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CULTURAL RESOURCES MANAGEMENT PLAN FOR THE NEVADA TEST SITE

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CULTURAL RESOURCES MANAGEMENT PLAN
FOR
THE NEVADA TEST SITE

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EXECUTIVE SUMMARY

As a federal agency, the United States Department of Energy (DOE) has been directed by Congress and the President, through various laws and regulations, to provide leadership in the protection, preservation, and conservation of cultural resources on lands it administers and to manage these resources in a spirit of stewardship for future generations. The purpose of this Cultural Resources Management Plan (CRMP) is to describe how the National Nuclear Security Administration Nevada Site Office (NNSA/NSO) will meet those responsibilities at the Nevada Test Site (NTS).

This CRMP is designed to:

- Implement historic preservation activities on the NTS under the National Historic Preservation Act (NHPA), National Environmental Policy Act (NEPA), Archeological Resources Protection Act (ARPA), American Indian Religious Freedom Act (AIRFA), Native American Graves Protection and Repatriation Act (NAGPRA), Executive Orders 11593, 13007, 13175, and 13287, DOE American Indian Policy, and DOE cultural resources management policy and guidance.

- Summarize the legal background of cultural resources protection on federal land.

- Provide cultural resources compliance guidance to NNSA/NSO, its contractors, and other users of the NTS.

- Outline tribal participation in NNSA/NSO cultural resource activities and details of this consultation process.

- Briefly describe the nature and extent of NTS cultural resources.

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ACRONYMS

ACHP	Advisory Council on Historic Preservation
AIRFA	American Indian Religious Freedom Act
APE	Area of Potential Effect
ARPA	Archeological Resources Protection Act
AEC	Atomic Energy Commission
BARA	Bureau of Applied Research in Anthropology
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CGTO	Consolidated Group of Tribes and Organizations
CRM	Cultural Resources Management
CRMP	Cultural Resources Management Plan
DOE	Department of Energy
DOE/NV	Department of Energy/Nevada Operations Office
DRI	Desert Research Institute
EPA	Environmental Protection Agency
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
IMACS	Intermountain Antiquities Computer System
MOA	Memorandum of Agreement
NAGPRA	Native American Graves Protection and Repatriation Act
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NNSA/NSO	National Nuclear Security Administration Nevada Site Office
NPS	National Park Service
NRDS	Nuclear Rocket Development Station
NRHP	National Register of Historic Places
NTS	Nevada Test Site
SHPO	State Historic Preservation Office
USGS	United States Geological Survey

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Appendix 4	Department of Energy's American Indian Policy
Appendix 5	State of Nevada Cultural Resources Laws
Appendix 6	State of Nevada Comprehensive Preservation Plan 2003 and Nuclear Testing and Operating Plan
Appendix 7	Short Report Format, Intermountain Antiquities Computer System Form, and State of Nevada Historic Resources Inventory Form

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1 INTRODUCTION

The Nevada Test Site (NTS) is a U.S. Department of Energy (DOE) facility managed by the National Nuclear Security Administration Nevada Site Office (NNSA/NSO). It is in a remote region of desert and mountainous terrain in southern Nevada about 105 km (65 mi) northwest of Las Vegas and encompasses approximately 3,561 sq km (1,375 sq mi) (Figure 1). Surrounding the NTS are federal lands administered by the U.S. Department of Defense, U.S. Bureau of Land Management (BLM), and the U.S. Fish and Wildlife Service. Routine access to the facility is from U.S. Highway 95.

Culturally, use of the NTS area extends back at least 12,000 years into the prehistoric past, starting with the Paleoindian period and progressing through the Holocene period to today. Much of this time, hunters and gatherers moved about the landscape in search of needed resources, such as seasonally-available food and material for making tools and other items. Generally, life was harsh compared to other regions of the United States and to modern times. This was mostly due to environmental restrictions, in that, locally-available food and water resources were limited. The first historic documentation for the NTS area involved travelers and surveyors passing through during the latter half of the nineteenth century, followed by small scale mining and ranching activities in the late 1800s and the first half of the 1900s. The NTS was established in 1951 to provide a proving ground for the United States nuclear weapons program. Since its inception, the facility has provided a testing place for various programs and projects related to the national security of the United States.

1.1 Mission of the NTS

The primary mission for the NTS, historically, has been the testing of nuclear devices and weapons; but today, because of a moratorium on such tests, the mission has changed and expanded to meet other national needs and interests. Currently, the NNSA/NSO has three main missions at the NTS: national security, environmental management, and NTS stewardship. Of the three, national security is the primary mission and supports the NNSA Stockpile Stewardship Program, Emergency Response Programs, and the Work for Others program. The environmental management mission involves environmental restoration and waste management. Objectives of the NTS stewardship mission are to manage the NTS, including the land and facilities, as a unique and valuable national resource and to provide emergency management services.

1.2 DOE Cultural Resource Management Program Objectives

DOE recognizes its stewardship responsibilities for managing cultural resources on DOE-administered land and other lands that are impacted by DOE programs. Concern for this public trust has prompted the development of a comprehensive Cultural Resources Management (CRM) program for all DOE facilities and programs. Moreover, there is a statutory and regulatory basis for this program and an agency commitment to meet, not only the letter, but the spirit of these laws and regulations. The cultural resources planning process is integrated into the compliance actions driven by other environmental statutes such as the National Environmental Policy Act (NEPA); the Comprehensive Conservation and Recovery Act; and the Comprehensive Environmental Response, Compensation, and Liability Act.

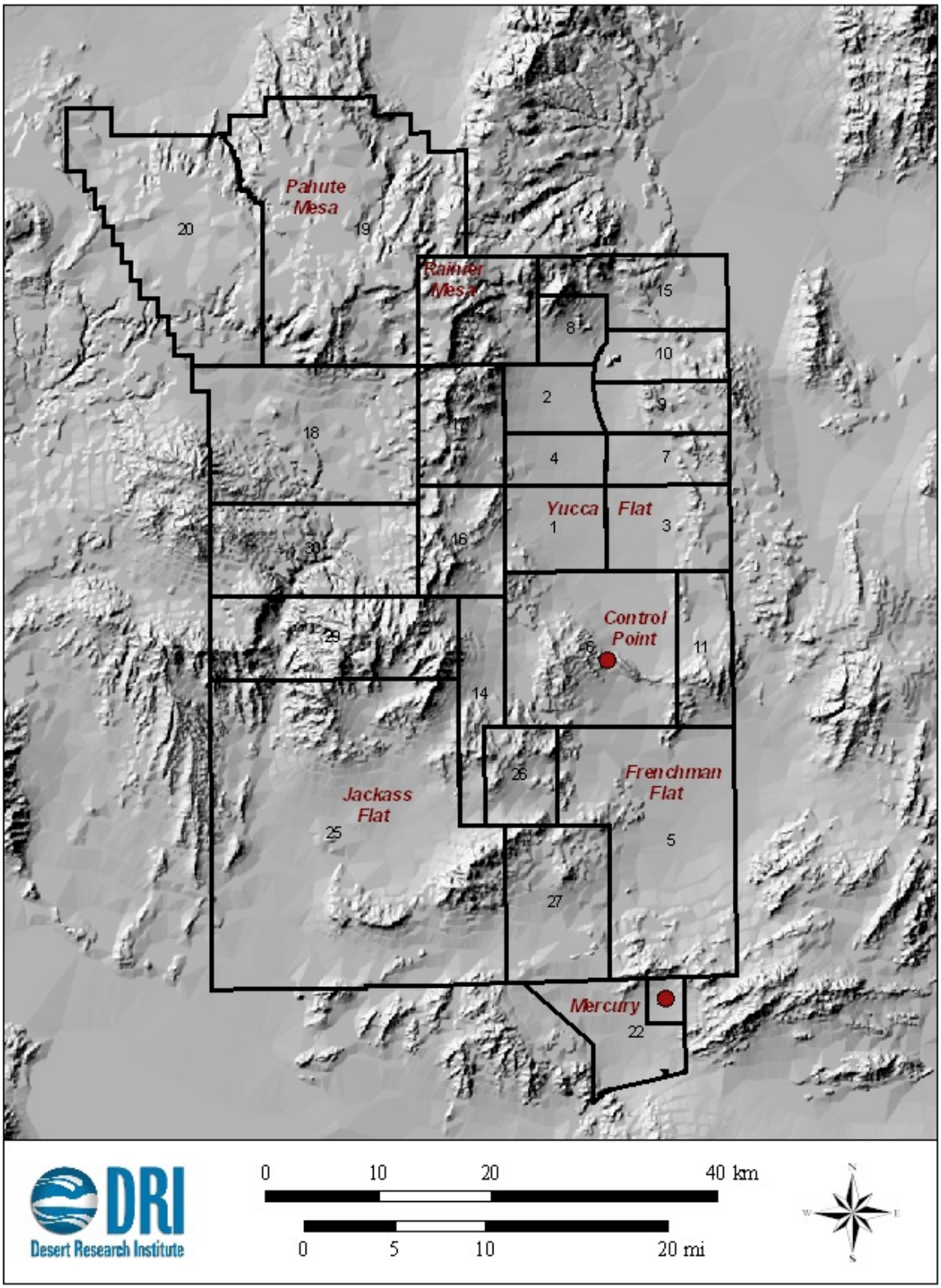

Figure 1. Nevada Test Site.

1.3 Legal Mandates

As a federal agency, DOE has been directed by Congress and the President to provide leadership in the preservation of cultural resources on lands under its jurisdiction and to manage them in a spirit of stewardship for future generations. Various laws, executive orders, and regulations concerning cultural resources have been created to support this ideal. The focus of these laws and regulations is on the inventory of cultural resources on federal lands, nominating the significant cultural resources to the National Register of Historic Places, and providing mechanisms to protect and preserve them. They also delineate American Indian rights to express religious freedom and for the repatriation of American Indian human remains, sacred items, and objects of cultural patrimony.

Antiquities Act of 1906 was the first federal involvement in the protection and management of cultural resources on public lands and allows the President to set aside federally-owned land as historic landmarks. It also established that objects of antiquity on federal lands had to be preserved, restored, and maintained, and could only be disturbed under permit from a federal agency and only for scientific and educational purposes by qualified personnel. It required artifacts and associated documents be cared for in public museums, a system be created to establish national historic monuments, and criminal penalties be assessed for violations by any person who excavates, injures, obtains objects from, or destroys any historic ruin or monument on federally-owned or controlled land without the permission of the appropriate federal department.

Historic Sites, Buildings, and Antiquities Act of 1935 established a national policy of preserving historic sites, buildings, and objects of national significance. It gave the Secretary of Interior authority to acquire, restore, and maintain such sites; and established the National Survey of Historic Sites and Buildings (now known as the National Register of Historic Places, or NRHP), the Historic Sites Survey, the Historic American Buildings Survey (HABS), and the Historic American Engineering Record (HAER).

National Historic Preservation Act of 1966, as amended, establishes a leadership role for the federal government in the preservation of cultural resources and promotes a policy of cooperation between federal agencies, states, tribes, and local governments. The Act also created the Advisory Council on Historic Preservation to serve as an independent counsel on historic preservation issues to the President, Congress, and federal and state agencies. Most importantly, the Act explains the responsibilities of federal agencies and outlines a process by which significant cultural resources are recognized and protected from undertakings and potential effects.

> **Section 106** of the National Historic Preservation Act requires federal agencies to consider in the planning stages of undertakings the potential impacts on historic properties listed on or eligible to the NRHP and provide consulting agencies, including the Nevada State Historic Preservation Office and the Advisory Council on Historic Preservation, sufficient information and time to comment on the effects of the undertaking.
>
> **Section 110** of the National Historic Preservation Act requires federal agencies to inventory cultural resources under their jurisdiction, evaluate and nominate eligible cultural resources to the NRHP, and establish a historic preservation program. Compliance with Section 110 implies

monitoring the conditions of historic properties and taking action to preserve them, stressing that federal agencies must take an active role in the preservation and management of all significant cultural resources under their jurisdiction.

Section 112 of the National Historic Preservation Act requires both agency and contracting personnel conducting cultural resources investigations meet certain professional qualifications and that their investigations meet certain standards. All data and records for historic properties are to be maintained and available for research purposes.

Section 304 of the National Historic Preservation Act directs federal agencies, after consultation with the Secretary of the Interior, to withhold from the public information regarding the location or character of a cultural resource when such disclosure may cause substantial risk, such as theft or destruction, to the resource.

National Environmental Policy Act of 1969, as amended, requires federal agencies to prepare a statement assessing the impact of any proposed action on the environment in advance of projects or actions that occur on federal land. It includes information-gathering, planning, and assessment of project impacts on the environment, including those on cultural resources, and emphasizes natural and social sciences planning and decision-making during the process.

Executive Order 11593 of 1971 formally designates the federal government as the leader in preserving, restoring, and maintaining the historic and cultural environment of the Nation. It gives federal agencies the responsibility for locating, inventorying, and nominating cultural resources to the NRHP.

American Indian Religious Freedom Act of 1978 reaffirms American Indian religious freedom rights under the First Amendment and sets United States policy to protect and preserve the inherent and constitutional right of American Indians to believe, express, and exercise their traditional religions. It includes access to sites on federal properties integral to religious ceremonies and traditional rites. It also directs agencies to consult with interested American Indian groups and leaders to develop and implement policies and procedures to protect and preserve cultural and spiritual traditions and sites.

Archeological Resources Protection Act of 1979 protects cultural resources on federal lands greater than one hundred years old and prohibits looting, vandalism, and unauthorized excavation. No one may sell, buy, or trade items from a cultural resource on federal land. Criminal and civil penalties for violations are mandated, including forfeiture of equipment and vehicles used in any violations. Permits for excavation and removal of cultural resources on federal lands by qualified persons are obtained from the appropriate federal agency and for the purpose of furthering archaeological knowledge for the benefit of the public. The federal land manager must contact any American Indian tribe or organization with an interest in the cultural resource to be excavated. Recovered items remain the property of the United States and are to be preserved by a qualified institution. Federal agencies cannot reveal the location of a cultural resource if by doing so the cultural resource is at risk of being altered or destroyed. Agencies are also to develop plans for

surveying lands other than those scheduled for undertakings and to record and report violations of the Act.

Native American Grave Protection and Repatriation Act of 1990 requires federal agencies to consult with tribes regarding human remains and materials in their collections. The Act acknowledges tribes rights to Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony. Persons can be prosecuted who knowingly sell or purchase, use for profit, or transport for sale or profit Native American human remains or objects covered by this Act. In the case of unexpected discoveries of Native American graves or grave goods during activities on federal lands, the tribes or organizations are to be notified and procedures are agreed upon to establish affiliation and for disposition of the remains or objects. The Act provides for the repatriation of these cultural items from federal archaeological collections and collections held by museums receiving federal funding to federally-recognized tribes when cultural affiliations can be established.

Executive Order 13007 of 1996 directs federal agencies to accommodate the access and ceremonial use of American Indian sacred sites on their lands by American Indian religious practitioners. The confidentiality of these sites are to be maintained by the federal agency and their physical integrity is not to be adversely affected.

Executive Order 13287 of 2003 reemphasizes the federal government policy to provide leadership in advancing the protection, enhancement, and contemporary use of federally-owned historic properties and to promote intergovernmental cooperation and partnerships for the preservation and use of the historic properties. Federal agencies are to maximize their efforts to integrate the policies, procedures, and practices of the National Historic Preservation Act and this order into their program activities to efficiently and effectively advance historic preservation objectives in the pursuit of their missions.

1.4 Purpose of the Cultural Resources Management Plan

Development of a Cultural Resources Management Plan (CRMP) is required under Section 110(f) of the National Historic Preservation Act. The purpose of the CRMP for the NTS is twofold: 1) respond to federal mandates and DOE orders, policy, and guidance for historic preservation; and 2) provide cultural resources compliance guidance to NNSA/NSO, its contractors, and other users of the NTS. As such, the CRMP establishes a framework that:

- Allows sufficient lead time in the NNSA/NSO project planning process to meet cultural resources compliance requirements for field surveys, archaeological excavations, historical evaluations, report preparation, and consultation with the Nevada State Historic Preservation Office (SHPO).

- Guides professional archaeologists who meet the Secretary of the Interior Standards for Historic Preservation in their efforts to conduct archaeological surveys, historical evaluations, archaeological data recovery, identify cultural resources, recommend National Register of Historic Places (NRHP) eligibility determinations, assess project effects, and prepare reports.

- Develops a systematic program to inventory archaeological sites, buildings, structures, and objects that may have significant historical importance.

- Monitors and protects known historic properties.

- Curates cultural resource material and associated records in accordance with the provisions of 36 CFR Part 79.

- Provides the American Indian Consolidated Group of Tribes and Organizations (CGTO) a reasonable opportunity to identify its concerns about historic properties and advise on identification of historic properties, including those of traditional religious and cultural importance. CGTO will also have the opportunity to articulate its views on project effects on such resources and participate in the resolution of adverse effects.

- Incorporates stakeholder, public, Nevada SHPO, Advisory Council on Historic Preservation (ACHP), American Indian tribes, representatives of other federal, state, and local governments, and interested individuals and organizations into the Section 106 review process in accordance with 36 Code of Federal Regulations (CFR) Part 800.

- Disseminates information about the NTS cultural resources management program through an educational outreach program using a variety of print and news media, including scientific journals, local newspapers, press releases, videos, and interpretive displays.

1.5 CRM Responsibilities

NNSA/NSO project and program managers, contractors and their subcontractors, and all other users of the NTS are responsible for incorporating cultural resources review into proposed projects and activities at the NTS.

Implementation and administration of the CRM program for the NTS is the responsibility of the NNSA/NSO Cultural Resources Program Manager within the NNSA/NSO Environmental Management Division. Responsibilities are to ensure that NTS cultural resources and American Indian resources are protected from deliberate or inadvertent destruction from NTS programs and activities and to know, through inventory and research, what cultural and American Indian resources exist on the NTS, determine their significance, and nominate those that are eligible to the NRHP.

The Desert Research Institute (DRI) of the Nevada System of Higher Education, as a contractor to NNSA/NSO, provides historic preservation program support by conducting cultural resources inventories and historical evaluations, preparing reports, developing NRHP evaluations and eligibility recommendations, preparing data recovery plans, conducting archaeological data recovery and other mitigation procedures, overseeing the curation of the NTS artifact collection, maintaining reports and archives of cultural resources information, promoting public education, designing NTS cultural resources protection and conservation efforts, conducting compliance-related and scientific studies of the cultural resources, and participating in the response to American Indian concerns for the cultural resources.

The Bureau of Applied Research in Anthropology (BARA) at the University of Arizona, Tucson has provided support to facilitate the NNSA/NSO American Indian Consultation Program and maintains certain databases for the program. The American Indian Consultation Program is conducted according to the DOE American Indian Policy and applicable legislation and based on a government-to-government relationship. It involves 16 tribes and three official Indian organizations representing three ethnic groups (Western Shoshone, Owens Valley Paiute, and Southern Paiute) from Arizona, California, Nevada, and Utah. Collectively, they are known as the Consolidated Group of Tribal Organizations (CGTO) and have cultural or historic ties to the NTS.

1.6 Key Terms and Concepts

Adverse Effect occurs when an undertaking diminishes the integrity of a cultural resource for inclusion in the NRHP. Adverse effects include the physical destruction, damage, or alteration of a cultural resource; isolation of the cultural resource from its context; introduction of visual, audible, or atmospheric elements not in character with the cultural resource; neglect that results in deterioration or destruction; and the transfer, sale, or lease of the cultural resource.

Advisory Council on Historic Preservation, created by the National Historic Preservation Act (NHPA), is an independent federal agency composed of twenty members that advises the President and Congress on cultural resources management activities. The Advisory Council is also provided the opportunity to comment when federal undertakings or federally-funded or licensed undertakings have the potential to affect cultural resources listed on or eligible to the NRHP or have been designated as National Historic Landmarks.

Area of Potential Effect is the geographic area or areas within which an undertaking may cause changes in the character or use of cultural resources. This area includes the actual site of the undertaking and may include other areas where the undertaking will cause changes in land use, traffic patterns, or other aspects that could affect cultural resources.

Avoidance is a modification of a project or undertaking to prevent effects on cultural resources by avoiding them.

Compliance is most commonly used in CRM to mean the observance of federal laws and regulations in regards to cultural resources.

Conservation is the protection, preservation, data recovery, and management actions that ensure the judicious use of cultural resources through time. This concept is based on the premise that cultural resources are nonrenewable and emphasizes non-destructive use of resources and prevention to degradation and loss.

Consultation is the process to obtain views or advice from parties concerned with the management of cultural resources. Consultation with federal and state agencies is required by law or regulation in most instances, and is advisable when concerned or interested parties are known to exist. Examples of agencies or people for consultation include the ACHP, SHPO, other federal, state, local, or tribal governments, members of the public, Native American Indians, and members of other ethnic

groups. Consulting parties consider ways to reduce or mitigate adverse effects on historic properties that best serve the public interest. A successful consultation results in a MOA signed by the federal agency, SHPO, and ACHP, if participating.

Context is the location at which cultural resources occur as a result of human behavior. Context is extremely important because most past human behavior is understood not only by the material objects themselves, but by where they are found and in their relationship to one another.

Cultural Artifact is any material object created, altered, or used by humans.

Cultural Resources are sites, structures, landscapes, objects, and lifeway skills important to a culture or community for historic, scientific, traditional, or religious reasons. They consist of non-renewable remains of human activity, occupation, or endeavor and are reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features.

Cultural Resources Clearance is a legal process and recommendation that cultural resources have been considered and ground-disturbing projects may begin. Implied in this process, outlined by federal law and guidelines, is that all regulatory and preservation obligations have been met and conditions and mitigation plans have been agreed upon. Neither the NNSA/NSO nor the cultural resources consultant can grant a clearance, and it can only be done through consultation with the SHPO and the ACHP.

Cultural Resources Management is the management of cultural resources in accordance to applicable laws and regulations, executive orders, DOE guides and memorandums, and professional scientific standards. The overall goal is the preservation of cultural resources, either in situ or through appropriate scientific recovery and the curation of the resources and information about them.

Historic Property refers to any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP.

Memorandum of Agreement is a legally binding document produced out of the consultation process whereby the federal agency states the actions it will take to avoid or resolve adverse effects, or documents acceptance of such effects, on historic properties as it carries out its undertaking.

Mitigation is a term for alleviating or lessening adverse effects of an undertaking upon a cultural resource by applying appropriate protective measures or adequate scientific study. Methods of mitigation include changing the design of the undertaking; altering the location of the undertaking; limiting the magnitude of the undertaking; rehabilitating instead of demolishing some of the cultural resources; adopting a planned program of preservation and maintenance; moving cultural resources; donating, selling, or leasing cultural resources; and documentation before destruction.

National Register of Historic Places is a master inventory maintained by the Secretary of the Interior for listing of districts, sites, buildings, structures, or objects significant at national, state, and local levels in American history, architecture, archaeology, engineering, or culture. A cultural

resource is eligible for inclusion in the NRHP if it satisfies criteria stated in 36 CFR Part 60.4 and, when determined eligible through consultation, treated as if it were already listed on the NRHP.

Protection is maintaining the integrity of a cultural resource. Protection can involve some alteration of the cultural resource through scientific research, excavation, enhancement, conservation, rehabilitation, and interpretation.

Preservation is an action that maintains cultural resources in their intact or unaltered condition. It and is generally the preferred alternative and achieved by avoidance and conservation.

Significance is in reference to a cultural resource with a specific legal definition and regulatory application under the NHPA. Significance is determined through a regulated NRHP eligibility process using a set of criteria stated in 36 CFR Part 60.4.

Undertaking is any project, activity, or program under the direct or indirect jurisdiction of a federal agency that has the potential to change the character of a historic property.

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2 COMPLIANCE PROCEDURES

NNSA/NSO is committed to ensuring that the CRM program for the NTS meets the requirements of federal mandates, addresses the concerns of external groups, minimizes adverse impacts to cultural resources, and integrates historic preservation into routine management and project-specific compliance activities. At all times the CRM program attempts to combine preservation and mitigation strategies to meet the needs of the NNSA/NSO missions.

2.1 Summary of Section 106 of the NHPA

Section 106 requires federal agencies to take into account the effect of their activities on properties listed on or determined eligible for the NRHP and to consult with the SHPO, and the ACHP if necessary, concerning those effects and determinations. The criteria for evaluation of properties eligible for nomination to the NRHP are given in 36 CFR Part 60.4. The purpose of consultation is to seek agreement on ways to avoid, reduce, minimize, or mitigate any adverse effects to historic properties. A successful consultation accommodates the needs of the project while maintaining the integrity of the historic property in a manner that meets the regulatory requirements and serves the public interest. It is important to acknowledge that preservation of every cultural resource is unrealistic and not in the public interest. What is required is that cultural resources review be given full consideration in project planning. This means that cultural resources review should be included in the early stages of project planning to allow sufficient time for archival searches; fieldwork, schedule and seasonal constraints, and CRM response.

The Section 106 process, provided below, is codified in 36 CFR Part 800 and should be consulted for a detailed explanation and analysis of the process. Figure 2.1 provides an outline of the process.

2.1.1 Initiate Section 106 Process

Real Estate Operations Permits for the NTS include cultural resources requirements. For specific activities, project proponents submit a project description to NNSA/NSO that is reviewed for cultural resources compliance as part of a NEPA checklist. This process identifies undertakings that require Section 106 cultural resources work

If NNSA/NSO determines that an activity does not have the potential to affect historic properties, then NNSA/NSO has no further Section 106 responsibilities and can proceed with the project. In the NRHP, historic properties are defined as cultural resources included in or that meet the criteria for the NRHP. This category of historic properties applies to prehistoric sites and traditional cultural properties as well as historic buildings, structures, objects and landscapes. Places, buildings, and structures of recent historic significance are also included in the definition of historic properties.

2.1.2 Identify Historic Properties

If an undertaking has the potential to affect historic properties, NNSA/NSO determines the scope of appropriate identification efforts and proceeds to identify historic properties in the area of potential effect (APE). This involves archival and literature searches and may include cultural

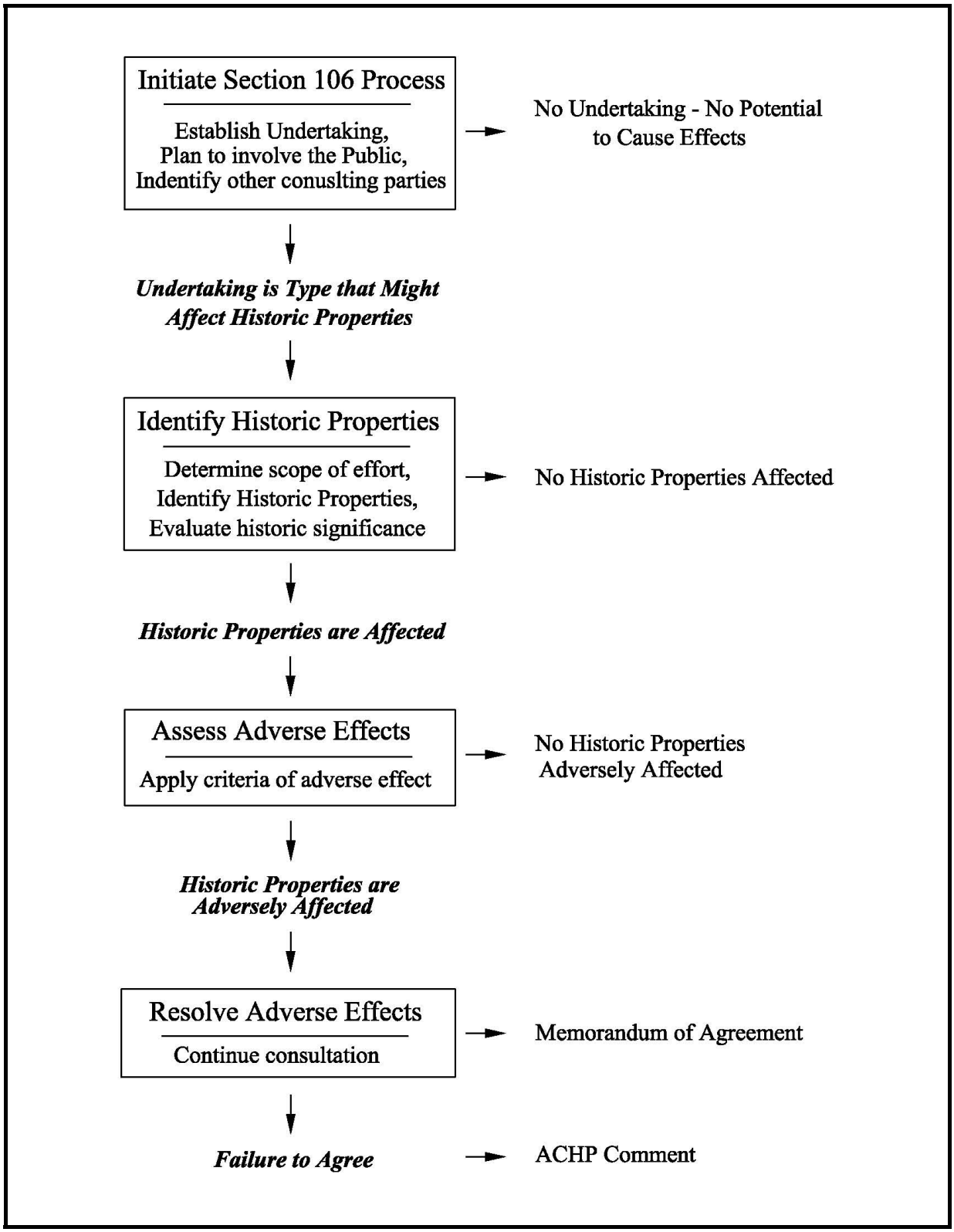

Figure 2.1. Section 106 review process.

resources field inventories. Based on archival research, NNSA/NSO, in consultation with DRI, determines what additional surveys or other field studies may be needed and conducts such studies. If cultural resources are found within the project area, NNSA/NSO evaluates them against the criteria for evaluation in 36 CFR Part 60.4, and published by the National Park Service (NPS) in National Register Bulletin 15, to determine their eligibility for the NRHP. The criteria are presented below.

2.1.2.1 Criterion A: Event

Properties can be eligible for the National Register if they are associated with events that have made a significant contribution to the broad patterns of our history.

To be considered for listing under Criterion A, a property must be associated with one or more events important in the defined historic context. Criterion A recognizes properties associated with single events, with a pattern of events, repeated activities, or historic trends. The event or trends must clearly be important within the associated context. Moreover, the property must have an important association with the event or historic trends, and it must retain historic integrity.

The following steps are involved in determining whether a property is significant for its associative values:

- Determine the nature and origin of the property.
- Identify the historic context with which it is associated.
- Evaluate the property's history to determine whether it is associated with the historic context in any important way.

2.1.2.2 Criterion B: Person

Properties may be eligible for the National Register if they are associated with the lives of persons significant in our past.

Criterion B applies to properties associated with individuals whose specific contributions to history can be identified and documented, and whose activities are demonstrably important within a local, state, or national historic context. The criterion is generally restricted to those properties that illustrate (rather than commemorate) a person's important achievements.

The following steps are involved in determining whether a property is significant for its associative values under Criterion B:

- Determine the importance of the individual.
- Ascertain the length and nature of his/her association with the property.
- Identify other properties associated with the individual.

2.1.2.3 Criterion C: Design/Construction

Properties may be eligible for the National Register if they embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

This criterion applies to properties significant for their physical design or construction, including such elements as architecture, landscape architecture, engineering, and art work. To be eligible under Criterion C, a property must meet at least one of the following requirements:

- Embody distinctive characteristics of a type, period, or method of construction.
- Represent the work of a master.
- Possess high artistic value.
- Represent a significant and distinguishable entity whose components may lack individual distinction.

2.1.2.4 Criterion D: Information Potential

Properties may be eligible for the National Register if they have yielded, or may be likely to yield, information important in prehistory or history.

Certain important research questions about human history can only be answered by the actual physical material of cultural resources. Criterion D encompasses properties with the potential to answer, in whole or in part, those types of research questions. The most common type of property nominated under this criterion is the archaeological site (or a district comprised of archaeological sites). Buildings, objects, and structures (or districts composed of these property types) can also be eligible for their information potential.

Criterion D has two requirements which must *both* be met for property to qualify:

- The property must have, or have had, information to contribute to our understanding of human history or prehistory, and
- The information must be considered important.

2.1.2.5 Criteria Considerations: Exceptions

Ordinarily, certain properties, such as cemeteries, birthplaces or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that achieved significance within the past 50 years, shall not be considered eligible for the NRHP. However, such properties will qualify if they are integral parts of districts that do meet the criteria, or if they fall within the following categories.

Criteria Consideration A — a religious property deriving primary significance from architectural or artistic distinction, or historical importance;

Criteria Consideration B — a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event;

Criteria Consideration C — a birthplace or grave of a historical figure of outstanding importance if there is no other appropriate site or building directly associated with his or her productive life;

Criteria Consideration D — a cemetery that derives its primary significance from graves of persons of transcendent importance, from distinctive design features, or from association with historic events;

Criteria Consideration E — a reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived;

Criteria Consideration F — a property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own historical significance;

Criteria Consideration G — a property achieving significance within the past 50 years if it is of exceptional importance.

2.1.3 Assess Adverse Effects

When no historic properties are present or historic properties will not be affected, NNSA/NSO provides documentation to the SHPO, and barring any objection within 30 days, proceeds with the undertaking. When cultural resources eligible to the NRHP will be affected by the proposed undertaking, NNSA/NSO then proceeds to the next step of assessing possible adverse effects.

NNSA/NSO, in consultation with the SHPO, makes an assessment of adverse effects on the identified historic properties based on criteria found in the regulations (see 36 CFR 800.9b). An effect occurs if the undertaking can change the characteristics qualifying the property for the NRHP.

If NNSA/NSO and SHPO agree that there will be *No Adverse Effect*, NNSA/NSO can proceed with the undertaking according to agreed upon conditions. If there is no agreement or there is an *Adverse Effect*, NNSA/NSO begins consultation to identify ways to avoid, minimize, or mitigate the adverse effects to the historic property. The ACHP is also notified of the adverse effect on the historic property and is provided an opportunity to participate in the consultation. The ACHP may or may not choose to participate and has 15 days to make that decision.

2.1.4 Resolve Adverse Effects

NNSA/NSO consults with the SHPO and other interested parties, e.g., American Indian tribes and organizations, local governments, permit or license applicants, and interested members of the public. The ACHP may participate in the consultation when there are substantial impacts to important historic properties, when a case presents important questions of policy or interpretation, when there is a potential for procedural problems, or when there are unresolved issues of concern to American Indian tribes and organizations.

Consultation for an adverse effect usually results in a Memorandum of Agreement (MOA), outlining the agreed upon measures that NNSA/NSO will employ to avoid, minimize, or mitigate adverse effects. In some cases the consulting parties may agree that no such measures are possible and that the adverse effects must be accepted in the public interest.

When a MOA is executed, NNSA/NSO proceeds with the undertaking under the terms set forth in the MOA. If the terms of a MOA cannot be executed as specified, the agreement is renegotiated to satisfy Section 106 requirements. Implementation of an MOA concludes the Section 106 process.

2.1.5 Failure to Resolve Adverse Effects

If consultation proves unproductive, that is, no agreement concerning adverse effects can be reached, NNSA/NSO, the SHPO, or the ACHP may terminate consultation. If the SHPO terminates consultation, then NNSA/NSO and the ACHP may conclude a MOA without SHPO involvement. When there is no MOA, NNSA/NSO must submit appropriate documentation to the ACHP and request written comments which are to be taken into account in deciding whether or how to proceed with the proposed undertaking.

2.2 NNSA/NSO Section 106 Goals

Section 106 goals specific to cultural resources compliance at the NTS are:

- To streamline and incorporate Section 106 review into the NNSA/NSO environmental compliance and planning process and the project screening and location approval process as an independent action or in coordination with NEPA.

- To involve cultural resources review *early* in the project planning. This is necessary to allow sufficient time for archival searches; fieldwork compatible with time, schedule, and seasonal constraints; and CRM response. Prompt archival work and field survey, when needed, provides for necessary cultural resources protection during urgent project field activities (data gathering, legal survey, drilling, etc.); and incorporates cultural resources work and any CRM-related project changes into budgetary considerations.

2.3 Section 110 of the NHPA

Section 110 reiterates the cultural resources protection emphasis of the NHPA and directs each federal agency to have a program to inventory and nominate historic properties under their control to the NRHP. Most of the emphasis of the NNSA/NSO CRM program is on project-related compliance activities and subject to Section 106 review and consultation. Therefore, to meet Section 110 goals, a program is in place to increase CRM activities in the other areas of the NTS and includes inventories of prehistoric, historic, and more recent significant cultural resources, such as Cold War facilities and nuclear testing locales.

2.4 American Indian Concerns

The NNSA/NSO AIRFA Compliance Program was initiated in 1991 to facilitate compliance with laws regarding American Indian concerns regarding archaeological, plant, and animal resources; traditional cultural properties; and sacred sites on the NTS important to them (Beck et al. 2000). The program is based on a government-to-government relationship and conducted according to applicable laws, executive orders, and DOE American Indian Policy. American Indian concerns and comments on cultural resources activities on the NTS will be invited regularly through forwarding of technical and annual reports, pertinent correspondence, and direct invitations for meetings and field visits.

2.5 ARPA Compliance

ARPA provides for criminal and civil penalties to be levied against any individual who removes, damages, alters, defaces, excavates without authorization, or attempts to injure archaeological resources located on public or American Indian lands. Since the NTS is located on public sector lands, educating NTS workers and users to laws protecting cultural resources is important. The NNSA/NSO Cultural Resources Program Manager serves as the point-of-contact and will consult with the NNSA/NSO security contractor and DRI concerning ARPA violations.

2.6 Preservation and Mitigation

When a historic property dating to the prehistoric period becomes threatened by an NTS program or project activity, an investigation and complete inventory or evaluation of the property is conducted. If it is determined to be recently associated with American Indians, a rapid cultural assessment or other ethnographic study is conducted to evaluate the significance of the property to American Indians. If possible, avoidance shall be selected. If not, an archaeological data recovery plan will be prepared and submitted to NNSA/NSO for approval. NNSA/NSO will then send the plan to the Nevada SHPO and the ACHP for review and approval and to the CGTO for review and comment before implementation. American Indian monitors will be involved in the data recovery work. All cultural materials collected will be curated in accordance with 36 CFR Part 79.

When a historic property dating to the historic period becomes threatened by a NTS program or project activity, a detailed evaluation of the property is conducted. If possible, the property is avoided by the activity. If not, and when appropriate, mitigation measures such as Historic American Buildings Survey (HABS) or Historic American Engineering Records (HAER) documentation will

be prepared according to NPS guidelines. Other data recovery efforts could involve archaeological data recovery plans with artifact collection and excavations to mitigate the adverse effects. Likewise, all cultural materials collected will be curated in accordance with 36 CFR Part 79.

2.7 Unexpected Discoveries of Cultural Materials

While field surveys should locate most eligible properties within a project area, it is possible that the discovery of unrecorded archaeological materials may occur during project activities, particularly if the activities involve digging or excavating. If this happens, the work must stop, the NNSA/NSO Cultural Resources Program Manager notified, and if warranted, DRI would survey and evaluate the cultural resource. If the evaluation indicates an eligible site is present, mitigation measures, including data recovery, would be initiated. If data recovery is not necessary, site records would be updated and emergency consultation with the Nevada SHPO completed. Efforts would be made to ensure the most efficient, expedient, and economical completion of the cultural resources work so the project could proceed.

The inadvertent discovery of an American Indian burial site or skeletal remains would result in an immediate halt of fieldwork until consultation with the CGTO could be completed to develop and implement mitigation measures. The delay of fieldwork would be temporary and the CRM program would adjust priorities to concentrate on an expedient resolution of the problem through an appropriate level of consultation.

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3 CRM METHODS AND STANDARDS

3.1 Personnel

DRI conducts cultural resources advisory, compliance, and research activities for NNSA/NSO. Professional qualifications, inventory, and reporting standards for conducting cultural resources studies on federal lands are outlined in The Secretary of the Interior Standards and Guidelines for Archeology and Historic Preservation (48 Federal Regulation 44738). DRI personnel and DRI subcontractors conducting CRM activities meet these federal qualifications.

3.2 Cultural Resources Inventories

Cultural resources inventories are conducted to ensure compliance with the laws to identify and protect sites and localities on, or eligible for, the NRHP during an undertaking. BLM guidelines, the standard used by most agencies in Nevada and the NNSA/NSO, define three levels of survey intensity.

- A **Class I** inventory entails a compilation of existing archaeological, historical, and environmental data for the area under investigation, including previously recorded cultural resources, particularly those determined eligible to the NRHP, and the development of pertinent research questions. No fieldwork is involved for a Class I survey.

- The **Class II** inventory is a sample inventory of the area under investigation, with an objective to statistically characterize the density, diversity, and distribution of cultural resources. This level of effort is usually acceptable for purposes of planning or predictive modeling. A detailed report is prepared describing the procedures, findings, background research, historic context, and research design.

- A **Class III** inventory is the most common and preferred type of inventory, and requires an intensive field survey of the project area and APE. The objective is to locate and record all cultural resources within the defined area using parallel, pedestrian transects. Recording a cultural resource typically involves determining the boundaries of the resource, plotting the location on a United States Geological Survey (USGS) topographic map, generating a plan map with features, if present, and an inventory of the cultural materials. Forms to be completed include the InterMountain Antiquities Computer System (IMACS) site form, and for certain historic period properties, a State of Nevada Historic Resources Inventory Form. A prepared report describes the work, what was found, and provides recommendations.

All cultural resources inventories conducted for the NNSA/NSO will be designed to provide intensive coverage of the ground surface (i.e., Class III inventory) to ensure that all visible surface remains be identified. Shovel probes or 1-x-1 meter test excavations may also be conducted during field surveys to determine the presence or absence of buried cultural materials, and if present, to assess their general nature and extent (Figure 3.1). These techniques allow for an expedient yet thorough assessment of the subsurface character of a cultural resource with minimal impact to the cultural deposits, and provide a standardized approach that will allow quantitative, qualitative, and

predictive statements to be made about the general nature and subsurface extent of archaeological sites.

Written results of cultural resources inventories are categorized as short reports and follow the format and style of the BLM cultural resources report format. The draft short report is reviewed internally by DRI cultural resources personnel and a derivative classifier to ensure that the report contains no classified material. Following DRI review, the final report is sent to NNSA/NSO for consultation with the Nevada SHPO. At the close of consultation, copies of the short report and associated documentation are placed in the state repository of cultural resources records for southern Nevada.

Figure 3.1. DRI archaeologist recording an excavation on Pahute Mesa (photograph by David Wehner).

3.3 Data Recovery

When a historic property is to be destroyed or substantially altered, or transferred out of federal control without reliable protective restrictions or conditions, archaeological or historical research and data recovery are conducted on the property to recover information that would otherwise be lost.

3.3.1 Archaeological Data Recovery

Data recovery for archaeological sites, both prehistoric and historic, includes mapping, systematic collection of artifacts and other types of samples, and excavation when there are subsurface deposits. Methods of the data recovery effort are described in a data recovery plan and are based on the type, setting, and condition of the cultural resource being investigated (e.g., a rockshelter site will require different data recovery methods than a surface artifact scatter), and by the specific research objectives developed for the work. The data recovery plan is sent to the SHPO for review and approval before fieldwork begins. When appropriate, it is also sent to CGTO representatives for review and comment. If data recovery is to be conducted at a prehistoric or ethnohistoric archaeological site, a rapid cultural assessment of the site is conducted by CGTO representatives to determine the traditional and cultural significance of the site to American Indians. American Indian monitors are also involved in the data recovery fieldwork and report writing.

Upon completion of the fieldwork and subsequent laboratory analyses of the cultural materials collected, a technical report is prepared. Technical reports are comparatively detailed and include an executive summary, introduction, environmental setting, previous cultural resources investigations, cultural history, research objectives, data recovery methods, laboratory methods, data recovery results, summary, conclusion, and management recommendations. Initial drafts are reviewed internally by DRI cultural resources personnel and a derivative classifier. Final drafts are submitted to NNSA/NSO and the SHPO for review and approval. Final reports are distributed to the Technical Information Resource Center at NNSA/NSO, the Office of Scientific and Technical Information in Oakridge, Tennessee, the Nevada SHPO, and if a prehistoric or ethnohistoric cultural resource, to each tribal group of the CGTO. A brief executive summary is also distributed to representatives of the CGTO.

3.3.2 Historical Data Recovery

Historical data recovery applies to the built environment (e.g., buildings, structures) and one common procedure is referred to as HABS/HAER documentation. Information gathered by these programs is deposited in the Library of Congress. Records in the HABS/HAER collections are intended to provide a detailed history of the construction and development of a historic property. Often, HABS/HAER documentation provides the only record of historic properties.

Preparation of HABS/HAER documentation involves consultation with the NPS and SHPO. When NNSA/NSO determines that HABS/HAER documentation can mitigate the adverse effects of an undertaking on an historic structure, the mitigation steps are outlined in a MOA prepared and signed by NNSA/NSO and SHPO. The MOA is binding and NNSA/NSO is responsible for carrying out its provisions.

The level of documentation is commensurate with the degree of significance of the building, site, structure, or object. The NPS, not the SHPO or NNSA/NSO, determines the level of HABS/HAER documentation. The NPS specifies four levels of HABS/HAER documentation:

- **Level I** is the highest level of documentation. Only nationally significant buildings, sites, structures, or objects require Level I documentation which includes a full set of measured drawings, photographs with large format negatives of exterior and interior views and a written history and description of the structure.

- **Level II** documentation consists of selected drawings, photographs with large format negatives of exterior and interior views plus a written history and description.

- **Level III** documentation includes a sketch plan, photographs with large format negatives of exterior and interior views, and written data on an architectural data form to explain what is not visible in the photographs.

- **Level IV** documentation consists of preparing HABS/HAER inventory cards to determine the presence or absence of historic resources in an area.

Documentation prepared for inclusion in the HABS/HAER collections at the Library of Congress must meet the standards and guidelines developed by the NPS to ensure uniformity and archival permanence of the HABS/HAER collections. These standards and guidelines are as follows:

- **Standard I**: Documentation shall adequately explicate and illustrate what is significant or valuable about the historic building, site, structure, or object being documented.

- **Standard II**: Documentation shall be prepared accurately from reliable sources with limitations clearly stated to permit independent verification of the information.

- **Standard III**: Documentation shall be prepared on materials that are readily reproducible, durable, and in standard sizes.

- **Standard IV**: Documentation shall be clearly and concisely produced.

Draft HABS/HAER reports are sent to the NPS for review and approval. Final reports are distributed to the NPS, SHPO, and the Nevada Historical Society in Las Vegas, Nevada.

3.4 Analysis and Cataloging of Cultural Materials

All cultural materials recovered during data recovery are taken to the DRI analysis laboratory and checked against a reference log compiled by field personnel. Reference logs are filed for future use and are part of the cultural resources records maintained at the curation facility. All artifacts are assigned a unique number composed of the permanent site number, a reference number, and a sequential specimen number. The permanent site number, assigned by the Nevada state repository, is consistent with the Smithsonian trinomial method using a numerical code for the state, two letters for the county where the cultural resource is located, and a sequential number assigned for each cultural resource in that county. The reference number is assigned in the field, reflecting the cataloging of the artifacts by provenience. Specimen numbers are assigned in the laboratory to artifacts within the hierarchical framework of the reference number.

DRI policy for cleaning artifacts is that they are only subjected to the most minimal treatment needed for cataloging and analysis, thereby guaranteeing they are preserved in a natural state for future reference. When special analyses, such as when microscopic lithic use-wear studies are planned, ultrasonic cleaning methods may be used.

After cataloging and cleaning, analysis of the artifacts is directed by a qualified professional archaeologist familiar with established procedures. Generally, analyses of the artifacts follow the established typologies for the Great Basin region, and metric measurements and morphological attributes are coded for each item. Standardized code sheets and forms are used for recording the measurements and attributes of the artifacts and all data are subsequently entered into an electronic database.

3.5 Cultural Resources Records and Databases

3.5.1 Reports, Records, and Forms

Cultural resources records and databases are documents and other media that record and track the inventory, data recovery, laboratory treatment and analysis, curation, preservation, research, legal compliance, or any other CRM activity regarding cultural resources. Records and databases for the NTS are maintained by DRI and kept in the documents room at the NNSA/NSO curation facility in the Frank H. Rogers Building on the DRI campus in Las Vegas, Nevada. Examples include site forms, environmental data, excavation forms, maps, correspondence, field notebooks, work requests, written reports, analysis forms, electronic databases, and photographs.

Final reports used for consultation with the SHPO and ACHP represent important sources of the archaeological and historic record, and original archival papers of final reports are maintained at the curation facility in Las Vegas. Copies of final reports are on file at NNSA/NSO and DRI facilities for management and research purposes. Copies are also distributed to various institutions, state and other federal agencies, and interested persons as part of the consultation process and for public outreach.

3.5.2 Cultural Resources Databases

DRI maintains and updates the following databases to support the NNSA/NSO cultural resources program:

- **Archaeological Site Database** contains an inventory and description of all recorded prehistoric and historic sites on the NTS from 1978 to present, including site forms and USGS 7.5 minute topographic maps showing site locations.

- **Cultural Resources Survey Database** contains written reports describing the results of site-specific cultural resources inventories conducted on the NTS since 1978.

- **Curation Database** contains a listing of all cultural materials collected on the NTS through approved data recovery plans and contains artifact descriptions, location, date collected, and site number.

- **Technical Report Database** contains comprehensive reports of all archaeological data recovery programs and other archaeological investigations conducted on the NTS since 1978.

- **GIS Database** contains the geographic information for archaeological surveys and site locations in an electronic format.

3.6 Cultural Resources Monitoring Program

Monitoring of cultural resources enables NNSA/NSO to take an active role in its stewardship responsibilities. Gathering such information establishes procedures to maintain the integrity of

cultural resources, their condition through time, and ensures that NTS activities do not adversely affect them. Monitoring also verifies that avoidance or other mitigation procedures agreed upon during consultation have been followed.

The cultural resources monitoring program for the NTS includes archaeological sites, traditional cultural properties, and historic buildings, structures, and objects that have been determined eligible for the NRHP. There are two types of monitoring activities. The first is associated with an undertaking and is typically conducted during and after land-disturbing activities or building modifications to ensure that historic properties are not adversely affected from the undertaking. The second is an on-going annual effort to conduct field evaluations at NRHP eligible properties to document the current state of the resource and if the resource has deteriorated. If so, then a determination is made as to the cause and appropriate remedial actions. Some identified cultural resources and traditional cultural properties are inspected annually, assessing their conditions, and taking photographs. Other properties monitored are identified from the list of qualifying cultural resources with the goal to visit all NRHP properties and then begin the cycle again. The information obtained serves for future monitoring of these resources and as an indicator for the overall effectiveness of the NTS cultural resources program.

3.7 Archives and Curation

NNSA/NSO is responsible for the long-term management and preservation of cultural materials recovered from its lands and for choosing a repository with adequate long-term curatorial capabilities appropriate to the nature and content of the materials. The NNSA/NSO artifact collection and associated records are maintained in the NNSA/NSO curation facility in the Frank H. Rogers Building of DRI, Las Vegas, Nevada (Figure 3.2). The facility is under the direction of the NNSA/NSO Cultural Resources Program Manager and maintained by DRI. The collection is managed and preserved according to professional museum and archival practices, and in compliance with 36 CFR Part 79. Periodic inspections and inventories, with annual reports to NNSA/NSO, document the condition of the collections and establishes that the collections are present and in good condition.

The collection contains more than a half million artifacts and associated documentation. In 1997, DRI completed an inventory of most of the archaeological materials collected from the NTS. This also consisted of physical inspecting the artifacts along with their archival packaging and labeling. The artifacts are currently stored in polyethylene bags in acid free, plastic archive boxes and kept on metal shelving in a room specific to the collections at the curation facility. Records associated with the collection, including project files, site records, and reports, are stored in fireproof filing cabinets in a separate room specific for documents. Maps are placed in metal map cases. Records of the items repatriated under NAGPRA are also stored in the documents room.

Both the artifacts and documents are available for inspection and study by persons with legitimate research or cultural interest. According to ARPA and the NHPA, access to records associated with archaeological collections may be restricted in order to protect archaeological sites from harm, theft, or destruction. NNSA/NSO makes the determination if a request for access to the collection is appropriate. Normally, people making the request are federal agency officials, American Indian tribal

Figure 3.2. Artifact collection room in the curation facility.

members, archaeologists conducting research on the history or prehistory of the region, and others who have an interest in the collections for research purposes. The collections are also available to qualified professionals for study, loan, and use for scientific analysis, scholarly research, public interpretation, and exhibition. Qualified professionals include curators, conservators, collection managers, exhibitors, researchers, scholars, archaeological contractors, and educators. Students may use the collection under the direction of a qualified professional.

Use of the collection is subject to terms and conditions necessary to protect and preserve them and their research potential. Any items deemed to be of religious significance will be made available to persons for use in religious rites or spiritual activities. No collections will be loaned to any person without a written agreement between NNSA/NSO and the borrower specifying the terms and conditions of the loan.

3.8 American Indian Program

3.8.1 Consultation

The goal of the NNSA/NSO American Indian Program is to consult with the CGTO to identify values and resources important to American Indians and develop recommendations for the protection and management of those resources. This goal will be accomplished by the implementation of a

consultation program in accordance with AIRFA, NHPA, NAGPRA, and DOE American Indian Policy. Consultation will recognize the government-to-government relationship between NNSA/NSO and the CGTO. The following eight steps comprise the NNSA/NSO American Indian Consultation Program. The program is conducted on behalf of NNSA/NSO by BARA, with the assistance of DRI. NNSA/NSO provides program guidance, scopes of work, and quality control.

3.8.1.1 Define Consultation

Federal consultation is driven by specific statutes, regulations, and policies. It is a process by which American Indians with cultural or historic ties to the area are brought into discussions about the effects of NNSA/NSO activities on resources and traditional values important to American Indians. It can include an exchange of information, repatriation, access to religious sites, meetings, conducting special studies, cultural assessments, and participation in NNSA/NSO programs. Consultation will be conducted in a culturally sensitive manner, respectful of tribal needs and concerns, and commences early in the planning process.

3.8.1.2 Establish Cultural Affiliation

Sixteen tribes and three official Indian organizations representing three ethnic groups (Western Shoshone, Southern Paiute, and Owens Valley Paiute) from Arizona, California, Nevada, and Utah have cultural or historic ties to the NTS. Collectively this group is called the CGTO and represents the American Indian tribes and organizations. Other tribes may be included depending on the scope of the NNSA/NSO activities.

3.8.1.3 Tribal Contact

Tribal contacts will be based on a government-to-government relationship and tribal chairpersons will be the principle points-of-contact. Official tribal contact representatives are designated by the tribes to represent their respective tribal governments. In addition, tribal individuals that can provide valuable cultural insight will be added as “interested persons.” In general, maps, letters, reports, photographs, and other correspondence relevant to the issues to be discussed will accompany the initial communication.

3.8.1.4 Tribal Meeting

Face-to-face meetings between NNSA/NSO and tribal representatives provide a forum for obtaining advice and opinion, discussing upcoming work, resolving controversial issues, approving reports, appointing consultation committees, and developing management recommendations.

3.8.1.5 Forming Consultation Committees

Indian tribal governments are inundated with projects, requests, and paper work, all needing attention. Most tribal government officials do not have the time or energy to be involved in every aspect of tribal business. Hence, consultation committees are formed to work on specific projects

and report to tribal councils. The committees are composed of Indian people selected by tribal governments.

3.8.1.6 Site Visits

As many activities involve land disturbance, it is essential that site visits by traditional cultural experts or consultation committee members be conducted. These visits are used to identify cultural resources having ceremonial or religious significance and other resources important to American Indians.

3.8.1.7 Develop Management Recommendations

Recommendations for the mitigation, protection, or management of traditional, cultural, or natural resources important to American Indians are developed by tribal cultural experts or consultation committee members. They are then presented to the tribal councils for approval. Upon tribal council approval, official recommendations are given to NNSA/NSO. The feasibility of tribal recommendations depends on whether they remain within the federal statutes and regulations that govern land management decisions and on the ability of NNSA/NSO to implement them.

3.8.1.8 Closing Consultation

Due to the variety of programs and activities, several individual consultations may occur. The close to consultation is NNSA/NSO's official response to tribal recommendations. Because this is a long-term program, it is important that a positive relationship between NNSA/NSO and the CGTO be maintained and that future consultations build upon and incorporate lessons learned from previous consultations.

3.8.2 American Indian Monitoring

CGTO representatives observe and participate in archaeological excavations to ensure the work is conducted in a culturally sensitive manner and to help identify potential burial sites, funerary objects, and sacred objects. DRI provides general training for the American Indian monitors before the fieldwork and general supervision during the fieldwork. Archaeologists from DRI and ethnographers from BARA may assist the monitors with their field journals and in preparation of project monitoring reports provided to NNSA/NSO.

3.8.3 American Indian Databases

BARA maintains the following databases to support the NNSA/NSO American Indian Program:

- **American Indian Low Level Radioactive Waste Transportation Study** database contains maps of transportation routes, traditional use areas, locations of involved tribes, reports and other information regarding the social and cultural impacts to American Indians of transporting low level radioactive waste to the NTS.

- **Appendix G of the 1997 Nevada Test Site Environmental Impact Statement** contains a summary of opinions expressed by the CGTO regarding the effects of NTS programs and activities on resources important to American Indians.

- **Native American Cultural Resources at the Nevada Test Site** contains the results of on-site visits by tribal elders to 11 ethnoarchaeology sites, 8 ethnobotany sites, and 13 ethnozoology sites on Pahute and Rainier Mesas in the northern part of the NTS.

- **Native American Graves Protection and Repatriation Act** database contains the results of NAGPRA consultation with the CGTO concerning the NTS artifact collection.

- **American Indian Rapid Cultural Assessments** contains the results of American Indian Rapid Cultural Assessments at Double Tracks, Clean Slates, Central Nevada Test Area, Kistler Aerospace project location, and low level radioactive waste transportation routes.

- **Rock Art Interpretive Study**. Contains the locations of rock art sites on the NTS and interpretations by CGTO representatives.

3.9 Public Outreach

Current interactions with the public and scientific and academic communities concerning the CRM program at the NTS consist of cultural resources technical reports provided to education institutions and other interested persons; meetings with American Indian tribal representatives; presentations to local societies and schools; participation in local student activities, such as Science Day and Odyssey of the Mind programs; journal publications; papers presented at local, national, and international professional meetings; tours of the curation facility; and guided tours of the NTS cultural resources.

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4 CULTURAL RESOURCES ON THE NTS

4.1 Cultural Resources Investigations

Prior to the establishment of the NTS and later in the 1960s, several cultural resources investigations were conducted in the area. These were limited in scope, mostly exploratory in nature, and not part of an established cultural resources program. Cultural resources projects conducted on the NTS since the late 1970s by DRI and others exceed 600 with more than 3,600 cultural resources recorded. Currently, about four percent of the NTS has been investigated, mostly by Class III inventories and some data recovery efforts. Most cultural resources are prehistoric, accounting for 90 percent, while the remaining 10 percent are historic, recent scientific significance related to test site activities, or are of unknown age. For the historic and recent scientific cultural resources, nearly 75 percent are associated with NTS activities, either as support facilities or as part of testing projects.

Types of cultural resources are prehistoric and historic isolated artifacts, artifact scatters, caches, water sources, prehistoric chipped-stone quarries, temporary camps, ceremonial areas, rock art, homesteads or residential bases, mines, mining camps, one historic townsite, and NTS buildings and structures. Surface areas encompassed by the cultural resources vary substantially, ranging from a few square meters for small localities and artifact scatters to over several square kilometers for chipped-stone quarries. Historic mining sites are known at the northern edge of Yucca Flat, the eastern and northern edge of Rainier Mesa, Mine Mountain, and the eastern part of Jackass Flats. Sites associated with nuclear testing are scattered throughout the NTS with most in Yucca Flat, Frenchman Flat, Pahute Mesa, Rainier Mesa, Aqueduct Mesa, and Jackass Flats.

The largest number of recorded cultural resources are in the northwest part of the NTS on and around Pahute and Rainier mesas, followed by Jackass Flats in the southwest and around Yucca Mountain. The relatively high number of cultural resources in these areas are indicative of NTS activities where most cultural resources investigations have been in response to various NTS projects. In contrast, fewer cultural resources are reported where there have been less NTS projects.

4.2 Prehistoric Cultural Resources

Prehistoric site types are based on the theories of hunter-gatherer behavior. The definition of a temporary camp is a short term or seasonal center of activities for a group where processing, manufacturing, maintenance, and living activities occur. The artifact assemblage, and features if present, reflect a relatively high diversity. In contrast, an extractive locality, such as a quarry, is where a specific resource procurement task is conducted, and reflects a limited number of activities. The artifact assemblage and feature diversity is relatively low. A processing locality, such as a milling station or cache, is where a specific resource processing task occurs. Expectations in diversity are the same as for resource extraction. An undefined locality is a site that cannot be placed into one of the above types based on the available information and usually consists of a limited number of artifacts. A lithic scatter may also be considered a locality, but is larger and denser. Most of the recorded prehistoric cultural resources are isolates and lithic scatters, with the next most common being temporary camps and localities. About 33 percent of the prehistoric sites are eligible to the NRHP and primarily include the more substantial sites, such as residential bases, temporary camps, and large and

dense lithic scatters. At least 10 sites are associated with ethnohistoric American Indian groups. All the ethnohistoric sites are eligible to the NRHP

4.3 Historic Cultural Resources

Classification of historic sites is based on themes of mining, ranching, transportation or communication, and of recent scientific and historic significance involving DOE and DoD testing activities. The more numerous and prominent are mining and NTS testing activities. Historic mining sites generally involved prospecting, ore extraction, ore processing, or support camps. One abandoned historic mining townsite is present. Associated with the NTS nuclear experiments and weapons tests are support facilities, extant structures, foundations, and other related materials from various atmospheric and underground nuclear tests. About half of the recorded historic period cultural resources are intact and not disturbed..

4.4 Accomplishments

Some significant and far-reaching accomplishments have been made concerning the cultural resources on the NTS over the last three decades. Numerous reports, a large number of them detailed and indepth studies, have been written by DRI and BARA. Other documents include papers presented at conferences, journal articles, at least four books, and two graduate theses at the University of Nevada, Las Vegas and one at the University of Nevada, Reno. Three film documentaries, two for the local public and one with an international audience, have also been produced.

Many of the cultural resources reports pertain to the prehistoric period, and involve settlement patterns, ancient technologies, ideology, and adaptive strategies. Most archaeological data recovery efforts have been conducted in the woodlands on the mesas located in the northern portion of the NTS (Amick 1992; Amick et al. 1991; Drollinger 1992, 1993; Drollinger et al. 1992; DuBarton 1992; Henton and Pippin 1987, 1991a, 1991b; Hicks et al. 1991; Johnson and DuBarton 1992; Johnson et al. 1999; Jones 1992, 1993, 1995; Klimowicz et al. 1992; Lancaster 1992; Lockett 1991; McLane 1992; Monteleone 1991; Pippin et al. 1992; Simmons 1991; Walsh and Pippin 1992; William et al. 1992). Studies have also been conducted at the major water sources and ethnohistoric residential bases, and include Captain Jack Spring, Tubb Spring, Whiterock Spring, Reitmann Seep, Cane Spring, and Tippipah Spring (DuBarton and Drollinger 1996; Jones 2001, 2005a). Basic research objectives were to characterize these types of sites, being the most complex and diverse, and determine what kinds of artifacts and features are represented in the archaeological record. Scholarly contributions produced from this large corpus of archaeological data for understanding the prehistoric cultural history of the region include a local chronology and a syntheses on past settlement patterns and adaptive strategies (Pippin 1995, 1998a, 1998b).

Some cultural aspects of American Indian lifeways, particularly traditional practices and ideologies, have been documented. These studies focused on natural (i.e., plant) and cultural resources and their use and interpretation as acknowledged by various elders of the American Indian tribes and groups with traditional ties to the region (Stoffle et al. 1989, 1989, 1990, 1994). In addition, issues with AIRFA have been addressed (Pippin 1991), and NAGPRA consultations were successfully completed with the repatriation of some of the artifacts collected during archaeological investigations (Stoffle

et al. 1996; Stoffle et al. 2001). An American Indian monitoring program has been established for archaeological data recovery efforts (Johnson et al. 1999; e.g., Arnold et al. 1998; e.g., Chavez et al. 1996). In another project, this time in upper Fortymile Canyon (Figure 4.1), a collaborative effort was made by DRI, BARA, and representatives of the American Indian groups to document the petroglyphs at one of the premier rock art sites of the Great Basin (Drollinger et al. 2000; Jones 1996; Jones and Drollinger 1997; Zedeno et al. 1999). Additional rock art studies involving pictographs have been conducted at and around Captain Jack Spring (Dubarton and Drollinger 1997; Monteleone 1993, 1994).

Figure 4.1. Petroglyph on boulder in Fortymile Canyon.

Several localities on the NTS have remains, some quite substantial, of historic mining activities. One is the Wahmonie townsite, recorded as an archaeological resource (Jones et al. 1996), in the southern part of the NTS around Mine and Skull mountains. A second mining district is around Oak Butte and Oak Springs at the northern edge of the NTS and is also where the Bower Cabin site is located. The Bower Cabin site, named after B.M. Bower a noted author of western novels during the first half of the twentieth century (McLane 1996), has been recorded and documented, as were some chronological listings of the Oak Spring mining district (Drollinger 2003a).

The NTS is best known for the testing of nuclear weapons, in the atmosphere initially and later underground. Nearly all the atmospheric tests were conducted in the 1950s during the early phases of nuclear explosive experiments, while most underground tests in vertical shafts or horizontal tunnels

were later, from the early 1960s until the moratorium in 1992. Studies of cultural resources associated with nuclear testing include the Area 2 Equipment Support Yard (Johnson 1994), the Japanese Village (Johnson and Edwards 1996), Camp Desert Rock (Edwards 1997), the Apple-2 Historic District in Yucca Flat (Johnson and Edwards 2000), the Frenchman Flat Historic District (Johnson et al. 2000) (Figure 4.2), the Yucca Lake Historic District (Jones et al. 2005), underground nuclear tests in Frenchman Flat (Jones and Drollinger 2001), bunkers used in atmospheric nuclear tests (Edwards and Johnson 1995; Johnson 2002; Jones 2003, 2004), benches for viewing atmospheric nuclear tests (Jones 2005b), buildings in the Area 6 Control Point area (Drollinger et al. 2003), the Super Kukla reactor facility (Drollinger et al. 2000; Drollinger and Goldenberg 2004), and underground nuclear tests in tunnels (Drollinger et al. 2007; Drollinger et al. 2008; Jones, Bullard, and Beck 2006). Sedan Crater, a Plowshare nuclear experiment conducted in 1962, is listed on the NRHP (see Frontispiece).

Figure 4.2. Remains of bank vault on Frenchman Lake from early nuclear testing phase.

Coinciding with the nuclear weapons testing from the mid 1950s to the early 1970s were the Rover and Pluto programs in the southwest part of the NTS. The Rover program was for the development of a nuclear-powered rocket for outer space, while the Pluto program was for testing a nuclear-powered missile. Engines for both programs were tested at the NTS. Cultural resources studies for the Rover program include the maintenance and disassembly buildings (Beck et al. 1995; Beck, Goldenberg, Drollinger, Jones, and Winslow 1996; Drollinger et al. 1997; Drollinger, Goldenberg, and Beck 2000a), the test cells (Beck et al. 2000; Drollinger, Goldenberg, and Beck 2000b), the Railroad Transport System (Drollinger 1999), and the Radioactive Material Storage Facility where rail cars used for transport and specially-modified rail cars as testing vehicles are currently stored (Drollinger 2003b). The primary engine of the Railroad Transport System was donated to the Railroad Museum in Boulder City, Nevada. Cultural resources studies for the Pluto facility have been conducted for the disassembly building (Drollinger, Goldenberg, and Beck 2000c; Jones et al. 1996) and the control point area (Drollinger et al. 2005).

5 CULTURE HISTORY FOR THE NTS

The NTS resides in the southern Great Basin where a number of chronological sequences have been developed (Lyneis 1982; Pippin 1995, 1998a; Thomas 1982,1983; Warren and Crabtree 1986). The one developed by Pippin (1995, 1998a) is the most relevant for the NTS (Figure 5.1). Material culture remains on the NTS range from the early prehistoric (Jones and Edwards 1994; Pippin 1995, 1997; Reno 1985) to historic, with the latter including American Indians (Steward 1938; Pippin 1998b; Reno and Henton 1991), miners (Drollinger 2002; Jones 2001; Jones et al. 1996; see Elliott 1966; see Zanjani 1992), a novelist (Drollinger 2002; McLane 1996), the U.S. Air Force bombing and gunnery range, DOE and DoD nuclear weapons testing (Beck et al. 1996; Drollinger et al. 2007, 2009; Fehner and Gosling 2002; Johnson et al. 2000; Jones 2003, 2004; Jones, Bullard, and Beck 2006; Jones, Beck, and Holz 2006; Miller 1991; Titus 1986), and other NTS projects (Beck et al. 1996, 2000; Drollinger, Goldberg, and Beck 2000a, 2000b, 2000c; Drollinger, Beck, and Goldberg 2000a, 2000b, 2000c, 2000d; Drollinger et al. 2005; Jones et al. 1996).

5.1 Prehistoric

The earliest occurrence of man in the Great Basin is ca. 12,000 years BP, accompanied by an economic strategy involving the hunting of big game and the use of lacustrine-marsh areas around late Pleistocene and early Holocene pluvial lakes (Madsen 1982:213; Warren and Crabtree 1986:184). The oldest cultural remains discovered on the NTS are Clovis style projectile point fragments dating to the Paleoindian period, ca. 12,000 to 10,000 BP. One was found along an alluvial terrace of Fortymile Wash near Yucca Mountain (Reno 1985) and a second at the upper reaches of the Fortymile drainage system near Rattlesnake Ridge at the west base of Rainier Mesa (Jones and Edwards 1994). Both of these artifacts are from surface contexts shared with early Holocene assemblages.

A general broadening in the types of resources exploited and from a variety of environments occurs during the early Holocene, ca. 10,000 to 7,500 BP, to include aquatic and small animals as well as plants (Grayson 1993:242-243). Initially, lakes and marshes still abounded overall, but the climate began to be drier and by 8,000 BP most of the standing bodies of water were gone (Grayson 1993:197). Consequently, the woodlands began to move upslope to be replaced by sagebrush or bursage and creosote bush (Grayson 1993:199). Most cultural activities still appear to be restricted to the lower elevations, however (cf. Haynes 1996; cf. Reno et al. 1989). Pippin (1998a:62) states only projectile points and a few pieces of debitage and the occasional biface are found in the higher elevations of the NTS, indicative of short term hunting forays from the lower elevations. This pattern is similar to that described for the eastern Great Basin (Madsen 1982:214).

The middle Holocene, ca. 7,500 to 4,500 BP, is marked by increased aridity, and a hotter and dryer climate compared to the previous episode and to that of today (Antevs 1948; Miller and Wigand 1994:466). Some evidence suggests that entire areas were abandoned. People may have aggregated at the margins of the deserts to be near springs and other dependable water sources and only briefly entered the more arid regions (Warren and Crabtree 1986:187). The higher elevation zones appear to have become an important part of the subsistence as well, coinciding with the upward movement of the woodlands (Grayson 1993:244, 255). Pippin (1998a:67-69) notes this cultural change on the

Years BP	Great Basin Grayson 1986	Central Great Basin Thomas 1983	Southwestern Great Basin Warren and Crabtree 1986	Nevada Test Site Pippin 1995	Projectile Points Pippin 1995
	Late Holocene		Shoshonean	Split Ridge	Cottonwood and Desert Series
		Yankee Blade		Silent Canyon	
1,000		Underdown	Saratoga Springs	Rainier Mesa	Rosegate Series
2,000			Gypsum	Pahute Mesa	Elko Series
3,000		Reveille			
4,000		Devil's Gate	Pinto	Dead Horse Flat	Gatecliff Series
5,000					
6,000	Middle Holocene	Clipper Gap		Prow Pass	Humboldt Series Large Side-notched Pinto Series
7,000					
8,000	Early Holocene		Lake Mojave		
9,000				Barren Wash	Western Stemmed Series
10,000	Pleistocene			Rattlesnake Ridge	Western Clovis
11,000					

Figure 5.1. Chronologies for the Great Basin and Nevada Test Site.

NTS, but he sees it as an intensification and expansion in the use of the upland areas and not in the relocation of residential bases to these areas.

According to Miller and Wigand (1994:466), climate for the early part of the late Holocene (ca. 4,500 to 1,900 BP) changed to cooler and wetter conditions. Subsequent climatic conditions fluctuated several times between dry and wet episodes (Miller and Wigand 1994:468). Notable arid periods occurred between 1,900 and 1,000 BP and between 700 and 500 BP; a pattern of heavy winter precipitation began after 500 BP; and average temperatures have gradually increased since the end of the Little Ice Age about 150 years ago. Culturally, the late Holocene is noted by an increase in the number of sites and a broadening of the subsistence base to include more frequent use of the highlands (Grayson 1993:256; Lyneis 1982; Warren and Crabtree 1986:189). A relatively large number of projectile points and a more diverse artifact assemblage with millingstones, pecked stones, and cores at higher elevations on the NTS supports this viewpoint (Pippin 1998a:72). Also, rock features, most interpreted as food caches, begin to appear within the woodlands (Pippin 1998a:84). One of the most conspicuous technological changes during the late Holocene is the introduction of the bow and arrow, ca. 1,500 BP. Another introduction was brownware pottery (Figure 5.2), ca. 700 to 1,000 BP (Lockett and Pippin 1990; Madsen 1986b; Pippin 1986; Rhode 1994), indicating increased sedentism and a change in the way food was prepared and stored. On the NTS, an increase in the frequency of groundstone implements to process plant foods beginning with the late Holocene does suggest a change in lifeways and subsistence (Pippin 1998a:75).

Figure 5.2. Brownware bowl recovered on Pahute Mesa (photograph by David Wehner).

5.2 Ethnohistoric American Indian

Early explorers and immigrants in the southern Great Basin encountered widely scattered groups of Numic-speaking hunters and gatherers currently known as Southern Paiute (see Kelly and Fowler 1986) and Western Shoshone (see Thomas et al. 1986). The origin of these groups in the Great Basin is controversial and has long been debated (Sutton and Rhode 1994). One of the more popular theories, both archaeologically and linguistically, is that they recently migrated northward and eastward from the southern California area (Grayson 1994; Lamb 1958; Lyneis 1994; Madsen 1994; Sutton 1994). The areas traditionally claimed by these tribal entities encompassed a large region and were bound in territories of ethnic or political groups (Stoffle et al. 1990:29). Subsistence strategies revolved around movements between environmental zones within their territories, e.g., highlands and

lowlands, according to the seasonal availability of food resources (Steward 1938:95-97; cf. Wheat 1967). The normal range was within 32 km (20 mi) from the primary residential base, but most resources could be found within a short distance of the main camp. Criteria for the location of the primary residential base was nearness to stored or cached foods, the availability of water, wood for fuel and house construction, and relatively warm winter temperatures like that found in canyon mouths or in the woodlands (Steward 1938:233). The nuclear family was the primary social and economic unit; bands or permanent and stable communal groups did not exist. Descent was bilateral and residence patterns were both matrilocal and patrilocal, with families forming a temporary group or small community usually related in some manner. Kinship, economic, and political ties were extensive and fluid, and were maintained and reinforced through marriage and cooperation.

According to Steward (1938:94-95), the communal group around Rainier Mesa and the southern end of the Belted Range ca. 1875-1880, with an estimated population of 42, were known as Ě*so* (little hill). The locale is at the boundaries of the traditional tribal lands for the Southern Paiute and Western Shoshone and the Ě*so* consisted of members from both tribes. The Ě*so* were closely linked linguistically with people to the east, but maintained close relationships with groups all around them, particularly to the north and west. They established winter residential camps at Cane Spring, Captain Jack Spring, Oak Springs, Tippipah Springs, Topopah Spring, White Rock Springs, and on Pahute and Rainier Mesas. Another campsite was at Ammonia Tanks. These camps consisted mostly of nuclear families, but other immediate relatives, such as grown siblings or grandparents, also resided at some of them.

5.3 Historic Mining

The first known occurrence of Euroamericans through what is now the NTS area were emigrants on their way to California in 1849 (Koenig 1967:37). In 1866, Nevada Governor Blasdel and a party traveled through the area when they embarked on a search for a shorter route between the settlements in western Nevada and the Pahranagat mining district in eastern Nevada (Stretch 1867). Lieutenant George M. Wheeler led a mapping expedition in 1869 through Indian Springs Valley to the southeast, and in 1871 through the northern portion of Yucca Flat (Wheeler 1872, 1889). Tingley (1984:1) mentions a Mormon gold mine dating to about 1861 on the south side of Bare Mountain just west of the NTS. The Groom lead and silver mine about 40 km (25 miles) to the east was discovered in 1864 (Humphrey 1945:35), the same year Nevada was granted statehood.

The great mining boom at the beginning of the twentieth century in southwest Nevada from Tonopah in the north to Rhyolite in the south was short-lived. By 1908, only four years after the boom began, the town of Rhyolite became one of the many ghost towns in the region. For Goldfield, production fell rapidly after 1911 (Zanjani 1992:233), and survives today principally because it is the seat for Esmeralda County (Elliott 1966:10). The decline for the Tonopah mining district was more gradual, still producing into the 1920s. This enabled the town to transform its economy from mining to a supply center, albeit relatively small and limited, for the surrounding ranches, remaining mining districts, and eventually, for military installations. The Las Vegas and Tonopah rail line lasted until 1918 and the rails were removed in 1919 (Myrick 1963:502). Still evident on the NTS today are some of the abandoned ties reused for the construction of corrals and other historic structures.

Figure 5.3. Mine Mountain Retort (photograph by Robert Jones).

5.3.1 Wahmonie

In 1928, the mining town of Wahmonie was located between Mine and Skull mountains in the southern region of the NTS (Jones et al. 1996). Wahmonie existed only a few years and was typical of the boom-and-bust cycle of the mining industry. Prospecting in the Wahmonie area began as early as 1905, and possibly earlier to around 1850 if some accounts are to be believed (see Quade and Tingley 1984:31), but the historic boom did not occur until the late 1920s (Paher 1970:322). In 1927, Mark Lefler extracted high grade silver-gold ore from the old Hornsilver mine (Carlson 1974:240). Lefler and his partner W.R. McCrea promoted the find and by early 1928 the mining camp of Wahmonie, located about 6 miles (10 km) west of Cane Spring, was organized (McLane 1995; Quade and Tingley 1984:31). It soon grew to have boarding houses, tent stores, and cafes. The Silver Dollar Saloon and the Northern Club were but two of the enterprises (Long 1950:103). Most of the miners lived in small tents. By March 1928, 1,350 claims had been staked within five miles of the original strike and the population had grown to 500, and by June 1928, 1,451 claims had been filed in the district and the population varied between 500 and 1,500 (McLane 1995). George Wingfield, a well-known mine owner and banker in Nevada, became interested and purchased a portion of the Lefler claim, and incorporated the Wahmonie Mining Company. Soon, however, the strike was not as rich as first believed and by early 1929 people began leaving. Wingfield attempted to cut his losses by selling, but was unsuccessful and the property was leased to Frank Otto, who shortly relinquished it. Wingfield then signed over all of his shares to McCrea for a dollar and resigned as President and Director of the Wahmonie Mining Company. McCrea, retaining his shares, continued to work on the

claim into early 1931. Small amounts of prospecting in the Wahmonie district continued into the 1930s and 1940s, but few ore deposits were discovered.

5.3.2 Oak Springs

Documents at the Recorder's Office in Tonopah indicate that the earliest record of prospecting on what is now the NTS is the Oak Springs mining district dating to the late 1880s (Drollinger 2002). The district was centered around Oak Butte at the northern edge of the NTS and the main objectives of these early mining activities were gold, silver, and chrysocolla (Ball 1907:128-130; Lincoln 1923:179; Quade and Tingley 1984; Stager and Tingley 1988:144-148). Lincoln (1923:178-179) states copper ore containing some silver was shipped from the Horseshoe claim in 1917 and that minor amounts of tungsten were mined. The Oak Springs district, although having relatively abundant water and wood resources, did not prove to be very productive overall and the mined ore was not rich enough to offset the costs of shipping it to the railhead at Caliente, Nevada, about 135 km (84 miles) to the east (Hall 1981:217).

In 1920, B.M. Bower, a noted author, with husband Bud Cowan and their family, moved to Nevada from Los Angeles, California and took up residence at a mining camp near Oak Springs (Drollinger 2002; McLane 1996) (Figure 5.4). An accomplished and prolific writer, B.M. Bower published a number of short stories and novels over a 40 year career, with some of them becoming the basis for early western-themed movies in Hollywood. She also served as a screenwriter on a couple of them. While living at the camp, Bower wrote 11 novels, incorporating some of the surrounding geographic

Figure 5.4. Historic Bower Cabin.

features, such as Oak Butte and the camp itself, into a few of the stories. The family also formed the El Picacho Mining Company, with B.M. Bower serving as president, and filed assessment work for the claims from 1922 to 1928. The family moved to Las Vegas around 1926, but still worked the mining claims sporadically over the next couple years until they abandoned them and returned to California. B.M. Bower was posthumously inducted into the Western Writers of America Hall of Fame in 1994.

In 1937, tungsten was rediscovered in the Oak Springs district and located as the Climax group by V.A. Tamney (Kral 1951:139; Stager and Tingley 1988:145). Two companies leasing the claims, Goldfield Consolidated Mines Company and the U.S. Vanadium Corporation, conducted preliminary sampling from 1938 to 1940, with both relinquishing their options in 1941 (Kral 1951:139; Quade and Tingley 1984:15; Stager and Tingley 1988:145). Later in 1941, the Pacific Bridge Company leased the claims and constructed new roads and a new exploratory adit, but most operations ended when the area was closed toward the end of the year with the establishment of the bombing and gunnery range by the federal government (Kral 1951:140; Quade and Tingley 1984:15; Stager and Tingley 1988:145). The last known mining operation at the Climax claims was from December 1956 to May 1957 involving a co-use agreement between the Atomic Energy Commission and George Tamney, W.A. Kinney, and A.J. Wright, owners of the Climax Tungsten Corporation (McLane 1996; Quade and Tingley 1984:15). The agreement was eventually terminated and no legal mining has since been conducted on the NTS.

5.5 Nevada Test Site

5.5.1 Nuclear Weapons Testing

During the late 1940s a search was conducted to establish a site for testing nuclear explosions within the continental United States. The main reasons for this were security, shorter travel times, and economic costs in the transportation of people and equipment (Lay 1950; Ogle 1985:44; Tlachac 1991a). At the time, testing was conducted at the Proving Grounds in the Pacific Ocean and was expensive in both cost and time. Security at the Pacific locale also became a major concern due to the situation developing in Korea (DTRA 2002:77). The ideal location, in addition to the attributes described above, was to have favorable and predictable weather and terrain conditions so as to be able to test year round, a low population because of radiological concerns, be under federal control, have an infrastructure in place, and be relatively close to the Los Alamos laboratory (Lay 1950; Tlachac 1991a). The place chosen, out of several contenders, best meeting these conditions was in southern Nevada. The first land withdrawal from the Las Vegas Bombing and Gunnery Range by the Atomic Energy Commission to establish an official continental testing ground for nuclear weapons was February 12, 1952. After several more land withdrawals and memorandum of agreements over the years, the NTS currently encompasses an area of approximately 1,375 sq mi (3,561 sq km).

Construction of the first support and testing facilities at the new testing grounds began in January 1951, with the first nuclear weapons test, codenamed Able in the Ranger series, conducted in Frenchman Flat on January 27, 1951 (Fehner and Gosling 2002; Ogle 1985:43-44; Miller 1991; Titus 1986:58). Between 1951 and 1958, numerous atmospheric nuclear tests were conducted in both Yucca and Frenchman flats. The bombs were initially dropped from airplanes, but due to efforts for

greater monitoring and a general lack of control from air drops, the nuclear devices were placed near the ground, on top of towers, and eventually elevated by balloons to the desired height.

Both the United States and the former Soviet Union ceased nuclear testing in 1958 by self-imposed moratoriums at the urging of internal and external forces (Ogle 1985:30-31), but by 1961 both superpowers were once again conducting tests. Following the moratorium, and except for a few surface and near-surface tests, most were placed below ground. The concept of the underground test, versus atmospheric, was initiated in the 1950s prior to the moratorium. It was primarily for containment purposes when radioactive fallout became a major safety and health concern for both the workers doing the test and the public at large (Carothers 1995:16, 20; Johnson et al. 1959:2; Malik et al 1981:12). The Rainier event in 1957, conducted in a tunnel in Rainier Mesa, was the first test that did not release radioactive material into the atmosphere (Carothers 1995:31). After ratification of the Limited Test Ban Treaty in 1963, all nuclear tests, except for some Plowshare experiments, were underground (Friesen 1995:6; Schoengold et al. 1996:2); none were to be carried out in the atmosphere, outer space, or underwater. Accordingly, the underground nuclear tests at the NTS by the United States began to be conducted either in vertical shafts or horizontal tunnels. Rainier Mesa was generally used for the horizontally-oriented tunnel tests, while most of the vertical tests have been conducted in Yucca Flat (Figure 5.5).

In 1974 the United States and the former Soviet Union agreed to the Threshold Test Ban Treaty and in 1976 to the Peaceful Nuclear Explosions Treaty in order to restrict nuclear test explosions to yields no greater than 150 kilotons. Another moratorium on nuclear testing was established in 1992 and no tests have been conducted by the United States since that date. The Comprehensive Nuclear Test Ban Treaty to prohibit nuclear weapons testing was signed in 1996 by the United States. This treaty, however, has yet to be ratified by the U.S. Senate. To date, a total of 928 nuclear tests have been accounted for the NTS, with 100 being atmospheric and mostly conducted during the 1950s, while the remaining were underground and mostly after 1961 (DOE/NV 2000; Friesen 1995:6, 10).

5.5.2 Nuclear Rocket and Missile Development

Another project on the NTS, beginning in the mid 1950s, was the Rover Program at the Nuclear Rocket Development Station (NRDS) in Area 25 (originally Area 400) managed by the Los Alamos Scientific Laboratory (now the Los Alamos National Laboratory). The mission of the project was to develop nuclear rocket reactors for use in the space program (Miller 1984:1; Space Nuclear Propulsion Office n.d.). It was believed that long and complex space missions could only be accomplished with nuclear energy. Facilities constructed within the NRDS were two reactor test cells (Test Cells A and C), a reactor assembly and disassembly building (R-MAD), an engine maintenance and disassembly facility (E-MAD), an engine test stand (ETS 1), a control point complex, and a support area. After some success, proving that a nuclear-powered engine was feasible, the Rover program was terminated in 1973 because of budget constraints (Miller 1984:5).

Similar to the Rover program, the Pluto program was situated in adjoining Area 26 (originally Area 401). Facilities consisted of a control area, a test area (Test Cell B), and a disassembly area. The Pluto

Figure 5.5. Yucca Flat at the northeast part of the Nevada Test Site, showing subsidence craters and surface activities associated with underground nuclear tests.

program was managed by the University of California Radiation Laboratory (UCRL), Livermore, California (now the Lawrence Livermore National Laboratory) and was designed to demonstrate the feasibility of a nuclear ramjet engine for use in strategic missiles (Atomic Energy Commission 1961:157-158). The program ended in 1964 after only two engine tests.

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