, and social events.

Eleven archaeological sites have been recorded in the vicinity of the Project Shoal Area. Five of these sites have been recommended as eligible for listing on the National Register of Historic Places. This study area is not within the traditional lands of the American Indian people represented by the Consolidated Group of Tribes and Organizations.

Charcoal kilns at Tybo are the only known cultural resources in the Central Nevada Test Area vicinity that are listed on the National Register of Historic Places. Many other sites in the area are likely eligible for inclusion on the National Register of Historic Places. The area contains a number of cultural resources of special interest to the Consolidated Group of Tribes and Organizations.

Prehistoric sites at Eldorado Valley have been recorded around the perimeter of Eldorado Dry Lake. Other sites date to the historic period. Most are isolated occurrences by prospectors or Hoover Dam construction workers passing through the area. Eldorado Valley contains a wide variety of cultural resources of importance to American Indians, including plants, animals, and archaeology sites. The traditional cultural properties associated with the area include trails, sacred sites, plants, and animals in the McCullough and Eldorado Mountains, and in Eldorado Valley.

Eight prehistoric sites have been recorded within the proposed Dry Lake Valley site. Most of these sites are associated with the shoreline of Dry Lake. The Mormon Road, a historic road that traverses Dry Lake Valley, is listed on the National Register of Historic Places. The Dry Lake Valley area contains a wide range of resources important to American Indian cultures, including plants, animals, and archaeological sites.

The Coyote Spring Valley area contains a wide variety of resources culturally important to American Indians. Those resources include plants, animals, trails, and archaeological sites.

Occupational and Public Health and Safety. All work at the NTS and Tonopah Test Range is performed in accordance with the safety and health requirements of the Occupational Safety and Health Administration. A series of DOE orders provide direction for worker safety and health programs. In addition, there are Standard Operating Procedures for the NTS and Tonopah Test Range which cover a range of additional relevant activities. On-site safety services are provided and include the fire department, occupational medicine, radiological safety, and industrial hygiene services. Radioactively contaminated surface areas on the NTS, the NAFR Complex, and the Tonopah Test Range resulted primarily from atmospheric testing of nuclear weapons.

Many on-site and off-site environmental monitoring programs are conducted on the NTS and surrounding areas. Some of these efforts include ecological studies of migratory birds and large animals, study plots of vegetation, and continued studies of base line information. The EPA continues its off-site monitoring of the air and

groundwater in the surrounding local communities to the NTS. These studies have not indicated any significant impacts to the surrounding environment and continue to assist the DOE in understanding the ecological environment.

Tritium-contaminated groundwater exists in the subsurface as a result of past underground testing of nuclear weapons. Underground weapons tests were performed within the NTS and at two off-site locations, the Project Shoal Area and the Central Nevada Test Area. The migration of tritium-contaminated groundwater from test locations within the NTS is estimated to be maximized for the flow path from Pahute Mesa to Oasis Valley. Based on the combined results of studies performed by various authors, the estimated range of peak tritium concentrations at the closest uncontrolled use area varies from 5×10^{-4} pCi/L arriving 150 years after the beginning of migration to 3,800 pCi/L arriving in 25 to 94 years. These concentrations are well below the EPA's maximum allowable tritium concentration in drinking water of 20,000 pCi/L. The hypothetical maximally exposed public individual at this location is estimated to have a lifetime probability of contracting a fatal cancer between 8×10^{-13} (about one in one trillion) and 1×10^{-5} (about one in 100,000).

The migration of tritium-contaminated groundwater from the test location at the Project Shoal Area could result in peak concentrations of 280 to 720,000 pCi/L arriving at the controlled area boundary 71 to 206 years after the test. Although no public well currently exists at this location, a hypothetical individual consuming well water at this location for a standard lifetime of 70 years would have a lifetime probability of contracting a fatal cancer between 2×10^{-10} (about one in five billion) and 2×10^{-3} (about one in 500). At the nearest existing public well, a hypothetical maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 4×10^{-24} (essentially zero) and 2×10^{-7} (about one in five million).

The migration of tritium-contaminated groundwater from the test location at the Central Nevada Test Area was predicted to have reached a peak concentration of about 1.2×10^{-8} pCi/L at the southern boundary approximately 8 to 15 years after the test (between the years 1976 and 1983). This predicted concentration has not been confirmed by groundwater sampling and analysis. No public well currently exists at the boundary of the Central Nevada Test Area. But if a well did exist, a hypothetical individual consuming well water at this location for a standard lifetime of 70 years around the time of peak tritium concentrations would have a lifetime probability of contracting a fatal cancer between 1.4×10^{-5} (about one in 70,000) and 5.5×10^{-3} (about one in 200). At the nearest existing public well, a hypothetical maximally exposed public individual is estimated to have a lifetime probability of contracting a fatal cancer between 1.7×10^{-24} (essentially zero) and 3.2×10^{-10} (about one in three billion).

Comparison of Environmental Consequences

Each program area identified within an alternative was evaluated separately to identify its potential environmental impact. For each of the programs there are resource areas that are of more interest than others, and these major areas are summarized in the following paragraphs.

Defense Program. Additional Defense Program impacts resulting from the alternatives considered in this EIS are potentially significant, although small compared to the impacts of previous testing. These would occur under Alternatives 1 and 3, which include a scenario to conduct one or more underground nuclear tests if directed by the President. Existing drill holes for potential underground tests are isolated from other NTS activities. The construction of new facilities would have a minor, localized impact to the physical environment of the site, and would not lead to significant off-site impacts. The most significant impacts would be the loss of income and jobs resulting from the elimination of the Defense Program activities under Alternatives 2 and 4.

Based on the more than 40 years of operations and information collected, many of the consequences of past Defense Program activities and other activities have been well-documented. More than 800 underground nuclear tests have been conducted at the NTS. As discussed in the *Final Environmental*

Impact Statement, Nevada Test Site, Nye County, Nevada (ERDA, 1977), underground testing has resulted in unavoidable adverse impacts to portions of the land, geologic, and groundwater resources, making them unusable for most purposes. Formation of craters, surface subsidence, and the release of radioactivity into the environment have been the most significant impacts to the physical environment as a result of historical testing operations at the NTS. Pockets of radioactive contamination surround each underground test location. The quantity of radioactivity remaining in the subsurface media can be estimated based on the half-life of the fission products. From data on the number and dates of the underground tests at the NTS, a total quantity of radioactivity remaining underground is estimated to be 3.0 x 10^7 curies. Much of this radioactivity remains captured in the original cavity, and thus is not available to leach into the groundwater.

The impacts of conducting subcritical experiments underground would be much less than those for nuclear testing since no self-sustaining fission chain reactions occur and much less radioactivity is deposited to the geologic environment. As in the case of nuclear testing, the radioactivity is captured underground

Radioactively contaminated surface areas on the NTS resulted primarily from atmospheric testing of nuclear weapons from 1951 to 1962. Additionally, safety tests conducted at the surface from 1954 to 1963 resulted in the radioactive contamination of the soil. More than 200 radiation-contaminated controlled areas have been identified and mapped on the NTS at the Tonopah Test Range and the NAFR Complex.

The DOE has established a monitoring program on and off the NTS to detect radionuclides in the air. Air monitoring results estimate radiation exposure well below existing standards.

Waste Management Program. The incremental environmental impacts over baseline conditions from waste management activities under Alternatives 1 and 3 would be negligible. Under Alternative 3, some new facilities would create a slight increase beyond the impacts under Alternative 1. Under Alternatives 2 and 4, little change in impact would be seen over present conditions because most of the required land clearing, waste transportation, and geologic disturbance have already occurred.

Waste management has been an integral part of the NTS operations since the establishment of the NTS in 1951. The environmental impacts related to the Waste Management Program are minor compared to those of the other programs. The issues related to waste management are waste transportation and protection of the hydrologic, geologic, and biologic resources.

Low-level waste at the Area 3 Radioactive Waste Management Site is disposed of in subsidence craters formed from past underground nuclear tests. Underground nuclear detonations create underground cavities into which the overlying soil and rock above the cavity then collapse. The final result is a crater on the surface. The craters that are and would continue to be used at the Area 3 Radioactive Waste Management Site represent the unavoidable adverse impacts that resulted from past underground nuclear tests. Use of the craters for waste disposal is a beneficial use of lands that have been significantly and unavoidably impacted by past actions. Additionally, recent hydrological data support the current conceptual hydrogeologic model that no groundwater pathway exists beneath the Area 3 disposal craters. These craters have significantly altered the topography and have significantly impacted the surface drainage. Engineered closure of the waste-filled cells would return portions of the surface topography to a natural grade, help to partially restore drainage patterns, and prevent the downward migration of precipitation into the buried waste.

Waste Management Program operations in Area 5 are more diverse and include facilities for hazardous and mixed waste management in addition to low-level waste management facilities. After 30 years of waste disposal operations, the DOE has not detected any contamination in groundwater monitoring wells recently completed near the Area 5 Radioactive Waste Management Site. In addition, field studies conducted to support the performance assessment models, which include monitoring of soil moisture and chloride ion concentrations, indicate that water falling on the surface (precipitation) in Frenchman Flat does not reach the groundwater. These studies and the absence of contamination support the conclusion that no groundwater pathway exists beneath the Area 5 Radioactive Waste Management Site. Thus, no impact to groundwater from waste management operations in Area 5 would be

expected to occur. Expansion of waste management activities under Alternative 3 would occur in an area that has been previously disturbed and previously surveyed for biological and cultural resources; therefore, no impacts would occur to these resources.

The long-term effects of waste disposal operations have been evaluated as a part of the performance assessment process. The performance assessment process has developed scenarios that are used to evaluate the potential for public exposure to radionuclides from the disposed waste. These scenarios consider transport of radionuclides by surface water and groundwater, by air, and by human intrusion pathways. Preliminary results of the Area 5 Radioactive Waste Management Site Performance Assessment indicate that the risk of potential exposure to the public from waste disposal activities through surface water is not significant. Based on results of field studies, the groundwater pathway and air pathways are not considered credible transport mechanisms.

The limiting scenarios identified in the Area 5 performance assessment are the inadvertent intruder scenarios. Maximum individual exposure would occur to a person living on the former waste disposal site consuming food and water (assumed to be contaminated) for a lifetime. Performance assessments address the consequences of disposal of a given radioactive waste at a given site. A waste acceptable for disposal must meet three performance objectives, one of which involves potential dose to an inadvertent human intruder. Performance objectives must be met for a period of 10,000 years. Inadvertent intrusion is not considered to occur during institutional control of the site. Institutional control is generally considered to be in effect for 100 years, and for conservatism in the performance assessment, site recognition and passive barriers are considered to be lost after institutional control. The results of this very conservative approach to estimating exposure are then used to establish design, operation, closure, and waste acceptance criteria for the waste management facilities. The performance assessment is a continuous process used to improve the design and operation of DOE waste management facilities.

Transportation Impacts. Impacts from transportation of materials to and from the NTS have been analyzed in Appendix I and reported in Volume 1, Chapter 5. This includes an analysis of the transport of Defense Program nuclear material and waste management activities related to mixed waste and hazardous materials.

The majority of the postulated injuries and fatalities would be a result of routine normal traffic accidents and not a result of exposure to the transported waste. Accident scenarios that involve release of radioactive waste were factored into the risk evaluation.

The DOE has over four decades of experience in the safe transportation of hazardous materials and waste. Although accidents involving vehicles containing radioactive material have occurred, no significant releases, exposures, or radiation fatalities have ever occurred. Appendix I, the Transportation Study addresses the risks associated with transport of materials to the NTS.

The expected number of occurrences of cargo-related health effects was calculated for both incident-free and accident scenarios for radioactive and hazardous cargo. Vehicle-related health effects of traffic fatalities and injuries were also calculated. Results of the transportation risk analysis are discussed in Sections 3.2.3 and 3.3.4 of Appendix I.

The results of the transportation risk analysis show that the human health risks from transportation operations are low under any alternative, and are not significant contributors to the total risk from all operations under these alternatives. Along the in-state routes vehicle-related fatalities and injuries dominate the risk, followed by incident-free radiation-induced fatalities. The risks along all in-state routes are low and, within the uncertainty bands of the analysis, so similar, that it is not meaningful to rank routes solely on the basis of risk.

Environmental Restoration Program. Environmental restoration activities would continue at a varying level of intensity under all but Alternative 2. Approximately 7,500 acres of land would be disturbed during the restoration activities under Alternatives 1, 3, and 4. However, after

restoration the land would be available for alternative uses. Under Alternative 2, environmental restoration activities would cease. This would result in a condition of noncompliance with environmental requirements and limit the future use of the land.

Nondefense Research and Development Program. Historic impacts from this program have been minimal. The most significant impact from the Nondefense Research and Development Program would occur under Alternatives 3 and 4 and would result from the siting and construction of the Solar Enterprise Zone facilities. These facilities would create jobs, but would require the clearing of more than 2,000 acres of undisturbed habitat, and the consumption of 6.8 x 10^6 m^3/yr (5,500 ac-ft/yr) of water.

Work for Others Program. The Work for Others Program under Alternatives 1 and 3 is similar to historic activities and not expected to have significant impacts. Under Alternative 2, the program is discontinued, and under Alternative 4, the program is minimal. Table S-6 presents a summary of the environmental consequences described in this section and detailed in Chapter 5 of this EIS.

Health Risk Assessment. In general, human health risks under each of the alternatives are expected to be dominated by occupational injuries to workers engaged in activities such as construction, maintenance, excavation, etc. By conducting activities for ten years under the various alternatives listed in the NTS EIS, it is estimated that the following number of injuries and fatalities would occur: Alternative 1, 204 injuries and 3 fatalities; Alternative 2, 3 injuries and no fatalities; Alternative 3, 775 injuries and 9 fatalities; and Alternative 4, 104 injuries and 1 fatality. As explained in Appendix H and Volume 1, Chapter 5, the estimates of worker injuries and fatalities are based on conservative models that tend to overestimate the actual consequences of proposed NTS activities. Historically, actual injury and fatality rates at the NTS have been lower than the average U.S. industrial rates used in the analysis. Occupational injury and fatality risks are reduced by strict adherence to DOE and OSHA safety standards, formal procedures for conduct of operations, worker training, and internal audits and assessments of work practices and procedures. The Waste Management Program had the greatest number of human health risks associated with it, when compared to all other program areas. It is unlikely that a single fatal cancer or other detrimental health effect would occur as a result of radiation exposure to workers or the public under any of the NTS EIS alternatives. Hazardous chemical spills could result in noncancer health effects to workers in operations conducted under Alternatives 1, 3, and 4.

Impacts Associated with the Maximum Reasonably Foreseeable Accident. The maximum reasonably foreseeable accidents associated with activities under the NTS EIS Alternatives would be as follows:

Under Alternatives 1 and 3, the maximum reasonably foreseeable radiological accident involves a non-nuclear explosion in an Area 27 nuclear weapons storage magazine. The accident has a probability of 1 x 10^{-7} per year and could result in injuries or deaths to nearby workers due to the physical impacts of the explosion or delayed radiation health effects. Radiation exposure from the accident could result in 13 latent cancer fatalities in the worker population at the next nearest facility, and from 3 to 55 latent cancer fatalities in the off-site population within 50 miles.

The maximum reasonably foreseeable chemical accident involves an airplane crash into the Spill Test Facility. The accident has a probability of 1 x 10^{-7} per year and could result in injuries or deaths to nearby workers due to the physical impacts of the crash or toxic effects of chemicals. Workers at the next nearest facility could experience non-life threatening health effects from exposure to airborne chemicals. The off-site population within 80 km (50 mi) could experience up to 3 latent cancers as a result of this accident.

The maximum reasonably foreseeable chemical accident involves a multi-container fire at the Area 5 hazardous waste storage unit prior to final shipment of these wastes off site. The accident has a probability of 8 x 10^{-5} per year. Workers

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 1 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Land Use, Site Support Activities, Airspace			
Minimal land-use impacts would occur from continuation of current operations. All land uses would be consistent with current site and zone designations. Because of the location of the sites analyzed, and because similar land uses generally would be located on the borders of the sites, surrounding land uses would not be affected by this alternative.	Surrounding land use impacts would be the same as those listed under Alternative 1. Closure without environmental restoration would not meet requirements of federal and state laws and signed agreements and memorandums.	Surrounding land-use impacts would be the same as those listed under Alternative 1. There would be minimal land use impacts on site from increased intensity of operations and land-use conditions. Land uses at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area would be similar to Alternative 1. The new Solar Enterprise Zone facility could result in up to 2,302 acres of new land disturbance.	Potential public uses of relinquished NTS lands would be located in designated areas surrounded by buffer zones. Current defense related designated areas would be redesignated for nondefense activities. Land uses at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area would be similar to those listed under Alternative 1. New Solar Enterprise Zone facility activities could occur in the NTS, Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley; these activities would be compatible with existing land uses. Surrounding land use impacts would be the same as those listed under Alternative 1. Land-use designations and zones would be incompatible with existing designations and zones.
Site support activities would continue at current levels.	Site support activities would decrease and facilities would be closed.	Site support activities and structures would be modified and expanded, as needed.	Site support activities would be reduced and facilities would be closed.
Airspace activities would be maintained at the current level of air traffic, navigational aid services, and airspace structure.	The NTS and Tonopah Test Range would experience reduced flight operations; otherwise, there would be no impacts to airspace.	Impacts to NTS airspace would be the same as those listed under Alternative 1. Minimal impacts would be experienced at the Tonopah Test Range, Central Nevada Test Area, Project Shoal Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	Airspace impacts would be the same as those listed under Alternative 1.
Land Disturbance[a]			
10,000 acres	0 acres	21,000 acres	15,500 acres

[a] The total amount of land currently disturbed on the NTS is approximately 60,000 acres. Numbers shown represent additional estimated disturbed acreage under each alternative after 10 years (acres to be reclaimed are not included).

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 2 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Transportation (On-site, Off-site, Transportation of Materials and Waste, Other Transportation)			
Minimal on-site impacts would exist at the NTS, Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area. The NTS would average 3,370 trips per day. This would not change the level of service on affected highways and roads.	A total of 60 one-way vehicle trips per day would occur on the site. This would not change the level of service on affected highways and roads.	A total of 16,320 on-site vehicle trips per day are estimated under this alternative. No roadway would experience any significant traffic congestion. All key NTS roadways would have a capacity exceeding 2,000 vehicles per hour. Minimal impacts would be felt at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	A total of 12,180 on site vehicle trips per day are estimated. No roadway would experience any significant traffic congestion. All key NTS roadways have a capacity exceeding 2,000 vehicles per hour. Minimal impacts would be experienced at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.
A total of 1,480 one-way vehicle trips per day would occur off site by 2005. All key roads in the vicinity of the site would continue to operate at level of service C or better. However, while NTS-generated traffic would be relatively minimal, segments of I-15, U.S. Hwy. 95, and U.S. Hwy. 93 within metropolitan Las Vegas could deteriorate to unacceptable levels of service by 2000 because of cumulative traffic growth without state and local governmental transportation improvement projects. Minimal impacts to off-site traffic would be experienced at the Tonopah Test Range, Central Nevada Test Area, and Project Shoal Area.	A decrease over Alternative 1 of 1,480 one-way vehicle trips per day would occur off site by 2005. All key roads in the vicinity of the site would continue to operate at level of service C or better.	An increase over Alternative 1 of 1,030 one-way vehicle trips off site per day would occur by 2005. Most key roads in the vicinity of the site would continue to operate at level of service C or better. While the NTS-generated traffic would be relatively minimal, segments of I-15, U.S. Hwy. 95, and U.S. Hwy. 93 within metropolitan Las Vegas could deteriorate to unacceptable levels of service by 2000 because of cumulative traffic growth without state and local governmental transportation improvement projects.	A decrease from Alternative 1 of 610 one-way vehicle trips off site per day would be experienced by 2005. All key roads in the vicinity of the site would continue to operate at level of service C or better. However, while the NTS-generated traffic would be relatively minimal, segments of I-15, U.S. Hwy. 95, and U.S. Hwy. 93 within metropolitan Las Vegas could deteriorate to unacceptable levels of service by 2000 because of cumulative traffic growth without state and local governmental transportation improvement projects.
Approximately 350,000 m³ (457,783 yd³) of low-level waste and 50,000 m³ (65,398 yd³) of mixed waste would be generated on and off the site in a 10-year period.	Minimal generation of materials and waste would occur under Alternative 2.	Approximately 100,000 m³ (130,795 yd³) low-level waste and 300,500 m³ (393,039 yd³) of mixed waste would be generated on and off the site in a 10-year period.	Approximately150,000 m³ (196,193 yd³) of low-level waste and 500 m³ (654 yd³) of mixed waste would be generated on and off the site in a 10-year period.
Transportation risks along the entire route for low-level radioactive and mixed waste during the 10-year study period from vehicular accidents is expected to be 2 fatalities and 27 injuries. Latent cancer fatalities associated with this level of radioactive waste transport for the 10-year study period would be 0.0025. There would be no impact on direct use of local railroads, air transportation, or other modes of transportation.	There would be no impact on direct use of local railroads, air transportation, or other modes of transportation.	Risks associated with transporting radioactive waste would increase to 8 vehicle related fatalities, 103 injuries, and 0.075 latent cancer fatality over the 10 year period of study. Minimal impacts would occur on direct use of local railroads, air transportation, or other modes of transportation.	No off-site transportation of radioactive materials and waste would occur. There would be minimal impacts on direct use of local railroads, air transportation, or other modes of transportation.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 3 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Socioeconomics (Economic Activity, Population, and Housing)			
Total direct employment would be approximately 6,600 in 2005. Unemployment rate: Clark County, 5.8% Nye County, 5.2% Total personal income in 2005: Clark County, $32,280,885,000 Nye County, $780,701,000. Population in 2005: Clark County, 1,380,920 Nye County, 38,516. Housing demand in 2005: Clark County, 539,422 Nye County, 14,435.	A decrease from Alternative 1 of 6,490 direct jobs in 2005 would occur under Alternative 2. Unemployment rate increase over Alternative 1 in 2005: Clark County, +1.9% Nye County, +2.5%. Total personal income decrease in 2005 from Alternative 1: Clark County, ($884,676,000) Nye County, ($44,609,000). Population decrease from Alternative 1 in 2005: Clark County, -7,946 Nye County, -583. Housing demand decrease from Alternative 1 in 2005: Clark County, -2,928 Nye County, -218.	An increase over Alternative 1 of approximately 4,550 direct jobs in 2005 would occur under Alternative 3. Unemployment rate decrease from Alternative 1 in 2005: Clark County, -1.1% Nye County, -0.05%. Total personal income increase in 2005 over Alternative 1: Clark County, +$632,638,000 Nye County, +$31,457,000. Population increase over Alternative 1 in 2005: Clark County, +10,020 Nye County, +656. Housing demand increase over Alternative 1 in 2005: Clark County, +3,914 Nye County, +246.	A decrease from Alternative 1 of approximately 2,750 direct jobs in 2005 would occur under Alternative 4. Unemployment rate increase over Alternative 1 in 2005: Clark County, +1.1% Nye County, +1.7% Total personal income decrease in 2005 from Alternative 1: Clark County, ($374,608,000) Nye County, ($18,833,000) No substantial employment level would be triggered; therefore, population and housing demand would not change when compared to Alternative 1.
Geology and Soils			
Testing impacts would include ground motion hazards and secondary seismic effects, soil contamination, alteration of natural drainage paths, and decreased surface stability. Impacts from other activities would include dust creation, soil contamination, and an increase in erosion potential. There would be minimal impacts at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area.	Discontinuing operations would result in no additional impacts to geology and soils. However, the media that have been contaminated or altered by underground nuclear test would as in alternatives remain unavailable for unrestricted use. No surface areas contaminated by past activities would be remediated and any present access restrictions based on contamination would continue.	Impacts would be the same as those listed under Alternative 1. Minimal impacts would be experienced at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	Impacts would include dust creation, soil contamination, and an increase in erosion potential. Minimal impacts would occur at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 4 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Hydrology (Surface Hydrology and Groundwater)			
There would be minimal potential impact from the alteration of existing drainage paths caused by testing. Total effects from continuing groundwater withdrawals are expected to be minor. Local effects to the Yucca Flat Basin could be substantial if the annual water demand exceeds the basin's perennial yield. There could be localized impacts related to underground tests conducted under or near the water table. Monitoring has revealed few instances of migration of radionuclides beyond the near test environment. No impacts are anticipated from waste management activities. Other potential quality impacts would be minimal. Minimal impacts would occur at the Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area.	There would be no new impacts to surface hydrology. Water demand would be reduced to that required for environmental monitoring and for potable water for the caretaker workforce. Contaminated areas would not be restored, resulting in continued possibility of groundwater contamination.	There would be minimal potential impacts from alteration of natural drainage paths caused by new construction. Because of new program activities, other potential impacts would be increased slightly over those listed under Alternative 1. However, the Solar Enterprise Zone has been estimated to require up to 6.8 x 10^7 m^3/yr (5,550 ac-ft/yr) of water. Local effects to the affected basin such as those near Dry Lake Valley could be substantial if the annual water demand exceeds the perennial yield of the basin. Increased waste quantities would not result in impacts. Minimal impacts would be experienced at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.	There would be minimal potential impacts from alteration of natural drainage paths caused by new construction. Other potential impacts generally would be the same as those listed under Alternative 1 except at a decreased level. However, the Solar Enterprise Zone has been estimated to require up to 6.8 x 10^7 m^3/yr (5,550 ac-ft/yr) of water. Local effects to the affected basin such as those near Dry Lake Valley could be substantial if the annual water demand were to exceed the perennial yield of the basin. Minimal impacts are expected at the Tonopah Test Range, Project Shoal Area, Central Nevada Test Area, Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley.
Biological Resources			
Approximately 7,360 acres of generally undisturbed habitat would be disturbed, primarily in support of the Environmental Restoration Program at the NTS, Tonopah Test Range, and Central Nevada Test Area. This would represent approximately 1 percent of total undisturbed habitat in these areas. There would be minimal impact to desert tortoise population viability and on biodiversity or ecosystem functions.	There would be no effect on undisturbed natural habitat. Discontinuation of man-made water sources would change the distribution of horses, deer, and chukar. However, there would be no statewide ecosystem impacts.	Approximately 10,420 acres of generally undisturbed habitat would be disturbed, primarily in support of the Environmental Restoration Program at the NTS, Tonopah Test Range, Project Shoal Area, and Central Nevada Test Area. This would represent an increase of 3,060 acres over Alternative 1. A portion of this area (3,015 acres) could be desert tortoise habitat. The Solar Enterprise Zone could minimally impact biodiversity or ecosystem functions at Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley. Coyote Spring Valley lies within critical habitat for the desert tortoise.	Approximately 9,275 acres of generally undisturbed habitat would be disturbed, primarily for the Environmental Restoration Program and the Solar Enterprise Zone at NTS. The NTS, Tonopah Test Range, Central Nevada Test Area, and Project Shoal Area impacts would generally be the same as those listed under Alternative 1. The Solar Enterprise Zone could minimally impact biodiversity or ecosystem functions at all sites and areas. Coyote Spring Valley lies within critical habitat for the desert tortoise.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 5 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Air Quality and Radiological Air Quality			
Pollutant emissions from stationary and mobile sources would be generated on site and off site. These emissions would be dispersed over a wide area. No major air emission sources are planned. Pollutant concentrations related to NTS activities would be well below ambient air quality standards. No substantial increases in air pollution are expected by 2005 and Nye County would continue its present attainment designation for all criteria pollutants. No additional violations of air quality standards would be provided in the nonattainment area of Clark County. The region is expected to conform with the applicable State Implementation Plan for all National Ambient Air Quality Standards (NAAQS). Radiological air quality impacts would not reach the maximum CAP-88 air dose assessment modeled dose. Impacts would be minimal.	Pollutant emissions associated with stationary sources would be essentially eliminated following discontinuance of operations, and mobile source emissions would be substantially reduced. Radiological air quality impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1. Pollutant concentrations related to NTS activities, though higher than the Alternative 1, would remain below ambient air quality standards. Selected values for two pollutants of concern are PM_{10}: 600 tons/ year, less than one percent of regional burden. CO: 224 tons/year of which 90 tons/year would be in the Las Vegas Valley, less than 0.2 percent of Clark County emissions.	Impacts would be the same as those listed under Alternative 1. Pollutant concentrations related to NTS activities would be lower than those of Alternative 1. All pollutants would remain below ambient air quality standards.
Noise			
Transportation noise levels on site would be minimal and would not produce any noise impacts off site. Temporary noise impacts from construction-related noise would occur within the immediate vicinity of construction sites. Noise impacts would be negligible because the sites are located within remote areas. No sensitive receptors are close to construction areas. Noise from other activities would decrease with distance and would be barely distinguishable from background noise levels.	A minor amount of noise would result from operations vehicles. Other noise levels would be a result of noises typically found in uninhabited desert areas.	Impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1, except for the Defense Programs, which would have the same impacts as Alternative 2.
Visual Resources			
New land disturbance would be located in areas of scenic quality common to the region, but none would be visible from any public viewpoints. Although there would be short-term, local adverse effects because of environmental restoration, there would be long-term beneficial effects because of revegetation.	There would be little change in the overall appearance of the existing landscape.	Most new land disturbance would be located in areas of scenic quality common to the region. However, the areas proposed for the Solar Enterprise Zone facility in Eldorado Valley, Dry Lake Valley, or Coyote Spring Valley have a high visual sensitivity because they cross major highways. Furthermore, Coyote Spring Valley has extensive panoramic views of linear mountain ranges and valleys.	There would be slight changes in the overall appearance of the existing landscape. New ground disturbance would be located in areas of scenic quality common to the region, but none of these areas would be visible from any public viewpoints. The impacts of the Solar Enterprise Zone would be the same as those listed under Alternative 3.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 6 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Cultural Resources			
There would be impacts to cultural resources as a result of ground disturbing activities resulting from construction of new facilities, utilities, road upgrades, and decommissioning of existing buildings. Continued visitation and vehicular traffic could indirectly affect recorded archaeological sites and archaeologically sensitive areas. The precise location of these resources is unknown until archaeological survey is conducted. Surveys will be conducted prior to any ground disturbing activities. Modification of existing buildings would include an evaluation of their historic significance, especially in relation to Cold War/nuclear development themes, to minimize impacts. According to the CGTO, under Alternative 1, access to American Indian culturally significant places would continue to be reduced. The potential would exist for unauthorized artifact collection and culturally inappropriate environmental restoration techniques.	Discontinuance of activities would eliminate most impacts to cultural resources. The degree of impact to American Indian cultural sites, as stated by the CGTO, would be less than that associated with Alternative 1.	The amount of acreage disturbed as a result of activities described for Alternative 3 would double as compared to Alternative 1. Approximately 20,930 acres of ground disturbance are anticipated Construction of new facilities, wells, utilities roads, and burial of contaminated soils may affect cultural resources. Large-scale activities associated with the Solar Enterprise Zone facility could affect cultural resources. Modification of existing buildings would include an evaluation of their historic significance, especially in relation to Cold War/nuclear development themes, to minimize impacts. According to the CGTO, under Alternative 3, access to American Indian culturally significant places would continue to be reduced. Increased visits by students and researchers who collect artifacts, visit sacred areas, and remove plants or animals, and the scraping of land would affect American Indian cultural resources.	Most impacts would be the same as those listed under Alternative 3. Access impacts, according to the CGTO, for American Indians would be less than that experienced under Alternative 1. However, the potential for unauthorized artifact collection would be increased from Alternative 1 because of increased public access.
Land Use Land Zone Areas			
1. Nuclear Test Zone (includes Areas 19 and 20) - 1,120 km^2 (435 mi^2) 2. Nuclear and High Explosive Zone - 180 km^2 (70 mi^2) 3. Research, Test, and Experiment Zone - 45 km^2 (20 mi^2) 4. Radioactive Waste Management Zone - 5 km^2 (2 mi^2) 5. Yucca Mountain Site Characterization Zone (within NTS boundary) - 225 km^2 (90 mi^2) 6. Critical Assembly Zone - 130 km^2 (50 mi^2) 7. Spill Test Impact Zone (within NTS boundary - 15 km^2 (5 mi^2) 8. Reserved Zones on NTS (within NTS boundary) - 1,775 km^2 (685 mi^2)	1. Yucca Mountain Site Characterization Zone (within NTS boundary) 225 km^2 (87 mi^2) 2. Monitored/Restricted Zone (within NTS boundary) - 3,255 km^2 (1,260 mi^2)	1. Nuclear Test Zone (includes Areas 19) 705 km^2 (275 mi^2) 2. Nuclear and High Explosive Zone 381 km^2 (147 mi^2) 3. Research, Test, and Experiment Zone - 575 km^2 (222 mi^2) 4. Radioactive Waste Management Zone 5 km^2 (2 mi^2) 5. Yucca Mountain Site Characterization Zone (within NTS boundary) - 225 km^2 (90 mi^2) 6. Solar Enterprise Zone - 34 km^2 (13 mi^2) 7. Spill Test Impact Zone (within NTS boundary - 15 km^2 (5 mi^2) 8. Defense Industrial Zone - 170 km^2 (65 mi^2) 9. Reserved Zones on NTS (within NTS boundary) - 1,375 km^2 (530 mi^2)	1. Non-Defense Research/Development/Testing Zone (includes Areas 19 and 20) - 1,295 km^2 (500 mi^2) 2. Radioactive Waste Management Zone - 5 km^2 (2 mi^2) 3. Yucca Mountain Site Characterization Zone (within NTS boundary) - 225 km^2 (90 mi^2) 4. Solar Enterprise Zone - 35 km^2 (13 mi^2) 5. Spill Test Impact Zone (within NTS boundary) - 15 km^2 (5 mi^2) 6. Reserved Zones (within NTS boundary) - 1,310 km^2 (505 mi^2) 7. Potential Turnback Area (includes Area 22 Solar Enterprise Zone) - 610 km^2 (235 mi^2)

NOTE: CGTO = Consolidated Group of Tribes and Organizations.

Table S-6. Summary comparison of environmental impacts of the alternatives (Page 7 of 7)

Alternative 1	Alternative 2	Alternative 3	Alternative 4
Occupational and Public Health and Safety (Routine and Accident Operations)			
The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 8 of a single latent cancer fatality and 1 in 21 of a single other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects on workers involved with an accidental release of hazardous chemicals has a hazard index of 0.58.	The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 47 of a single latent cancer fatality and 1 in 120 of any other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects on workers involved with an accidental release of hazardous chemicals has a hazard index of 0.48.	The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 8 of a single latent cancer fatality and 1 in 20 of any other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects on workers involved with an accidental release of hazardous chemicals has a hazard index of 2.4.	The health impacts to workers due to occupational exposure and accidents could result in a probability of 1 in 13 of a single latent cancer fatality and in 1 in 30 of any other detrimental health effect in the worker population. The risk of life-threatening noncarcinogenic effects of workers involved with an accidental release of hazardous chemicals has a hazard index of 0.58.
Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 18,000 of a single latent cancer fatality and 1 in 40,000 of any other detrimental health effect in the population within 50 miles. Potential public exposure to accident release of hazardous chemicals could result in a probability of 1 in 4,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.	Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 20,000 of single latent cancer fatality and 1 in 50,000 of any other detrimental health effect in the population within 50 miles. Potential public exposure to accidental release of hazardous chemicals could result in probability of 1 in 50,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.	Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 18,000 of a single latent cancer fatality and 1 in 40,000 of any other detrimental health effect in the population within 50 miles. Potential public exposure to accidental release of hazardous chemicals could result in a probability of 1 in 4,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.	Health impacts to the public from accidental release of radionuclides could result in a probability of 1 in 20,000 of a single latent cancer fatality and 1 in 43,000 of a single other detrimental health effect in the population within 50 miles. Potential public exposure to accidental release of hazardous chemicals could result in a probability of 1 in 4,000 of a single incidence of cancer in the population. No noncarcinogenic detrimental health effects are expected.
Potential accidental venting of radionuclides from an underground test could result in a probability of 1 in 180 of a single latent cancer fatality and 1 in 400 of any other detrimental health effect in the population within 50 miles.		Potential accidental venting of radionuclides from an underground test could result in a probability of 1 in 180 of a single latent cancer fatality and 1 in 400 of a single other detrimental health effect in the population within 50 miles.	
The maximum reasonably foreseeable radiological accident has a probability of 1 in 10 million years and involves a non-nuclear explosion in a nuclear weapons storage bunker at Area 27. This accident could result in public impacts of 3 to 55 latent cancer fatalities and 1 to 25 other detrimental health effects.	The maximum reasonably foreseeable radiological accident has a probability of 1 in 10 million years and involves a failure of an artillery-fired test assembly at the Tonopah Test Range. This accident would result in only small fractional increases in the probability of latent cancer fatality or other detrimental health effects in the offsite population.	The maximum reasonably foreseeable radiological and chemical accidents are the same as for Alternative 1.	The maximum reasonably foreseeable radiological accident has a probability of 1 in 2 million years and involves an airplane crash into the Area 5 transuranic waste storage unit. This accident could result in public impacts of 1 to 13 latent cancer fatalities and 0 to 6 other detrimental health effects.
The maximum reasonably foreseeable chemical accident has a probability of 1 in 10 million years and involves an airplane crash into the Spill Test Facility. This accident could result in 0 to 3 latent cancers in the offsite population, but no noncancer health effects would be expected.	The maximum reasonably foreseeable chemical accident has a probability of 1 in 13,000 years and involves a multi-container fire at the Area 5 hazardous waste storage unit. This accident would result in only small fractional increases in the probability of latent cancer in the offsite population, and no noncancer health effects would be expected.		The maximum reasonably foreseeable chemical accident is the same as for Alternative 1.
Environmental Justice			
American Indian impacts would only consider American Indian groups and would, therefore, be disproportionately high according to the CGTO's method of defining impacts.	Impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1.	Impacts would be the same as those listed under Alternative 1.

immediately downwind of the fire could be exposed to life-threatening air concentrations of hazardous chemicals. The off-site population within 80 km (50 mi) would not be expected to experience any noncancer health effects, and the likelihood of a single cancer in the population would increase by 0.002 to 0.004.

Under Alternative 2, the maximum reasonably foreseeable radiological accident involves a failure of an artillery fired test assembly at the Tonopah Test Range. The accident has a probability of 1×10^{-7} per year. Nearby workers would be under cover when the device fired, but up to three latent cancer fatalities could occur in workers at the next nearest facility. The off-site population within 80 km (50 mi) would have an increased likelihood of 0.009 to 0.16 of a single latent cancer fatality.

Under Alternative 4, the maximum reasonably foreseeable radiological accident involves an airplane crash into the Area 5 transuranic waste storage unit. The accident has a probability of 6×10^{-7} per year and could result in injuries or deaths to nearby workers due to the physical impacts of the crash or delayed radiation health effects. The worker population at the next nearest facility would have an increased likelihood of 0.04 of a single latent cancer fatality. The off-site population within 80 km (50 mi) could experience 1 to 13 latent cancer fatalities.

The maximum reasonably foreseeable chemical accident is the same as that described for Alternative 1 (airplane crash into the Spill Test Facility).

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

The Consolidated Group of Tribes and Organizations (CGTO) has identified impacts to American Indian groups as a result of Alternative 3. While not physically located in Clark, Nye, or Lincoln counties, these groups have traditional ties to the NTS and surrounding areas. Impacts would include continued reduced access to culturally significant areas, the potential for unauthorized artifact collection, and the potential for culturally inappropriate environmental restoration techniques. Because of the expansion of activities under Alternative 3, potential impacts would be greater than those listed under Alternative 1. These impacts would be perceived only by American Indian groups and would, therefore, have a disproportionately high effect on these groups.

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

Unavoidable Adverse Effects

Unavoidable impacts result from a substantial adverse change to existing environmental conditions that cannot be fully mitigated. Substantive unavoidable impacts resulting from activities addressed in this EIS are discussed in Chapter 5 for each alternative.

Alternative 1 - Continue Current Operations (No Action). All continuing programs and operations at the NTS and NAFR Complex would produce some environmental impacts that may not be possible to mitigate. Impacts from conducting underground nuclear tests, if so directed, remain the largest unavoidable adverse effects of management of the NTS. Past nuclear testing has resulted in the release of large quantities of radioactivity into the subsurface and the formation of subsidence craters. If additional testing at the NTS is directed by the President, an additional increment of these impacts would be added and there would likely be generation of ground motion that could be felt outside of the boundaries of the NTS. Other testing and experimental activity, including subcritical experiments, in support of stockpile stewardship programs would have unavoidable adverse impacts

including placement of radioactivity in the subsurface environment.

At the NTS, surface disturbance associated with any remediation, construction and new testing programs would cause unavoidable impacts on habitat. At the NAFR Complex, surface disturbance associated with any remediation programs would cause unavoidable impacts on habitat.

Certain activities, such as off-road training exercises that take place in desert tortoise habitat, could result in tortoise mortality. It is expected that substantially less than one tortoise would be killed by vehicular traffic on roads per year on average.

Geologic media contaminated by radionuclides would remain contaminated and unavailable for use at any site where underground nuclear testing has been conducted. Contaminated groundwater that could not be remediated would be unavailable for use as well.

Alternative 2 - Discontinue Operations. Past nuclear testing has resulted in the release of radioactivity onto the surface and the subsurface, and in the formation of subsidence craters. These conditions would persist if the NTS were closed.

Closure of the NTS would result in unavoidable adverse impacts to the regional socioeconomic conditions. These impacts would be short-term and would include loss of relatively high paying jobs, increases in unemployment, loss of economic diversification, and out-migration of DOE and contractor employees and their families.

Although the rates of desert tortoise or habitat loss would likely decline relative to Alternative 1, there could be some loss because of security and monitoring vehicular activities. In addition, the loss of manmade surface water sources would cause some redistribution and reduction of animals inhabiting the area.

Because no environmental restoration projects would occur under Alternative 2, contaminated areas of the Tonopah Test Range and the NTS would remain contaminated. Potential land uses that are affected by the presence of contamination would continue to be affected.

At the Project Shoal Area and Central Nevada Test Area, evaluations of geologic media and groundwater contaminated by radionuclides would not occur, and these media would remain contaminated and unavailable for use.

Alternative 3 - Expanded Use. At the NTS and NAFR Complex, the unavoidable adverse impacts of Alternative 3 would be similar to Alternative 1 but greater in extent. Construction of new facilities would affect presently undisturbed habitat and eliminate those areas from other land uses. If a Solar Enterprise Zone project is implemented at the NTS, up to 2,400 acres of desert tortoise habitat could be lost from construction activities.

The unavoidable adverse impacts of Alternative 3 at the Tonopah Test Range would be similar to those of Alternative 1.

At the Project Shoal Area and Central Nevada Test Area, geologic media that may be contaminated by radionuclides where underground nuclear testing was conducted would remain contaminated and unavailable for use. Contaminated groundwater that could not be remediated would be unavailable for use as well.

In Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley, present land uses such as land sailing, model aircraft flying, ultralight operations, off-highway vehicle use, and camping would be precluded by the presence of a solar energy generation facility. The loss of these opportunities would be an unavoidable adverse impact.

Construction of gas lines, pipe lines and/or power lines would affect wildlife and vegetation through direct disturbance of the land and habitat fragmentation. Increased traffic and construction activities could result in desert tortoise mortalities and land designated as critical habitat for this species would be disturbed. At Coyote Spring Valley, use of groundwater could affect discharge at Muddy Spring, and therefore, the resident population of Moapa dace, a threatened fish species,

Construction of a solar energy generation facility and associated infrastructure would create considerable change in the visual environment of the valleys.

Alternative 4 - Alternate Use of Withdrawn Lands. Although there would be no development associated with Defense Program activities at the NTS and NAFR Complex, development of facilities for other programs and the Solar Enterprise Zone would occur under Alternative 4. The unavoidable adverse impacts of past underground nuclear testing activities would remain. Termination of the Defense Program activities would result in short-term adverse impacts to the regional economy.

The unavoidable adverse impacts for sites where underground nuclear testing has been conducted are the same as those for Alternative 1.

In Eldorado Valley, Dry Lake Valley, and Coyote Spring Valley, the unavoidable adverse impacts from development of solar energy generating facilities associated with Alternative 4 would be similar to those for Alternative 3.

Cumulative Impacts

Cumulative impact analysis includes the anticipated impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions. When considered from this perspective, activities proposed for the NTS or other areas in Nevada do not result in a significant contribution to the larger impacts because of the expanding economy and growth patterns of southern Nevada. There are local impacts on the NTS that have been identified in this EIS. Potentially cumulative adverse impacts could occur to groundwater quality (under Alternative 3) and to cultural resources (under Alternatives 1, 3, and 4). Table S-7 provides a summary of anticipated cumulative impacts on a resource-specific basis.

Mitigation Measures

This EIS describes a range of potential measures designed to reduce the potential environmental impacts of the actions considered. Where no adverse impacts are identified for a particular resource, no mitigation measures are identified. Resources and issues for which mitigation measures are identified include the following:

- Transportation—Transportation activities include on-site, off-site transportation of materials and waste and other transportation. A full range of mitigation measures are identified under Alternatives 1, 3, and 4. Some of the mitigation measures include: full government- to-government consultation with American Indian tribes; provide parking within the secured area for shipments of hazardous materials and waste during non-duty hours; and provide information to stakeholders concerning waste shipments.

- Geology—Under Alternatives 1 and 3, the established practice of the DOE to minimize impacts from underground nuclear weapons testing through containment design review and implementation will continue for any potential defense program tests involving nuclear materials. Siting, design, operation, and monitoring waste management facilities on the NTS and NAFR Complex are conducted in accordance with relevant regulations. Secondary containment could be used to mitigate contamination by spills. Areas disturbed by grading and excavation would be minimized. Soils disturbed by grading and excavation would be revegetated.

- Surface Water—Under Alternatives 1 and 3, water diversion structures to prevent alteration of natural drainage patterns would be constructed when required. Lined storage or settlement ponds would be used, and contaminated soils would be restored or removed.

- Groundwater—Under Alternatives 1, 3, and 4, activities potentially affecting groundwater quality unavoidably for the long-term (such as potential underground nuclear weapons testing) cannot be mitigated and will continue to be the subject of an extensive monitoring program. If the monitoring program indicates the potential for radionuclide or hazardous

Table S-7. Summary of cumulative impacts (Page 1 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Land Use	Over the period 1996-2005, it is likely that changes in ownership involving the disposal of public lands in the Las Vegas area will continue. As the Las Vegas metropolitan area continues to expand, land-use development and zoning regulations will extend over a larger geographical area. Where land-use zoning regulations are absent, as in Nye County, incompatible land-use patterns may evolve. The number of civilian aircraft operations in the region will increase as the levels of population and economic activity grow. Military aircraft operations associated with activities at Nellis Air Force Base and the NAFR Complex are expected to increase gradually over the next decade.	Activities at the NTS under all alternatives are not expected to effect land-use patterns or land ownership in measurable ways. The majority of DOE and DoD aircraft transiting to and from the NTS/NAFR Complex use existing corridors that are adequate to accommodate future use. These corridors do not conflict with routes flown by commercial aircraft.	Activities at the NTS are expected to have negligible effects on regional land use patterns and land ownership. Activities at the NTS would have negligible effects on regional airspace and its use.
Transportation	Rapid urban development will continue to place pressure on existing transportation infrastructure. Level of service on key roads within the metropolitan Las Vegas region and on segments of I-15, U.S. Hwy 95, and U.S. Hwy 93 could deteriorate to unacceptable levels by the year 2000. Approximately 4.0×10^6 vehicle trips per day are projected for Clark County in the year 2005. Planned highway improvements over the next two decades are expected to meet the increased vehicle use. Impacts of transportation of radioactive materials consist of impacts from (1) historical shipments of radioactive waste and spent nuclear fuel to the NTS, (2) other historical shipments, (3) contributions made by the alternatives evaluated in the NTS EIS, (4) reasonably foreseeable actions that include transportation of radioactive material, and (5) transportation of general radioactive materials that are not related to a particular action.	Virtually all impacts to transportation would occur on site under all project alternatives. Maximum off-site impacts would occur under Alternative 3 as additional workers at the NTS commute over regional highways. Such impacts are expected to be negligible. In the year 2005, NTS-related activities would add approximately 1,030 one-way vehicle trips per day to approximately 4.0×10^6 occurring daily in Clark County. Trucks bringing radioactive wastes to NTS would increase from 2 under Alternative 1 to 11 under Alternative 3. The total number of waste shipments from off-site generators could reach 40,000 under Alternative 3. The collective general population dose (person-rem) could reach 154.0.	Impacts to regional transportation facilities associated with NTS activities will comprise a negligible increment. The estimated number of transportation-related latent cancer fatalities attributable to NTS Alternative 3 would be indistinguishable from other latent cancer fatalities. They would comprise 0.0008 percent of the total number of latent cancer fatalities.
Socioeconomics	Population in Clark County is projected to increase to approximately 1.2×10^6 persons by the year 2000 and 1.4×10^6 by the year 2005. This rapid growth could result in substantial increases in demand for housing, schools, and other public services. Additional expenses associated with construction of new facilities and personnel could produce adverse conditions in the area of public finances for local jurisdictions and service providers.	NTS-related activities under Alternative 3 would add only 10,000 persons to a projected population of approximately 1.4 million in Clark County in the year 2005. This minor (less than 1 percent) increase would not result in adverse socioeconomic impacts. Under Alternative 2, some out-migration of NTS workers and their families from the region could occur. Impacts would be negligible.	In- and out-migration potentially associated with Alternatives 3 and 2, respectively, would contribute only negligible impacts to regional socioeconomic effects.

Table S-7. Summary of cumulative impacts (Page 2 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Geology and Soils	Geological resources include sand and gravel, mineral products, petroleum and natural gas, and geothermal resources. Continued urban development will influence the demand for sand and gravel with the demand for other resources related more to national and international market forces.	Types of activities at the NTS relate to subsurface contamination through underground testing. Restrictions placed on public access to the site adversely impact the use of mineral and geothermal resources.	It is not anticipated that continued inaccessibility of mineral and geothermal resources at the NTS will result in measurable adverse impacts. These resources are widespread in their occurrence and exist in adequate quantities to fulfill anticipated regional needs.
Hydrology	Rapid urban development in the Las Vegas area and southern Nye County has contributed to a state of groundwater overdraft. This condition is likely to be exacerbated as water made available through allocation from the Colorado River is committed.	Groundwater withdrawals on the NTS in excess of historic pumping levels will decrease the water available for future appropriation in the Death Valley flow system. Such increases in withdrawals would be associated with the location of the Solar Enterprise Zone on the NTS. The location of this proposed facility could lower water table levels on the NTS.	Any additional demand for water derived from groundwater sources could exacerbate an existing overdraft condition. Although the development of the Solar Enterprise Zone has the possibility of lowering the water table on the site (or at other potential locations offsite), water withdrawals associated with its operation are not expected to affect downgradient water levels or water quality.
Biological Resources	Development and implementation of the Desert Tortoise Recovery Plan is designed to ensure the sustainability of the species. It is unlikely, however, that the species will survive in large sections of the Las Vegas Valley. The Clark County Desert Conservation Plan authorizes the "take" of all tortoises on 110,000 acres of non-federal land in the county. The Plan designates several recovery units located in areas of prime desert tortoise habitat that are subject to a number of land-use constraints designed to optimize the survival and recovery of the species in these units.	The potential exists for disturbance to as much as 15,600 acres of land at the NTS under Alternative 3. Such a loss represents a small amount of the available habitat, and adverse effects to the desert tortoise are not anticipated.	Activities at the NTS will not add measurably to the loss of desert tortoise habitat.

Table S-7. Summary of cumulative impacts (Page 3 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Air Quality	The Las Vegas metropolitan area is a nonattainment area for PM_{10} and carbon monoxide (CO). It is anticipated that continued rapid urban development will exacerbate these conditions. The Regional Transportation Commission of Clark County has prepared a Regional Transportation Plan which would allow the county to be in conformity with the State Implementation Plan for all National Ambient Air Quality Standards (NAAQS). Nye County is in attainment for all criteria pollutants.	Much of the local impact under Alternative 3 is associated with ground disturbance and the generation of fugitive dust (PM_{10}). The NTS is located in Nye County and, although activities would increase quantities of dust, it is not expected that State and national ambient air quality standards would be exceeded. Only a small portion of the pollutants associated with mobile sources would occur in Clark County. Although this would add approximately 90 tons per year of carbon monoxide (CO) to the projected CO emissions of 47,532 tons per year in Clark County by the year 2000, it would not create additional violations of the CO ambient air quality standard. Marginal improvements in air quality standards could be expected under Alternative 2.	With implementation of the Regional Transportation Plan in Clark County, it is expected that conformity with the State Implementation Plan for all National Ambient Air Quality Standards will be achieved. Effects associated with NTS activities are not expected to hinder this achievement of conformity. It is not expected that ambient air quality standards in Nye County would be exceeded in the near future.
Noise	In areas undergoing urban development, ambient noise levels can be expected to increase. In areas lacking land-use controls to guide development, incompatible land uses could occur.	Noise impacts associated with activities at the NTS have the potential to affect only an extremely small number of persons because of constraints that exist for access to the site by the general public.	Activities associated with implementation of Alternative 3 would not add measurably to regional noise levels.
Visual Resources	The visual character of areas would change as urban development and mineral extraction activities continue.	No significant changes are expected to occur to existing facilities at the NTS under Alternatives 1, 3, and 4. Under Alternative 2, deterioration of facilities could occur that would marginally degrade the visual environment.	Facilities at the NTS are not accessible to the general public, and impacts would have a negligible impact on regional visual resources
Cultural Resources	As a result of ground-disturbing activities and unauthorized artifact collecting, over 12,000 sites, 12 percent of which (1,460) may be eligible for the National Register of Historic Places, will be adversely affected. Cultural resources found on private lands may be destroyed without data recovery, resulting in a serious loss of the information value inherent in these nonrenewable resources.	Ground-disturbing activities at the NTS could result in the potential loss of an additional 670 sites under Alternative 3. Of these, about 80 may be eligible for the National Register of Historic Places.	The addition of these NTS-related impacts to those attributable to all other activities could raise the number of potentially lost sites to between 12,200 and 12,900. Of these sites, between 1,460 and 1,550 could be eligible for the National Register of Historic Places

Table S-7. Summary of cumulative impacts (Page 4 of 4)

Resource	Non-NTS Activity Impacts	NTS Program Alternative Impacts	NTS Contribution to Cumulative Impacts
Occupational and Public Health and Safety	With the number of persons residing and working in the region, the number of injuries and fatalities will increase. However, injury and mortality rates should remain unchanged, or decrease, assuming the continued enforcement of occupational and public health and safety regulations.	Activities at the NTS could result in up to 775 injuries and 9 fatalities over the period 1996-2005. Occupational radiation exposure to the worker population at the NTS could be 380 person-rem, resulting in 0.128 latent cancer fatalities and 0.096 other detrimental health effects in the worker population.	Activities at the NTS contribute extremely small increments to the risks to which the general population is exposed on a daily basis and should not increase injury and mortality rates in the region.
Environmental Justice	The non-NTS programs and projects account for approximately 284,000 acres of land disturbance. Land disturbance of this size could have adverse impacts on Americans Indians who have expressed concerns about holy land violations and the continued survival of their culture.	Concerns that representatives of American Indian groups have expressed relative to activities at the NTS include holy land violations, perceived risks from radiation, and the continued survival of their culture. Land disturbance at the site could have adverse impacts in these areas of concern	Land disturbance in the region, attributable to changes in use away from an undeveloped state, could potentially raise environmental justice concerns. The increment to such land disturbance contributed by proposed actions at the NTS would be minimal and would not add measurably to the level of concern

material migration beyond the NTS boundaries, large-scale groundwater withdrawals may be implemented to preclude further migration. Although off-site migration of contaminants is not expected to occur during the 10-year period of this EIS, the potentially adverse effects of this migration could be mitigated through management of recharge and discharge areas. Other activities under these alternatives will include both physical controls in the design of the facilities and administrative controls in the operation of the activities to avoid or minimize potential changes in water quality.

- Biology—Under Alternatives 1, 3, and 4, impacts to listed threatened or endangered species would be mitigated by implementing all reasonable and prudent measures required by the U.S. Fish and Wildlife Service. Habitat disturbance may be partially mitigated by revegetation. Careful planning of activities, pre-activity biological surveys, fire-suppression procedures, and implementation of a *Resource Management Plan* would also mitigate impacts to biological resources.

- Air Quality—Under Alternatives 1, 3, and 4, impacts to air quality would continue to be mitigated by use of central parking facilities and car-pooling of workers to and from remote sites, proper vehicle maintenance, imposing speed limits on unpaved roads, and applying water to construction areas for dust control.

- Cultural Resources—Under all alternatives, pre-activity cultural resource surveys would be conducted in undisturbed areas and, whenever possible, historic properties would be avoided. Appropriate data recovery or other mitigation plans prepared in consultation with the State Historic Preservation Officer and Advisory Council on Historic Preservation would be implemented.

The DOE will continue to consult on a government-to-government basis with Native Americans through the Consolidated Group of Tribes and Organizations and will evaluate study proposals to fund those studies, subject to funding, scheduling, and the requirements of existing agreements with state, federal, and local agencies, which address their concerns.

Consultation and Coordination

The DOE invited four federal agencies and one county government to be cooperating agencies in preparation of this EIS. Federal cooperating agencies are the U.S. Air Force, the Defense Nuclear Agency, the U.S. Fish and Wildlife Service, and the U.S. Bureau of Land Management. As the host county of the NTS, Nye County, Nevada, is also a cooperating agency.

In addition, American Indian tribes and groups participated in preparation of this EIS. The DOE invited representatives of the Consolidated Group of Tribes and Organizations (CGTO) to write sections of this EIS so that their concerns and viewpoints regarding the alternatives and the technical analyses would be presented. In many instances, viewpoints of the American Indians differ widely from the DOE's. The Consolidated Group of Tribes and Organizations' viewpoints are included in the text of the NTS EIS as italicized sections. The full text of American Indian concerns related to the alternatives evaluated in this EIS is included in Appendix G of this EIS.

Appendix G, the Native American Resource Document, is a summary of opinions expressed by the CGTO regarding the Environmental Impact Statement for the Nevada Test Site and other off-site test locations within the state of Nevada. The document contains general concerns regarding long-term impacts of the DOE operations on the NTS and a synopsis of specific comments made by the American Indian Writers Subgroup for various chapters of the NTS EIS.

The Native American Resource Document was produced in response to consultation required for the NTS EIS, in accordance with DOE Order 1230.2, American Indian Tribal Government Policy. The consultation focused specifically on four alternative management decisions concerning the future mission of the NTS and related off-site locations in Nevada. However, the present CGTO's response to this consultation is not limited to NTS EIS alternatives, but also integrates relevant

recommendations made by Indian people for previous DOE projects in which American Indians participated.

The CGTO has a long history of relationships with the DOE. In 1985, the DOE began long-term research concerning the inventory and evaluation of American Indian cultural resources on the NTS area. This research was designed to comply with the American Indian Religious Freedom Act, which specifically reaffirms the First Amendment of the United States Constitution, rights of American Indian people to have access to lands and resources essential in the conduct of their traditional religion. These rights are exercised not only in tribal lands but beyond the boundaries of a reservation (Stoffle et al., 1994).

To reinforce their cultural affiliation rights and to prevent the loss of ancestral ties to the NTS, 19 tribes and organizations aligned themselves together to form the CGTO. This group is formed by officially appointed representatives who are responsible for representing their respective tribal concerns and perspectives. The primary focus of the group has been the protection of cultural resources. The DOE and the CGTO have participated in cultural resource management projects for the NTS, including the Yucca Mountain Project, the Underground Weapons Testing Project, and ongoing consultation in compliance with the Native American Graves Protection and Repatriation Act of 1990.

While the American Indian Resource Document provides recommendations that target the preservation of American Indian religion, culture society, and economy, many of the comments presented here focus heavily on cultural resources. This emphasis is the product of continued cultural resource management consultation between the DOE and the CGTO, which has reinforced Indian people's awareness of the wealth of cultural resources present at the NTS. On the other hand, the potential impacts of NTS actions on other essential aspects of Indian life, such as health and socioeconomics, are virtually undocumented. This is due to the absence of consultation and research on the long-term effects of radiation exposure, nuclear waste transportation and storage on the life of Indian communities. Being a minority group, American Indians have also been overlooked in regard to issues of Environmental Justice. The CGTO recommends that these issues be systematically evaluated by the federal government. The opportunity given to the CGTO to contribute their written comments to the NTS EIS is a highly positive step the DOE has taken toward voicing Indian concerns.

References

Regulation, Order, Law

10 CFR Part 1021 — U.S. Department of Energy (DOE), "Energy: Compliance with the National Environmental Policy Act," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1992.

40 CFR Part 1500-1508 — Council on Environmental Quality (CEQ), "Protection of the Environment: Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC, 1993.

DOE Order 1230.2 — DOE, "American Indian Tribal Government Policy," Washington, DC, 1992.

General

DOE/NV, 1995 — U.S. Department of Energy, Nevada Operations Office (DOE/NV), *Implementation Plan for the Nevada Test Site Environmental Impact Statement (Final)*, DOE/NV-390, Pp. 3 and 4, 3-14, Las Vegas, NV, 1995.

ERDA, 1977 — U.S. Energy Research and Development Administration (*ERDA*) *Nevada Test Site, Nevada Final Environmental Impact Statement*, Report No. ERDA-1551, Washington, DC, 1977.

Stoffle et al., 1994 — Stoffle, R.W., M.J. Evans, D.B. Halmo, M.E. Dufort, and B.K. Fulfrost, "Native American Cultural Resources on Pahute and Ranier Mesas, Nevada Test Site," Desert Research Institute Technical Report No. 84, BARA, University of Arizona, Tucson, AZ, 1994.

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About NEPA

The National Environmental Policy Act (NEPA) was enacted to ensure that Federal decisionmakers considered the effects of proposed actions on the human environment and to lay their decisionmaking process open for public scrutiny. NEPA also created the President's Council on Environmental Quality (CEQ) to establish a NEPA review process. DOE's NEPA regulations (10 CFR 1021) augment the CEQ regulations (40 CFR 1500- 1508).

An environmental impact statement (EIS) documents a Federal agency's analysis of the environmental consequences that might be caused by major Federal actions, defined as those proposed actions that might result in a significant impact to the environment. An EIS:

- Explains the purpose and need for the agency to take action
- Describes the proposed action and the reasonable alternative courses of action that the agency could take to meet the need
- Describes what would happen if the proposed action were not implemented — the "No Action" (or Status Quo) Alternative
- Describes what aspects of the human environment would be affected if the proposed action or any alternative were implemented
- Analyzes the changes, or impacts, to the environment that would be expected to take place if the proposed action or an alternative were implemented, compared to the expected condition of the environment if no action were taken.

The DOE EIS process follows these steps:

- Notice of Intent, published in the *Federal Register*, identifies potential EIS issues and alternatives and asks for public comment on the scope of the analysis
- Public scoping period, with at least one public meeting
- Implementation Plan, which gives the results of public scoping and provides a "roadmap" of how the EIS will be prepared
- Draft EIS, issued for public review and comment, with at least one public hearing
- Final EIS, which incorporates the results of the public comment period on the draft EIS
- Record of Decision, which states:
  - — The decision
  - — The alternatives that were considered in the EIS, and the environmentally preferable alternative
  - — All decision factors, such as cost and technical considerations, that were considered by the agency along with environmental consequences
  - — Mitigation measures designed to alleviate adverse environmental impacts.
- Mitigation Action Plan, which explains how the mitigation measures will be implemented and monitored.