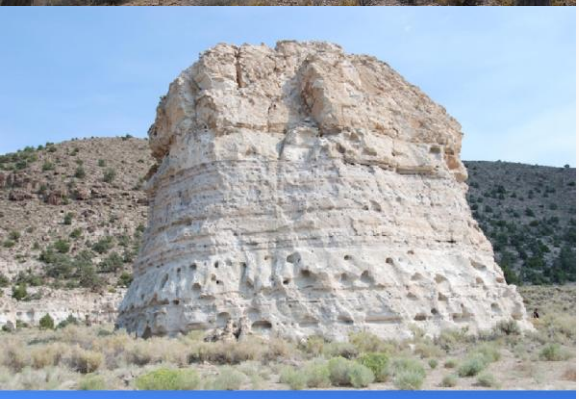

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National Nuclear Security Administration

Cultural Resource Management Plan

for the Nevada National Security Site, Nye County, Nevada

Cover Photos

Counterclockwise from top left:

- Cabin near Tippipah Spring, Photo 1625_0451, DRI 2016.
- Joshua trees with Yucca Flat in the background, Desert Research Institute (DRI) 2016.
- Landmark Rock, Photo DSC_0037, DRI 2006.
- Tribal representatives on an NNSS site visit, Photo 2409_3850, DRI 2023.
- Engine Maintenance and Disassembly Facility, Photo 1905_1449, DRI 2019.
- Sedan Crater, https://www.flickr.com/photos/nnsanevada/50825499347/.

Cultural Resource Management Plan for the Nevada National Security Site, Nye County, Nevada

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National Nuclear Security Administration Nevada Field Office,
Las Vegas, Nevada

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ACRONYMS

ACHP	Advisory Council on Historic Preservation
AEC	Atomic Energy Commission
AICP	American Indian Consultation Program
AIRFA	American Indian Religious Freedom Act of 1978
APE	Area of Potential Effects
ARA	Architectural Resource Assessment
ARPA	Archaeological Resources Protection Act of 1979
BLM	Bureau of Land Management
BREN	Bare Reactor Experiment—Nevada
cal yr bp	Calendar Years Before Present (where “present” is defined as AD 1950)
CD	Company Directive
CFR	Code of Federal Regulations
CP	Control Point
CRC	Cultural Resource Coordinator
CRCR	Cultural Resource Compliance Review
CRM	Cultural Resource Management
CRPM	Cultural Resource Program Manager
DC	District of Columbia
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DRI	Desert Research Institute
FNAE	Finding of No Adverse Effect
FNAE-SC	Finding of No Adverse Effect with Standard Conditions
FOIA	Freedom of Information Act
GIS	Geographic Information System
HABS	Historic American Building Survey
HAER	Historic American Engineering Record

IMACS	Intermountain Antiquities Computer System
LANL	Los Alamos National Laboratory
LV&T	Las Vegas and Tonopah Railroad
LVBGR	Las Vegas Bombing and Gunnery Range
M&O	Management and Operating Contractor
MOA	Memorandum of Agreement
NAGPRA	Native American Graves Protection and Repatriation Act of 1990, as amended (Public Law 101-601; 25 U.S.C.3001 et seq.)
NASA	National Aeronautics and Space Administration
NATM	National Atomic Testing Museum
NATO	North Atlantic Treaty Organization
NEPA	National Environmental Policy Act of 1969
NFO	Nevada Field Office
NHPA	National Historic Preservation Act of 1966, as amended (Public Law 89-665 as amended by Public Law 96-515)
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NPG	Nevada Proving Ground
NPS	National Park Service
NRDS	Nuclear Rocket Development Station
NRHP	National Register of Historic Places
NSSAB	Nevada Site Specific Advisory Board
NTA	Nuclear Testing Archive
NTS	Nevada Test Site
NVCRIS	Nevada Cultural Resource Information System
PA	Programmatic Agreement
RM	Responsible Manager
RSL	Remote Sensing Laboratory
SHPO	State Historic Preservation Officer
SME	Subject Matter Expert
SOI	Secretary of the Interior
THPO	Tribal Historic Preservation Officer
TPC	Tribal Planning Committee
U.S.	United States
USC	United States Code
WWII	World War II

GLOSSARY

Words and phrases defined in this glossary include technical terms that convey a meaning within this document that may differ from general use.

Adverse Effect is an effect that may directly or indirectly alter those characteristics of a historic property that qualify that property for inclusion in the National Register of Historic Places (NRHP). This includes any effect that may diminish the integrity of a property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects can include the physical destruction, damage, or alteration of a historic property; the isolation of a property from its spatial context; the introduction of visual, audible, or atmospheric elements not in character with the property; neglect that results in deterioration or destruction; and the transfer, sale, or lease of a property out of federal ownership. Adverse effects may also include reasonably foreseeable effects caused by an undertaking that may occur in the future or be located farther away, or the cumulative effects to a property over the years.

American Indian (also Native American), is in reference to, or relating to, a tribe, people, or culture that is indigenous to the Americas.

Area of Potential Effects (APE) is the geographic area (contiguous or noncontiguous) within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. The area of potential effects is influenced by the scale and nature of an undertaking and may be different based on the different kinds of effects caused by the undertaking. This area includes the actual location 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 historic properties.

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

Avoidance is the modification of a project or undertaking to prevent effects to cultural resources by avoiding them, such as rerouting a road.

Conservation is the protection, preservation, and management actions that ensure the judicious use of cultural resources through time. Based on the premise that cultural resources are nonrenewable, this concept emphasizes the nondestructive use and re-use of resources and the prevention of degradation and loss.

Consultation is the process of seeking, discussing, and considering the views of other parties concerned with the management of cultural resources. Consultation 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 that should be consulted include the Advisory Council on Historic Preservation (ACHP); the State Historic Preservation Officer (SHPO); federal, state, local, and tribal governments; interest groups, including historical societies, museums, and the like; and interested members of the public.

Context can refer to two different concepts. First, a "historic context" may refer to historic narratives, themes, and trends that serve as the basis from which cultural resources derive their historic significance, and therefore their eligibility for listing in the NRHP. Second, "spatial context" may refer to a specific locational pattern of artifacts and cultural resources resulting from human behavior. Spatial context is valuable in archaeological interpretation because most past human behavior is understood not only by interpreting the artifacts themselves, but also by where they are found and their spatial relationships to one another.

Culture refers to an integrated system of learned behavior, ideas, and values that is characteristic of the members of a society and not the result of biological inheritance.

Cultural Resources are resources that may be important to a culture or community for historic, scientific, traditional, or religious reasons. These nonrenewable remains of human activity, occupation, or endeavor take form as sites, districts, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features.

Cultural Resource Management (CRM) is the management of cultural resources in accordance with applicable laws and regulations, executive orders, departmental guidance and memorandums, and professional standards. The overall goal of CRM is to protect cultural resources and their values, either through preservation or through appropriate scientific investigation and curation of the resources and information about them.

Determination of Eligibility is the determination made by the agency official, after applying the NRHP criteria for evaluation (36 Code of Federal Regulations [CFR] § 60.4), that a cultural property meets or does not meet the criteria for inclusion in the NRHP.

Ecofacts are natural objects or materials found at an archaeological site that have not been purposely modified by humans, yet still carry archaeological significance, for example, animal bones, charcoal, pollen, or minerals.

Finding of Effect (FOE) is the determination made by the agency official, after applying the criteria of adverse effect (36 CFR § 800.5(a)(1)), that an undertaking may or may not alter, either directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in such a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

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

Memorandum of Agreement (MOA) is a legally binding document produced through the consultation process whereby the federal agency records the terms and conditions agreed upon to resolve the adverse effects of an undertaking on historic properties.

Mitigation is a term for alleviating or lessening the adverse effects of an undertaking on a historic property by applying appropriate protective measures or completing adequate scientific study.

National Register of Historic Places (NRHP or National Register) is a master inventory maintained by the National Park Service (NPS) for listing districts, sites, buildings, structures, or objects determined to be significant at national, state, or local levels in American history, architecture, archaeology, engineering, or culture. To be listed in the National Register, a property must go through a nomination process and be approved by the Keeper of the National Register.

Programmatic Agreement (PA) is an alternative procedure to implement Section 106 and may substitute for all or part of the Section 106 process. The agency official may negotiate a PA to govern the implementation of a particular program or resolve adverse effects from certain complex project situations or multiple undertakings.

Protection is maintaining the physical integrity of those characteristics that qualify a historic property for inclusion in the National Register. Protection can involve scientific research, enhancement, conservation, preservation, rehabilitation, restoration, and interpretation.

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

Significance is determined through a regulated NRHP eligibility process using a set of criteria stated in 36 CFR § 60.4. To be listed in the NRHP, a property must not only be shown to be significant under the National Register criteria, but it must also have integrity to convey its significance.

Undertaking refers to any project, activity, or program funded in whole or part under the direct or indirect jurisdiction of a federal agency. This includes those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; and those requiring a federal permit, license, or approval. The agency official shall determine whether the proposed undertaking is a type of activity that has the potential to affect historic properties.

Cultural Resource Management Plan for the Nevada National Security Site

1 INTRODUCTION

The U.S. Department of Energy (DOE) National Nuclear Security Administration Nevada Field Office (NNSA/NFO) plans and directs mission activities conducted at the Nevada National Security Site (NNSS). NNSA/NFO recognizes the importance of protecting and preserving cultural resources under its stewardship and is committed to complying with legal mandates that require consideration of cultural resources as part of project planning and overall management of the NNSS. This Cultural Resource Management (CRM) plan outlines NNSA/NFO's commitment to managing and protecting cultural resources at the NNSS, which include numerous nationally significant Cold War era properties.

The NNSS (Figure 1.1) is in Nye County, Nevada, approximately 65 miles northwest of the center of Las Vegas. The site encompasses approximately 1,360 square miles and borders federal lands managed by the U.S. Department of Defense (DOD) and the U.S. Department of the Interior (DOI). Established initially as the Nevada Proving Ground (NPG) and renamed the Nevada Test Site (NTS) in 1955, the primary activities at the site were the testing of nuclear devices and technology, until a moratorium on nuclear weapons testing was instituted in 1992. Currently, NNSA/NFO supports several missions at the NNSS, which include National Security/Defense, Environmental Management, and non-defense missions (NNSA/NFO 2024).

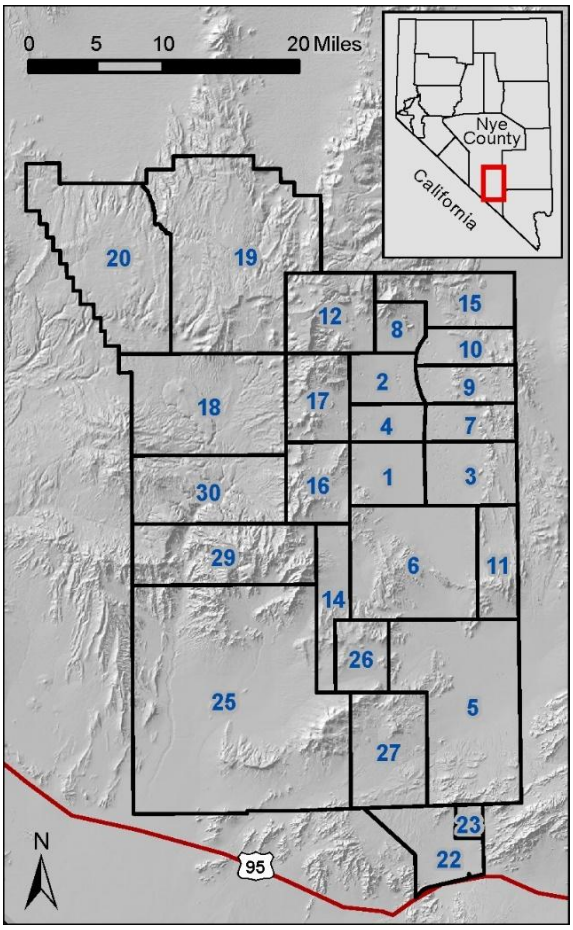

Figure 1.1 NNSS area designations and boundaries.

Cultural resources at the NNSS include a broad range of items and places such as:

- Archaeological materials (including artifacts, features and ruins, ecofacts, sites, and settlement landscapes) that date to prehistoric, ethnohistoric, and historic periods and may be located on the ground surface or buried beneath it.
- Buildings and standing structures and/or their component parts that are important because they represent a major historical theme or era, including the Cold War era, and/or because they possess significant workmanship, materials, and design (Beck et al. 1996, 1998).
- Cultural and natural places, select natural resources, and other objects that have traditional importance for American Indians (Beck et al. 2000; Stoffle et al. 2001).
- Historic districts that encompass areas containing historical buildings, structures, objects, and landscapes pertaining to Cold War-era testing. Examples include Mercury, Frenchman Flat, the Nuclear Rocket Development Station (NRDS), the Area 6 Control Point, and Area 12 Camp, among others.

1.1 Legal Basis for CRM

As a federal agency, the DOE is directed by U.S. Congress and the president to take an active role in the preservation and stewardship of prehistoric, historic, and other cultural resources on the lands it manages. For cultural resources on federal lands, several laws direct the identification, evaluation, treatment, and preservation of cultural resources. Among these laws are the National Historic Preservation Act (NHPA) and its implementing regulations at 36 Code of Federal Regulations (CFR) Part 800; the National Environmental Policy Act (NEPA); the American Indian Religious Freedom Act (AIRFA); the Archaeological Resource Protection Act (ARPA); and the Native American Graves Protection and Repatriation Act (NAGPRA). Management of NNSS cultural resources is also guided by other federal regulations, executive orders, DOE directives, and Nevada state laws (see Appendix A).

The DOE is committed to integrating cultural resource management and protection into its programs and missions (DOE Policy 141.1, see page A-4). Because the DOE manages a complex array of installations spread over a diverse geographic area, the agency has delegated responsibilities for local cultural resource management to its local Field Offices. To meet these responsibilities, each Field Office develops and implements a site-specific CRM plan. Each CRM plan is reviewed and updated periodically to meet changing operational needs. This CRM plan for the NNSS updates earlier editions (Drollinger et al. 1999; Drollinger and Beck 2010) and reflects the evolving mission objectives for the NNSS. It will be updated at least every ten years and made available to the public on the NNSS.gov website in accordance with the 2024 *Programmatic Agreement for the Protection of Historic Properties on the Nevada National Security Site* (NNSS PA) (for more information on the NNSS PA, see Chapter 4).

1.2 DOE CRM Philosophy

NNSA/NFO established a management program to ensure compliance with regulations pertaining to cultural resources and initiated the development of this CRM plan for the NNSS. The plan reflects the philosophy of the DOE as stated in DOE Policy 141.1:

> [The] DOE will uphold these laws by preserving, protecting, and perpetuating cultural resources for future generations in a spirit of stewardship to the extent feasible given the agency's mission and mandates. To do this, the DOE will implement management accountability for compliance with federal statutes, Executive Orders, treaties, DOE Orders, and implementation guidance. The Department also ensures that DOE contractors are obligated to implement DOE programs and projects in a manner that is consistent with this Policy and that reflects this commitment in site management contracts.
>
> Consultation with affected stakeholders is pivotal to maintaining the cultural and historical values associated with identified cultural resources for future generations and implementing all stewardship responsibilities. Therefore, the DOE will consult with State agencies, other federal agencies, American Indian Tribes and organizations, historic preservation interest groups, and additional consulting parties early in the planning process of the proposed undertaking. The DOE also will coordinate that planning with all appropriate parties as specified by the requirements of applicable statutes.

1.3 Purpose and Scope of this Plan

This CRM plan serves several purposes. The plan outlines the necessary processes and procedures for preserving and protecting NNSS cultural resources in a spirit of stewardship while complying with executive and legislative mandates and DOE directives. To be useful for these purposes, the CRM plan must meet the following criteria:

- Provide an organizational and procedural reference manual for NNSA/NFO and its contractors to follow, including its cultural resources staff and contractors.
- Respond to existing and changing executive orders and federal, state, and DOE requirements for historic preservation and fulfill federal stewardship responsibilities.

- Outline processes to identify, evaluate the importance of, and take appropriate action to protect NNSS cultural resources in accordance with legal requirements, regulations, professional standards, and stakeholder wishes.
- Outline a process for effective communication and consultation with the Nevada SHPO, the Advisory Council on Historic Preservation (ACHP), culturally affiliated American Indian Tribes and organizations, and other NNSS stakeholders as mandated by law.
- Provide guidance to employees and decision-makers on regulatory compliance as it pertains to cultural resource management.
- Serve as a tool for managing cultural resources during activities that range from routine tasks to long-term land-use planning.
- Provide an effective balance between DOE's ongoing missions and programs and the preservation and enhancement of cultural resources.
- Describe the nature of the cultural resources present at the NNSS and provide historic and cultural contexts for understanding and managing the historic, cultural, architectural, and scientific significance of these resources.
- Encourage and enhance educational, interpretive, and research opportunities for NNSS cultural resources consistent with NNSA/NFO management objectives.

This CRM plan applies to the NNSS properties managed by the Cultural Resource Subject Matter Experts (SMEs) and the M&O under NNSA/NFO's direction. Ultimately, the intent of this plan is to meet the following cultural resource management objectives:

- Serve as a commitment by the DOE to manage the NNSA/NFO CRM program.
- Serve as a complement to and foundation for the sitewide programmatic agreement (PA) between NNSA/NFO, the Nevada SHPO, and the ACHP, hereafter referred to as the NNSS PA.

1.4 Organization

This CRM plan is intended to be a dynamic, flexible document that is responsive to changes in regulations, legislation, NNSA/NFO's mission, and progress in the NNSS cultural resource program. The main body of the document is divided into seven chapters and followed by six appendices.

The following chapter, titled "Background," summarizes the history of the NNSS and its current mission, its setting and environment, and the main types of cultural resources that occur in the area. The chapter also includes a brief outline of regional prehistory and history.

Chapter 3, "Historic Preservation Program," begins the working portion of the plan and summarizes the goals and objectives of the NNSA/NFO CRM program, which include general descriptions of preservation priorities, compliance strategies, and future goals and objectives. This chapter develops a systematic strategy to inventory, monitor, and protect sites, buildings, structures, and objects that may have significant historical importance.

Chapter 4, "Section 106 Compliance Process," provides a broad summary of NHPA Section 106 (Title 54 United States Code § 306108) and its implementing regulations (36 CFR Part 800). This chapter serves to guide professional CRM specialists in their efforts to identify and evaluate cultural resources and recommend eligibility for listing in the National Register of Historic Places (NRHP or National Register), assess project effects, and implement treatment actions to avoid, minimize, or mitigate adverse effects. This chapter also introduces several procedures designed to streamline the Section 106 compliance process at the NNSS, per the NNSS PA (see Appendix E).

The fifth chapter, "Consultation," describes the processes used to engage with stakeholders concerning historic preservation at the NNSS, which is consistent with the "DOE Requirements for Consultation and Engagement with Federally Recognized Indian Tribes and Alaska Native Claims Settlement Act Corporations Pursuant to DOE Policy 144.1" (DOE O 144.1A) and (by reference)

Executive Order 13175, and recent presidential memoranda. Stakeholders include the Nevada SHPO and the ACHP, American Indian Tribes and organizations and their tribal historic preservation officers (THPOs), other government agencies, interested parties, and the public.

Chapter 6, "Accomplishments and Goals of the NNSS CRM Program," discusses major accomplishments of the CRM program in meeting NNSA/NFO's historic preservation obligations and strategic planning and the long-term goals for the program going forward. This chapter sets forth several goals for managing cultural resources at the NNSS through:

- More effectively managing and meeting Section 106 obligations;
- Monitoring the conditions of known historic properties and identifying preservation needs;
- Completing necessary reporting requirements;
- Enhancing consultation efforts; and
- Ensuring long-term maintenance and efficient management and use of records, databases, and collections.

Chapter 7 includes an extensive list of references used to prepare this document.

The six appendices that follow Chapter 7 provide details and supporting material that enhance the general descriptions contained within the main body of the document. The appendices are designed to be distributed separately to disseminate current information on or clarification of specific aspects of NNSA/NFO CRM. The appendices may be reviewed and updated as needed without requiring extensive changes to the rest of the CRM plan text. The following topics are addressed in the appendices:

- Appendix A provides an in-depth look at the numerous laws, statues, regulations, and executive orders that guide the management, protection, and preservation of cultural resources.
- Appendix B presents a description of the various cultural resource site types at the NNSS and the historic contexts and research themes used in evaluating the significance of these resources.
- Appendix C is currently a placeholder for the NNSS Native American Graves Protection and Repatriation Act Plan of Action, which is in development.
- Appendix D lists affiliated American Indian Tribes and organizations.
- Appendix E contains NNSS PA excerpts that detail the streamlined alternate procedures for Section 106 review and compliance.
- Appendix F provides summaries of select accomplishments of the NNSS CRM program.

1.5 Professional Qualifications

The minimum qualifications standards for historic preservation professionals are set forth in 36 CFR Part 61, "Professional Qualification Standards". They are an important element of the DOI Secretary's standards and guidelines for all federal historic preservation programs nationwide. They are designed to ensure that a consistent level of expertise is applied to the identification, evaluation, registration, documentation, treatment, and interpretation of cultural resources and that there is credibility in the practice of historic preservation at all levels. As such, all NNSA/NFO cultural resource investigations are carried out by SMEs who meet these Secretary of the Interior (SOI) standards.

1.6 CRM Roles and Responsibilities

Numerous managers, support staff, agencies, organizations, and other entities play important roles in the management and protection of cultural resources at the NNSS.

- ***DOE Headquarters.*** The DOE Headquarters provides overall guidance and policy direction for its nationwide cultural resources and American Indian tribal consultation programs. It works with the ACHP to develop program contents and nationwide PAs. The DOE Headquarters staff may periodically provide direction or guidance on project-specific policies.

- ***NNSA/NFO Manager.*** The NNSA/NFO Manager is responsible for compliance with cultural resource laws and regulations at the NNSS. The Manager has the authority to commit NFO resources to meet legal obligations and is signatory to the two Programmatic Agreements for the NNSS.
- ***NNSA/NFO CRPM.*** The CRPM is the NNSA/NFO's designated federal lead for the cultural resource program. The CRPM (1) is the point of contact for Cultural Resource SMEs, (2) reviews Cultural Resource SME recommendations for proposed projects and undertakings, (3) makes decisions regarding regulatory compliance issues, (4) represents the positions and policies of NNSA/NFO in cultural resource consultations with the SHPO, ACHP, Tribes, and other parties, and (5) reviews progress toward CRMP goals.
- ***Cultural Resource SMEs.*** The Cultural Resource SMEs are contractors to NNSA/NFO and implement the CRM program and provide support to the NNSA/NFO CRPM. They are cultural resource specialists who meet the qualifications set forth in 36 CFR Part 61, "Professional Qualifications Standards". Specific areas of expertise include archaeology, architectural history, historic architecture, and history. They conduct Section 106 reviews of all projects or undertakings that involve ground-disturbing or building-modifying activities at the NNSS, and report on the results. The Cultural Resource SMEs provide expertise in Section 110 and Section 106 activities, which include identifying and evaluating cultural resources, monitoring the condition of known historic properties, and providing support for NNSA/NFO consultation and outreach efforts.
- ***M&O Cultural Resource Coordinator (CRC).*** The M&O for the NNSA/NFO manages properties and facilities at the NNSS on behalf of the NNSA/NFO. The M&O CRC functions as the primary integrator for culture resource compliance associated with NNSS activities and works with the CRPM and Cultural Resource SMEs to incorporate CRM requirements into the planning process for all proposed projects.
- ***Responsible Managers (RMs).*** RMs are the individuals responsible for the planning and execution of an undertaking. They may include NNSS contractors, laboratory personnel, or NNSS tenants. They are responsible for submitting project plans to the M&O CRC for cultural resource review early in the planning process to ensure sufficient time to complete the Section 106 review.
- ***Contractor Personnel.*** Contractors work with the CRPM, M&O CRC, and Cultural Resource SMEs to incorporate CRM requirements into project planning and implementation. Contractor personnel must comply with all legal and regulatory requirements regarding cultural resources at the NNSS and on NNSA/NFO sponsored or managed projects.
- ***American Indian Representatives and the American Indian Consultation Program (AICP) Coordinator.*** NNSA/NFO works with 16 American Indian Tribes and organizations with cultural and historic ties to the NNSS. Hereafter referred to as "the Tribes" (see list in Appendix D), they interact with NNSA/NFO on a regular basis through NNSA/NFO's American Indian Consultation Program. The AICP Coordinator is a contractor to NNSA/NFO and facilitates communication between NNSA/NFO and the Tribes, coordinates AICP meetings and tribal visits to the NNSS, and completes NNSA/NFO project reviews pertaining to American Indian cultural resources.
- ***SHPO.*** The Nevada SHPO is the State's oversight agency for compliance with cultural resource laws and regulations. The Nevada SHPO works with NNSA/NFO and the ACHP to ensure that NNSA/NFO meets its federal and state compliance obligations.
- ***ACHP.*** The ACHP is an independent federal agency that works with the DOE and NNSA/NFO to assist in meeting federal CRM goals and requirements. The ACHP is typically afforded the opportunity to participate in the Section 106 process when federal undertakings or federally funded or licensed undertakings will have an adverse effect to historic properties listed in or eligible for the NRHP.

- ***Other Federal, State, and Local Government Agencies.*** Other government agencies may be involved in specific projects and undertakings at the NNSS or with NNSA/NFO in cases of overlapping jurisdiction and management requirements.
- ***Other Interested Parties and the General Public.*** Cultural resource legislation and regulations require involvement of and consultation with other interested parties (such as local historical societies and museums) and the interested public. The CRPM, with support from the Cultural Resource SMEs, provides opportunities for interested parties and the public to learn about, share information, and provide comments, perspectives, and concerns about CRM-related activities.

2 BACKGROUND

Since its establishment, the NNSS has provided a secure testing and training ground used by different agencies and participating organizations for programs and projects related to national defense and the security of the United States and its allies. Historically, the NNSS was primarily used as a secure facility to test nuclear devices and technology. After the 1992 moratorium on such tests, NNSA/NFO missions have changed and expanded to meet other national needs and interests. Currently, NNSA/NFO supports several main operations at the NNSS, which include subcritical experiments as part of nuclear stockpile stewardship, global security and counterterrorism training, environmental hazards management, safety training and testing, testing and treaty verification, and other programs (www.nnss.gov). The DOE Office of Environmental Management Nevada (EM NV) is a tenant organization at the NNSS whose mission includes air and water monitoring, radiation monitoring, community-based offsite monitoring, waste management, environmental restoration, historic preservation, and ecological monitoring (NNSA/NFO 2024).

2.1 Physical Setting

Designated areas of the NNSS serve, or have served, various functions in the facility's overall mission (**Error! Reference source not found.**). These areas can be generally grouped into zones to effectively manage cultural resources within each zone.

- Mercury (Areas 22, 23): This is the main secure gateway to the NNSS and is the administrative center of the NNSS. Before serving as the NNSS administrative nexus, it was a military staging base for personnel (Camp Desert Rock) and an airstrip (Desert Rock Airport).
- Frenchman Flat/Yucca Flat/CP Hill (Areas 1-11, 15): This zone of open desert flats and intervening hills is located on the east side of the NNSS. It was primarily devoted to atmospheric nuclear testing during the 1950s and early 1960s and to underground testing in subsequent decades until the 1992 moratorium.
- Jackass Flats/Rock Valley/Mid Valley and adjacent uplands (Areas 14, 25-27): This zone in the southwest NNSS was the central location devoted to nuclear rocket development in the 1960s. Several Air Force Peacekeeper (also known as MX) missile experiments took place from 1978 to 1982. The area has also been used for studies of the effects of radiation and climate change on desert biota, and it was the location of the proposed nuclear waste storage facility at Yucca Mountain, among other projects.
- Pahute Mesa, Rainier and Aqueduct Mesas, and Eleana Range (Areas 12, 19, 20): These upland areas were main centers for underground nuclear testing from the early 1960s until 1992.
- Fortymile Canyon (Areas 16-18, 29, 30): These areas cover much of the rugged terrain surrounding Fortymile Canyon, a major watershed that drains the upland mesas and ultimately feeds the Amargosa River. The areas were previously used for limited nuclear tests.

2.2 Environment

The NNSS covers a wide range of desert, semi-desert, and montane environments typical of the Basin and Range physiographic province and the Mojave and Great Basin deserts (Dohrenwend 1987; O'Farrell and Emery 1976). The overall terrain is heterogeneous and often rugged (Figure 2.1). Elevations at the NNSS range from 2,700 feet at the Amargosa River drainage in the southwest corner to 7,679 feet on Rainier Mesa in the north. Broad valleys or flats, circumscribed by sloping alluvial piedmonts (bajadas) and often containing dry lakebeds (playas) at their low points, are separated by intervening mountains and mesas. The main valleys are Frenchman Flat and Yucca Flat in the eastern half of the NNSS, Mid Valley in the center, Jackass Flats in the southwest corner, Rock Valley and Mercury Valley in the southeast corner, and Groom Lake Valley in the far northeast corner. Major uplands include Pahute Mesa, Rainier Mesa, and the Eleana Range in the north; Timber and Shoshone Mountains in the west; Yucca Mountain on the southwest edge; the Halfpint Range on the eastern boundary; and smaller ranges in the southeast

quarter, such as Mine Mountain, CP Hills, Skull Mountain, Specter Range, Striped Hills, and Spotted Range. The northern uplands feed the Amargosa River drainage through Fortymile Canyon; otherwise, the limited surface runoff of the region drains into the separate valleys and occasionally floods the playas.

Figure 2.1 Aqueduct Mesa looking toward Yucca Flat (DRI 2018).

Precipitation is typically scant but variable, ranging from an average of approximately 5 inches at the lowest elevations to approximately 12 inches at the highest elevations; inter-annual variation is extreme. Most of the precipitation at the NNSS occurs in the autumn and winter, falling either as snow delivered by Pacific frontal cyclonic storm systems or occasionally as rain during more intense atmospheric river events. A second peak in precipitation commonly occurs in the summer, associated with localized high-intensity convective cloudbursts fed by tropical or subtropical moisture incursions (monsoons). Despite these various precipitation sources, the NNSS is characteristically arid. Temperatures are spatially variable based on the heterogeneous terrain and have large diurnal and seasonal amplitudes. Evaporation rates are typically high, and relative humidity is often below 10 percent.

Beatley (1976) recognized several different plant associations at the NNSS with characteristic dominant shrubs and trees. Barren flats in valley bottoms are covered in dusty fines and sometimes salts, and support a limited array of salt- and clay-tolerant shrubs and subshrubs, such as greasewood (*Sarcobatus vermiculatus*), seepweed (*Suaeda intermedia*), green molly (*Kochia americana*), and iodinebush (*Allenrolfea occidentalis*). Some of these playas formerly were shallow lakes or ponds during the late Pleistocene (Mifflin and Wheat 1979).

Alluvial fans and bajadas in the valleys are populated by typical "warm desert" Mojave Desert shrublands dominated by creosote bush (*Larrea tridentata*) in variable association with bursage (*Ambrosia dumosa*), thornberry (*Lycium andersonii*, *L. pallidum*), hopsage (*Grayia spinosa*), and saltbush (*Atriplex* spp.).

A transitional desert vegetation complex is found at somewhat higher elevations, which includes communities dominated by hopsage mixed with thornberry, occasional creosote bush and Joshua tree (*Yucca brevifolia*), or blackbrush (*Coleogyne ramosissima*) (Figure 2.2). Higher montane elevations are typified by "cold desert" Great Basin vegetation communities dominated by shadscale (*Atriplex confertifolia*) or four-wing saltbush (*A. canescens*), and sagebrush (*Artemisia tridentata* and *A. nova*) or woodlands dominated by sagebrush, juniper (*Juniperus osteosperma*), and pinyon pine (*Pinus monophylla*).

Figure 2.2 View toward Yucca Flat showing Joshua trees in a transitional desert vegetation complex, view east (DRI 2016).

Geologically, the northern uplands are formed by Tertiary volcanic rocks (chiefly rhyolitic ash-flow tuffs), which underlay approximately two-thirds of the NNSS. The regional Tertiary volcanic centers responsible for the ash-flow tuffs also formed several distinct deposits of volcanic glass (obsidian) (Haarklau et al. 2005; Hughes 2010). The more southerly mountains expose late Precambrian and Paleozoic sedimentary rocks (chiefly limestones, dolomites, and interlayered quartzites, cherts, and shales). Natural springs are scattered widely in the region, attracting wildlife and millennia of human occupation (DuBarton and Drollinger 1996; Giles 1976; Jones 2001; Thordarson and Robinson 1971).

2.3 Cultural Resources at the NNSS

Cultural resources at the NNSS include the following:

- Archaeological materials (sites, features, artifacts, and associated records) dating to the prehistoric, ethnohistoric, and historic periods.
- Buildings, structures, objects, and associated constructions or components that are older than 50 years or that represent major historic episodes of exceptional importance to national and world history, including the Cold War.
- Districts encompassing areas of related historic buildings, structures, objects, and landscapes that pertain to specific themes and events, such as:
  - Nuclear Rocket Development Station Historic District (Reno et al. 2023);
  - Area 12 Camp Historic District (Reno et al. 2021);
  - Area 6 Control Point Historic District (O'Neill et al. 2021);
  - Mercury Historic District (Reno et al. 2018);
  - Frenchman Flat Historic District (Johnson et al. 2000);
  - Apple-2 Historic District (Johnson and Edwards 2000); and
  - Others listed in Appendix B, Table B-4.

- Cultural places, resources, and sacred objects and constructions that are important to affiliated American Indians with traditional connections to the NNSS region (Stoffle et al. 1989, 1994; Zedeño et al. 1999).

Efforts to identify cultural resources at the NNSS have been ongoing since the 1940s (Tuohy 1965; Wheeler 1940; Worman 1966, 1969) but became a systematic part of NNSA/NFO's CRM program beginning in the 1970s. As of 2024, more than 3,400 cultural resources and at least 15 historic districts have been recorded at the NNSS, which is evidence of a long history of human use and occupation. More than 76,000 acres of land have currently been subject to cultural resource inventory surveys, approximately 8.8 percent of the total NNSS area.

Table 2.1 provides a summary of historic contexts and research themes relevant to the NNSS that may be used to evaluate cultural resources. Three major cultural traditions are identified for resources at the NNSS. These relate to the long history of American Indian occupation, early Euro-American exploration and settlement, and the use of the NNSS as the nation's premier Cold War era nuclear testing facility. For descriptions of these major historic contexts and research themes, see Appendix B.

Table 2.1. Outline of NNSS-specific historic contexts and research themes.

American Indian Occupation History
Chronology
Material Technology
Subsistence Practices and Diet
Settlement and Mobility
Economic and Social Interaction Networks
Spiritual, Ceremonial, and Artistic Expression
Demography and Migration
Environmental Change and the Cultural Niche
Paleoamerican Stage
Archaic Stage
Late Archaic/Puebloan Stage
Post-Puebloan Late Prehistoric and Ethnohistoric Stage
Euro-American Entry and Occupation History
Exploration and Early Travel
Mining
Ranching
Military Training
Cold War History
The Cold War
Nuclear Weapons Testing at the NNSS
The Post-Cold War NNSS

3 HISTORIC PRESERVATION PROGRAM

This chapter outlines major elements of the NNSA/NFO Historic Preservation Program and discusses how NNSA/NFO implements the program to meet the obligations of Sections 110[1] and 112[2] of the NHPA.

Section 110 requires each federal agency to assume responsibility for the preservation of historic properties that it owns or controls. Each agency must also establish a preservation program for the identification, evaluation, and nomination of historic properties to the NRHP and provide for the protection of these properties. Specific benchmarks for compliance are established as follows:

- Historic properties under the jurisdiction or control of the agency are managed and maintained in a way that considers the preservation of their historic, archaeological, architectural, and cultural values, and gives special consideration to the preservation of those values in the case of a property designated as having national significance.
- The preservation of property not under the jurisdiction or control of the agency but potentially affected by agency actions is given full consideration in planning.
- The agency's preservation-related activities are carried out in consultation with other federal, state, and local agencies; American Indian Tribes and other interested parties; organizations carrying out historic preservation planning activities; and the private sector.

In addition, Section 110 mandates that each federal agency shall ensure the following:

- Prior to acquiring, constructing, or leasing a building for the purposes of carrying out agency responsibilities, the agency shall use historic properties available to the agency to the maximum extent feasible, in accordance with Executive Order 13006.
- The agency shall undertake preservation necessary to implement the NHPA that is consistent with the preservation of historic properties, the mission of the agency, and the professional standards established by the Secretary of the DOI. Preservation as defined in 54 USC § 300315 includes identification, evaluation, recordation, documentation, curation, acquisition, protection, management, rehabilitation, restoration, stabilization, maintenance, research, interpretation, and conservation, as well as any education and training required for these activities.

Section 112 of the NHPA establishes standards and guidelines for the protection and preservation of resources. Each federal agency must ensure the following:

- All archaeology and historic preservation actions taken by employees or contractors of the agency meet professional standards under the regulations developed by the Secretary of the DOI in consultation with the ACHP, other affected agencies, and the appropriate professional societies of archaeology, architecture, conservation, history, landscape architecture, and planning.
- Agency personnel or contractors responsible for historic properties meet qualification standards established by the Office of Personnel Management in consultation with the Secretary of the DOI and the appropriate professional societies of archaeology, architecture, conservation, curation, history, landscape architecture, and planning.
- Records and other data, including data produced by historical research and archaeological surveys and excavations, are permanently maintained in appropriate databases and made available to potential users pursuant to such regulations as the Secretary of the Interior shall promulgate.
- Encourage the protection of American Indian cultural items and property of religious or cultural importance to a tribe or organization as defined under NAGPRA.

[1] 54 USC §§ 306101-306114, excepting 54 USC § 306108 (formerly Section 106).
[2] 54 USC § 306131.

- Prior to excavating or disposing of an American Indian cultural item in which a tribe or organization may have an interest under NAGPRA, give notice to and consult with the tribe or organization.

3.1 Preservation Responsibilities

Identification of Historic Properties

In compliance with Section 110, NNSA/NFO proactively identifies and evaluates new cultural resources for NRHP eligibility each year. Methods used to identify cultural resources vary according to the type of resource under consideration. Archaeological sites are typically identified through an intensive pedestrian surface survey. Historic architectural districts, buildings, structures, and objects are also identified during surveys, as well as using historic archives, maps and aerial imagery, and from information provided by individuals who may have direct knowledge of the functions and historical events associated with the NNSS. Direct communication and consultation are also utilized to identify and characterize resources that are culturally important to American Indians, such as sacred objects, sites, or traditional use areas.

Certain identification efforts may target specific types of resources, such as nuclear testing instrument stations, scientific equipment, important American Indian plants or raw materials, rock writing sites, early explorer routes, mining camps, or other resources that may otherwise be inadequately documented. The goal is to enhance the understanding of the overall NNSS cultural resource environment.

Predictive modeling is another method that can build on existing resource inventories for land-use planning by providing expectations about site density and distribution in areas that have not yet been surveyed. Such information is helpful in planning future activities by identifying areas where historic properties are expected to be abundant or intact—or conversely, rare, redundant, or not expected to retain integrity—and to use this information to best plan for, manage, and protect previously undocumented resources. At large facilities such as the NNSS, predictive modeling affords a cost-effective means to work within statutory requirements to best manage cultural resources.

Evaluation of Historic Properties for NRHP Eligibility

Evaluation of cultural resources for NRHP eligibility involves determining their historic significance. NHPA implementing regulations (36 CFR § 60.4) provide the approach for evaluating historical significance and define criteria for considering the eligibility of properties (see “Eligibility Criteria” sidebar). To be eligible for the NRHP, a property must meet one or more of the established criteria and possess sufficient integrity to convey its significance (see “Aspects of a Property’s Integrity” sidebar). Integrity is defined as:

> [T]he authenticity of a property’s historic identity, evidenced by the survival of physical characteristics that existed during the property’s historic or prehistoric period. If a property retains the physical characteristics it possessed in the past, then it has the capacity to convey association with historical patterns or persons, architectural or engineering design and technology, or information about a culture or people (NPS 1997).

Although the NRHP criteria are useful, they are not necessarily or solely used in the process of evaluating site significance at the NNSS for the purposes of all legal obligations. Some important cultural resources at the NNSS may not meet any of the evaluation criteria or may lack sufficient integrity. For instance, the significance of a traditional cultural area lies with people who have traditional ties there and can only be established by communicating directly with them. Likewise, archaeological resources protected under ARPA do not require NRHP eligibility for protection.

Significance evaluations play essential roles in identifying cultural resources as protected historic properties under the NHPA and are therefore important parts of cultural resource management activities at the NNSS.

A property’s significance is documented through data collection and established within the framework of historic contexts, themes, and research designs developed for the NNSS.

Eligibility Criteria[3]

Criterion A: Events Significant to Broad Historic Patterns

Properties may 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. A property must be associated with one or more events important in the defined historic context to be considered for listing under Criterion A. This criterion recognizes properties associated with single events, a pattern of events, repeated activities, or historic trends. The event or historic trend must clearly be important within the associated context. Moreover, the property must have an important association with the event or historic trend, 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 an important way.

Criterion B: Persons Significant in Our History

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 the property's association with the person's significant productive life.
- Compare with other properties associated with the individual to determine if the property best represents the individual's historic contributions or is otherwise unique, exemplary, or distinctive in the person's productive life.

Criterion C: Design/Construction

Properties may be eligible for the National Register under Criterion C if they 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.

This criterion applies to properties significant for their physical design or construction, which include elements such as architecture, landscape architecture, engineering, and artwork.

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. Many 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 an 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 that must both be met for a property to qualify:

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

Criteria Considerations: Exceptions

Ordinarily, certain properties are not eligible, such as cemeteries, birthplaces or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures moved from their original locations, reconstructed buildings, commemorative properties, and properties that are less than 50 years of age. However, such properties will qualify if they are integral parts of districts that meet the criteria or if they fall within the following categories:

Consideration A: Religious Properties — A religious property deriving significance from architectural or artistic distinction or historical importance.

Consideration B: Moved Properties — A building or structure removed from its original location but still significant primarily for its architectural value or for being the surviving structure most importantly associated with a historic person or event.

Consideration C: Birthplaces or Graves — 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.

Consideration D: Cemeteries — A cemetery that derives its significance from graves of persons of transcendent importance, distinctive design features, or association with historic events.

Consideration E: Reconstructed Properties — 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.

Consideration F: Commemorative Properties — A property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own historical significance.

Consideration G: Properties that have achieved significance within the past 50 years — A property achieving significance within the past 50 years if exceptionally important.

[3] Adapted from *National Register Bulletin 15: How to Apply the Register Criteria for Evaluation*: https://nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf.

Aspects of a Property's Integrity[4]

In addition to meeting the criteria for historic significance, a National Register-eligible property must also have integrity, which is the ability of the property to authentically convey its historic significance. A historic property must not only have an important message, but also the integrity to successfully convey that message. Evaluating integrity is sometimes subjective, but it must always be based on an understanding of a property's physical features and condition and how these relate to its significance within the appropriate historic context associated with specific research themes.

There are seven aspects that help define a property's integrity:

- **Location:** This is the place where the historic property was constructed or the place where the historic event occurred. It is often critical to understanding and recapturing the property's historic associations and significance. If a structure was moved from its original location, the integrity of location is reduced or lost.
- **Design:** This includes the elements creating the structure, space, and style of a property. Design elements identify historic functions, technologies, and aesthetics. Design elements of historic importance can apply to a single property or to districts.
- **Setting:** This is the physical environment of a historic property, how the property is situated in its location, and how it relates to surrounding features and open spaces. It is sometimes referred to as the character of the place in which the property is located. Integrity of setting is important insofar as the physical environment directly contributes to a property's historical significance and eligibility.
- **Materials:** These are the physical elements that were combined or deposited in a particular form and during a particular span of time that make up the property. In general, a property must retain its original materials (or at least the exterior) dating from the period of significance; it cannot be a recreation made to look historic.
- **Workmanship:** This is the physical evidence of the crafts a particular people used in creating the historic property during a specific period in history or prehistory.
- **Feeling:** This refers to the expression or evocation of a particular period of time given by the property's character. The presence of physical features from the historic period that represent the cultural activity, event, or pattern are important to convey a sense of feeling..
- **Association:** Association is the direct link between the property and an important historic event, person, or historic pattern. If the property is the locus where an event or activity occurred and conveys that connection to an observer, the property retains an association with that event or activity. Again, the presence of actual physical features connected with the historic event or activity is important in demonstrating association. Association, like feeling, depends on individual perceptions and judgements, so retention of 'feeling' or 'association' alone is never sufficient to make a property eligible for the National Register; they must be accompanied by positive aspects in location, design, setting, materials, and workmanship.

Integrity is addressed using the following steps:

- Define the essential physical features that must be present for a property to represent its significance.
- Determine whether the essential physical features are tangible enough to convey their significance.
- Determine whether the property needs to be compared with similar properties.
- Based on the property's significance and essential physical features, determine which aspects of integrity are particularly vital to the property and if they are present.

Appendix B contains historic contexts, themes, and research questions that provide the necessary background to evaluate the significance of NNSS archaeological and architectural resources. In addition, reference materials in local archives and repositories are often of value in understanding and evaluating significance. Records pertinent to NNSS historic properties are available from the Nuclear Testing Archive (NTA), the Desert Research Institute (DRI), and the Atomic Museum (formerly the National Atomic Testing Museum or NATM), all of which are located in Las Vegas, Nevada. Engineering records pertinent to the built environment are maintained by NNSA/NFO, and historic photo records are maintained at the NNSS Remote Sensing Laboratory (RSL). Information on resources from the more recent past is also available from knowledgeable current and former NNSS employees.

Section 110 encourages agencies to formally nominate historic properties to the NRHP, though for management purposes a determination of eligibility of a historic property essentially treats the property as if it were in fact listed in the NRHP. NRHP nominations require detailed documentation in a format specified by the National Park Service (NPS). Data collection is often necessary to accumulate the required information. Methods for collecting data to meet eligibility requirements vary for archaeological sites, historic architectural properties, and traditional use or sacred areas. Nominations must also include a

[4] Adapted from *National Register Bulletin 15: How to Apply the Register Criteria for Evaluation*: https://nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf.

robust historic context and narrative statements detailing the level of significance, applicable National Register criteria, justification for the period of significance, and any other applicable criteria considerations (see "Eligibility Criteria" sidebar). Currently, one historic property at the NNSS, Sedan Crater is listed in the NRHP (Figure 3.1). The rest of the NNSS historic properties identified through Section 110 efforts have been determined eligible for the NRHP in consultation with the Nevada SHPO, but have not been formally listed to date.

Figure 3.1 Sedan Crater, a historic property listed in the NRHP in March 1994. (https://www.flickr.com/photos/nnsanevada/50825499347/)

Adaptive Reuse of Historic Properties

Reuse of government property at the NNSS began in 1950 with the repurposing of part of the old Las Vegas Bombing and Gunnery Range (LVBGR) and associated infrastructure (see Appendix B). Over the decades, many buildings and other structures have been reused and repurposed to fit new programs and ongoing mission needs. Several buildings from the 1950s and 1960s in Mercury and elsewhere throughout the site continue to support important functions.

However, complying with current health and safety laws and regulations and cleaning up "legacy" waste left by past activities must be considered when government properties are reused. Properties identified as contaminated include those that contained materials such as asbestos, petroleum products, acids and bases, radionuclides, unexploded ordnance and explosive residues, heavy metals, and hazardous chemicals.

Additionally, the DOE mandates in its Real Property Efficiency Plan the reduction of the maintenance footprint of its installations to achieve cost-effectiveness and to modernize its infrastructure to meet current mission needs (DOE 2019). This mandate presents challenges to reusing and repurposing old properties, which are often at or near the end of their useful lives. NNSA/NFO continues to seek ways to use existing historic properties in new and ongoing programs but is mindful of modern, mission-critical needs and expenses associated with maintaining and repurposing older, outdated, and often hazardous properties.

Monitoring Program

The NNSS cultural resource monitoring program includes archaeological sites and built resources determined eligible for the NRHP. The program aims to identify, track, and reduce impacts to known historic properties throughout the NNSS. Cultural Resource SMEs conduct monitoring activities for NNSA/NFO to determine the effectiveness of NNSA/NFO and contractor procedures to safeguard cultural resources from destruction and deterioration caused by natural or human processes. Monitoring also verifies that avoidance or other mitigation procedures agreed upon during consultation have been followed.

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 by an undertaking.

The second is an ongoing annual effort to conduct field evaluations at NRHP-eligible properties to document the current state of the resource and determine if the resource has deteriorated. Each year, the Cultural Resource SMEs select a few locations for monitoring based on factors such as NNSA/NFO preference, stakeholder feedback, input from the Tribes, NRHP status, history of adverse effects, and proposed NNSA/NFO project activities. The Cultural Resource SMEs update site or architectural resource forms, take photographs as a visual record of site conditions, and file these documents in the NNSA/NFO

archival records. When monitoring results in significant updates to resource forms or changes in eligibility findings, NNSA/NFO submits the updates and findings to the Nevada SHPO for concurrence.

If monitored properties are being damaged, threatened with imminent damage, or suffering other adverse effects, the Cultural Resource SMEs notify the CRPM, who develops a plan to take appropriate remedial actions to address the findings. The information obtained during monitoring serves as an indicator for the overall effectiveness of the NNSS cultural resource program and supports NNSA/NFO's stewardship responsibilities under Section 110 of the NHPA.

Records and Data Management

Cultural resource records and databases are used to record and track the inventory, data recovery, laboratory treatment and analysis, curation, preservation, research, legal compliance, or any other CRM activity regarding cultural resources. Examples of cultural resource records include project review forms, resource forms, environmental data, excavation forms, maps, correspondence, field notebooks, written reports, analysis forms, drawings, and photographs.

Section 112 of the NHPA mandates the curation and management of these records for long-term preservation. Implementing regulations for the management of federal archaeological collections are found in 36 CFR §79.

Records and databases for the NNSS are maintained electronically, and in hard copy when necessary, by the Cultural Resource SMEs. Hard copy records are housed in the documents room at the NNSA/NFO curation facility in the Frank H. Rogers Building at the DRI campus in Las Vegas.

Final reports used for consultation with the SHPO and ACHP represent important sources of the archaeological and historic record, and original archival copies of final reports are maintained at the NNSA/NFO curation facility. 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.

Archaeological records are exempt from the Freedom of Information Act (FOIA) according to federal law and are only released on a strict need-to-know basis. The restrictions on distribution of archaeological site information are designed to protect these sensitive resources from looting and vandalism.

Similar safeguards are also extended to all known American Indian cultural resources at the NNSS. To meet the criteria for confidentiality established by law (AIRFA, ARPA, NHPA, NAGPRA), the NNSA/NFO CRPM limits the circulation of detailed maps and locational information of archaeological sites and important tribal sites. When not in use, this information is maintained in secure files by the Cultural Resource SME. Reports that are released for reasons such as NEPA compliance are carefully screened and redacted to remove all details of the locations of archaeological resources and important American Indian resources.

In contrast to archaeological and sensitive tribal resources, the locations of historic architectural properties are widely known by NNSA employees and the general public. However, some restrictions on the distribution of information are in place due to classification issues and national security concerns.

The Cultural Resource SMEs maintain and update the following to support the NNSA/NFO cultural resource program:

- ***Cultural Resource Geodatabase.*** A geographic information system (GIS) database that includes information on past and current archaeological inventories and architectural surveys on the NNSS. In addition to locational data, this database includes fields related to resource type, important dates, NRHP eligibility status, collection status, related reports, and more.
- ***Project Records.*** Complete electronic project records including all forms, reports, photographs, field notes, drawings, and correspondence created or compiled in support of NNSA/NFO's CRM program.
- ***Curation Database.*** An electronic listing of all cultural materials collected at the NNSS through approved data recovery plans, which includes artifact descriptions, locations, dates collected, and site numbers.

Collections and Curation

NNSA/NFO 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/NFO artifact collection and associated records are maintained in the NNSA/NFO curation facility in the Frank H. Rogers Building at the DRI campus in Las Vegas. The collection is managed and preserved according to professional museum and archival practices and in compliance with 36 CFR §79. Periodic inspections and inventories, with annual reports to NNSA/NFO, document the presence and condition of the collections. Since the early 2000s, NNSA/NFO has maintained a no-collection policy for prehistoric and culturally sensitive artifacts on the NNSS.

The collection currently contains nearly a half million artifacts and associated documentation. Artifacts are cataloged and analyzed according to Cultural Resource SME protocols and standards (Menocal and Rowe 2018). The artifacts are currently stored in polyethylene bags in acid free, plastic archive boxes and kept on metal shelving in a room specifically designed to house NNSA/NFO's collection (Figure 3.2**Error! Reference source not found.**). Records associated with the collection—including project files, site records, and reports—are stored in fireproof filing cabinets in a separate room set aside for documents. Maps are placed in metal map cases. Records of the items repatriated under NAGPRA are also stored in the documents room.

Figure 3.2 NNSA/NFO curation facility (DRI 2018).

Both the artifacts and documents are available for inspection and study by persons with legitimate research or cultural interest. According to the 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/NFO makes the determination if a request for access to the collection is appropriate. Typically, people making requests are federal agency officials, American Indian tribal 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 artifacts 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/NFO and the borrower that specifies the terms and conditions of the loan.

3.2 Permitting

Most cultural resource investigations at the NNSS are conducted by the Cultural Resource SMEs in support of the NNSA/NFO. Archaeological investigations on NNSS property by outside agencies, universities, or subcontractors must be permitted by NNSA/NFO under the authority of the ARPA. These permits are tracked and coordinated through the NNSA/NFO CRPM.

Under Section 470cc of the ARPA, the federal land manager—in this case NNSA/NFO—may grant a permit to excavate or remove any archaeological resource located on public lands and to carry out activities associated with such excavation or removal. The federal land manager will issue permits pursuant to an application if the activity is undertaken to advance archaeological knowledge in the public interest. If any archaeological resources are excavated or removed, they will remain federal property, and such resources and copies of the associated archaeological records and data will be preserved by a suitable university, museum, or other scientific or educational institution. Before issuing a permit that may result in harm to or the destruction of any religious or cultural site, as determined by the federal land manager, the federal land manager shall notify any American Indian tribe that may consider the site to have religious or cultural importance.

3.3 Education and Outreach

NNSA/NFO provides opportunities for the public to learn about the history of the NNSS, its mission, and current plans, as well as for the public to give input on the management of its cultural resources. NNSA/NFO maintains an informational website (https://www.nnss.gov) containing an array of Fact Sheets about the history and missions of the NNSS, historical and current videos, photographs, historical publications, and past and current environmental documents.

The Fact Sheets are updated on a periodic basis to highlight programs, buildings, or past events at the NNSS. Links to affiliated organizations, including the Atomic Museum, are provided as well. Educational exhibits, displays, and a speaker's bureau are available by contacting the NNSA/NFO Office of Public Affairs or visiting the NNSS website. Publications with detailed histories about nuclear testing and other programs carried out at the NNSS (Fehner and Gosling 2000, 2006) are available at https://www.osti.gov/biblio/769471 and https://www.govinfo.gov/app/details/GOVPUB-E-PURL-gpo11175, respectively. In addition, many NNSS buildings and structures have been documented in written, photographic, and drawing form through the publicly available Historic American Buildings Survey (HABS) and Historic American Engineering Record (HAER) collections maintained by the Library of Congress (https://www.loc.gov/pictures/collection/hh/).

A large collection of additional reports and documents detailing historic and prehistoric research at the NNSS are available to the public through the DOE's Office of Scientific and Technical Information (https://www.osti.gov/). Historic documents related to the NNSS, nuclear testing, and radiation experimentation can also be obtained from the NTA in Las Vegas. The NTA collects and consolidates historical documents, records, and data for long-term preservation. This collection of over 386,000 documents is available to the public, but certain records may be subject to FOIA restrictions.

NNSA/NFO maintains a strong working relationship with the Atomic Museum, providing important artifacts, records, and other information for use in exhibits. Past and current employees of NNSA/NFO and affiliated contractors frequently participate in public-oriented educational forums and presentations hosted by the museum. One example of the NNSA/NFO CRM program actively supporting the museum was the recovery of a largely intact spring-loaded instrumentation package (or "pogostick") in an underground instrument shelter from the Fizeau nuclear test of 1957, found during a historical building evaluation (Fehner and Gosling 2006:166-7; Johnson 2002). This extraordinary piece of 1950s era nuclear testing technology was retrieved and is now on permanent display at the museum (Figure 3.3).

NNSA/NFO also hosts public tours of the NNSS, in coordination with the Atomic Museum. These popular daylong tours engage busloads of the public by visiting important historic locales, such as Mercury, Frenchman Flat, Sedan Crater, Icecap, and the Apple-2 houses. The general interest tours are held throughout the year. This part of the NNSS cultural resource program is consistent with and supports the Preserve America Program (54 USC Ch. 3111), which seeks to "advance the protection, enhancement, and contemporary use of federal historic properties and to promote partnerships for the preservation and use of historic properties, particularly through heritage tourism" (www.achp.gov/preserve-america).

Civic or technical organizations, private clubs, and other interest groups can also arrange special tours. One important example of such specific NNSS tours is conducted biannually in association with the AICP Tribal Update Meeting, in which the Tribes are invited to visit locations and sites of interest to them.

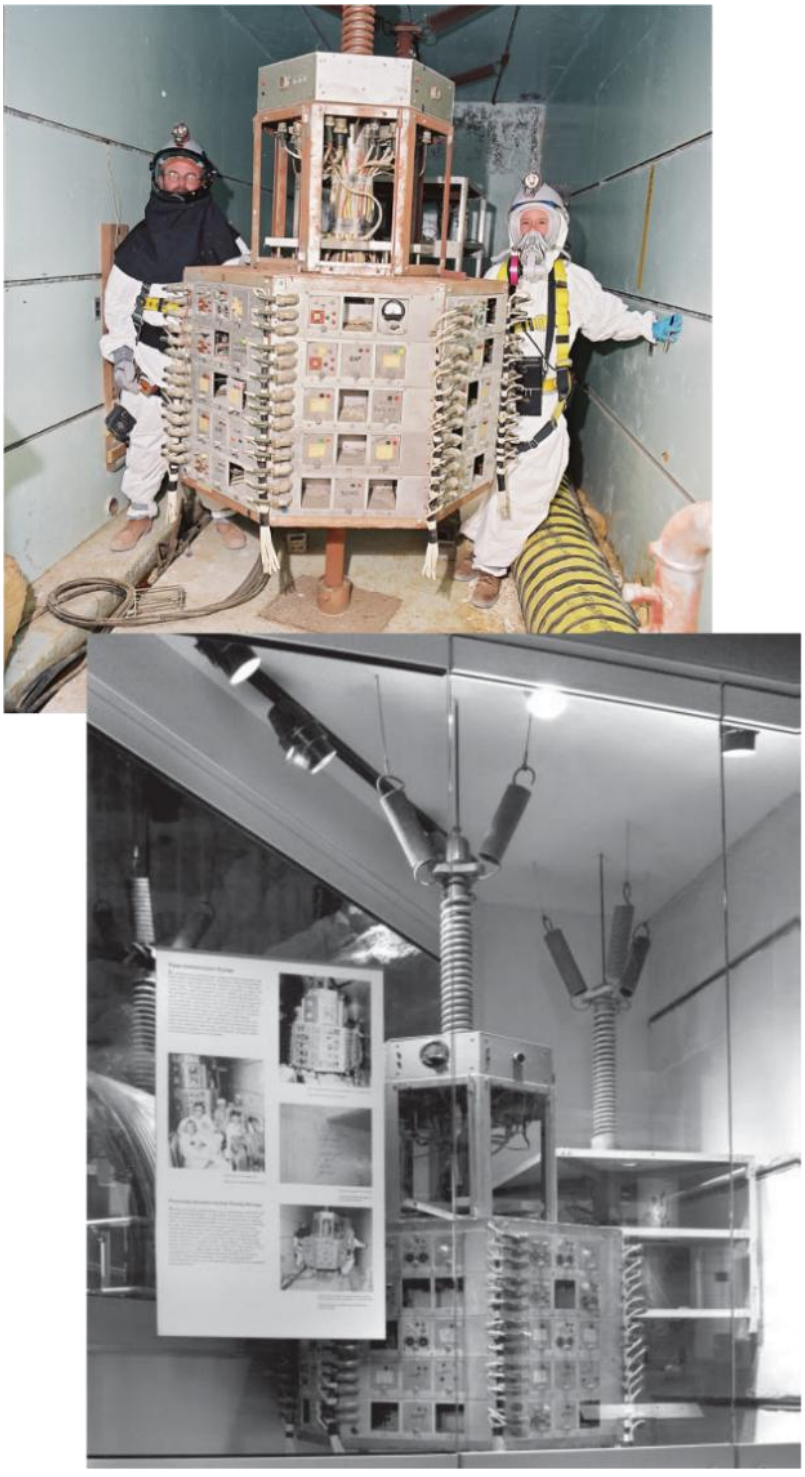

Figure 3.3 The Fizeau atmospheric test spring-loaded instrument package was moved to a display at the Atomic Museum. (top photo: https://web.archive.org/web/20030706123013/http://newsletter.dri.edu/2002/spring/pogostick.htm; bottom photo: Fehner and Gosling 2006)

4 SECTION 106 COMPLIANCE PROCESS

A major component of the NNSA/NFO CRM program is compliance with Section 106 of the NHPA. Section 106 requires federal agencies to consider the effects of their undertakings on historic properties and afford the ACHP a reasonable opportunity to comment on such undertakings. The procedures in 36 CFR Part 800, "Protection of Historic Properties," define how federal agencies meet these statutory responsibilities. The Section 106 process seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation with the agency official, the SHPO, culturally affiliated Tribes, and other parties interested in the effects of the undertaking on historic properties. As a federal agency, NNSA/NFO must:

- Incorporate Section 106 review of projects into the NNSA/NFO compliance and planning process, as independent actions or in coordination with the NEPA process.
- Initiate Section 106 review early in project planning. This is necessary to allow sufficient time to identify and evaluate cultural resources in the project area; make NRHP eligibility determinations; assess potential effects on historic properties; implement actions to avoid, minimize, or mitigate adverse effects; and provide the ACHP, the SHPO, American Indian Tribes, stakeholders, and members of the public the opportunity to participate in the planning process.

Alternative procedures, known as programmatic agreements, may be adopted by consulting parties to make the Section 106 process more efficient and cost-effective, less time-consuming, and more responsive to an agency's particular needs, while maintaining the objective of minimizing or eliminating potential effects of undertakings on historic properties. As of the date of this plan, NNSA/NFO has two PAs in place for undertakings on the NNSS.

The first was executed in 2018 to mitigate the effects of modernization and operational maintenance activities in Mercury. Known for short as the Mercury PA, it is not discussed in detail herein, because it applies to a specific long-term project – modernizing Mercury. The full text of the Mercury PA can be found on the Nevada SHPO website (www.shpo.nv.gov).

The second PA was executed in 2024 and applies to all undertakings on the NNSS outside of Mercury. It is not specific to any one project and therefore is the primary document for streamlining NNSA/NFO's Section 106 compliance process. The full text of the NNSS PA can be found on the Nevada SHPO website (www.shpo.nv.gov).

It is important to note that the NNSS PA does not change or replace the major steps in the Section 106 process. Rather, it streamlines some aspects of the process for routine undertakings and common property types. For a summary of the streamlined aspects, see Section 0. For more details, see Appendix E.

4.1 M&O Project Planning

The NNSS M&O, under NNSA/NFO's direction and supervision, must develop and implement CRM company directives (CDs) to ensure projects comply with cultural resource laws, regulations, executive orders, DOE orders, and management plans. The CRM CDs must outline a process to plan, prioritize, and schedule projects and activities that require cultural resource evaluations, as well as ensure that priorities are coordinated with NNSA/NFO's Cultural Resource SMEs.

M&O managers are responsible for implementing the CD procedures related to their specific scopes of work. They must notify the M&O CRC at the beginning of the planning process to ensure adequate time for completing all requisite Section 106 compliance steps in consultation with the SHPO, ACHP, Tribes, and other interested parties, prior to beginning any project activities.

To the extent practicable, M&O managers, as well as their subcontractors, must maintain a working five-year forecast of potential projects. At minimum, a one-year forecast of projects is required to ensure that the proper coordination and prioritization of cultural resource compliance is maintained among NNSA/NFO, its Cultural Resource SMEs, and the M&O.

Note that EM NV, a DOE NNSS tenant, has its own support contractors separate from the M&O. NNSA/NFO requires EM NV's contractors to follow the same CRM process as the NNSS M&O, including notifying the NNSS M&O CRC at the beginning of project planning and maintaining five- and one-year project forecasts for proper CRM integration.

4.2 Summary of the Section 106 Process

Figure 4.1 outlines the Section 106 compliance process, as established in the NHPA implementing regulations at 36 CFR Part 800. It is important to acknowledge that preservation of every single cultural resource is neither realistic, nor in the public interest. The legal requirement is that effects of a project on historic properties be given full consideration in project planning. Sufficient lead time for cultural resource review must be maintained to allow the Section 106 process to be completed, including consultation with various parties and stakeholders. The steps in the process are described below:

1) Establish the undertaking (36 CFR § 800.3[a]).
    a. Determine if the proposed action is the type of activity that has the potential to affect historic properties.
    b. Coordinate with other reviews (36 CFR § 800.3[b]) such as NEPA, NAGPRA, AIRFA, ARPA, and any agency-specific legislation.
    c. Identify the appropriate participants (36 CFR § 800.3[c]), including the SHPO or ACHP, and provide opportunities for American Indian Tribes to participate; involve the public; and identify and involve other consulting parties (such as local governments or other agencies).
2) Identify and evaluate historic properties (36 CFR § 800.4).
3) Assess adverse effects (36 CFR § 800.5).
4) Resolve adverse effects (36 CFR § 800.6) through the completion of any necessary measures to avoid, minimize, or mitigate project-related adverse effects.

Section 106 places high importance on the role of consultation with various agencies and groups (most notably the SHPO, American Indian Tribes, and the public) to seek input on the interests and concerns of these parties and to devise and implement ways to avoid, reduce, minimize, or mitigate potential adverse effects to historic properties. A successful consultation accommodates the needs of the project while minimizing or mitigating effects to historic properties in a manner that addresses the concerns of the parties consulted. NNSA/NFO has adopted the following protocol to fulfill the Section 106 process and its two PAs.

Establish the Undertaking and Determine the Area of Potential Effects

The Section 106 process is initiated by establishing the undertaking, which is any project, activity, or set of related activities with federal agency involvement that may potentially affect historic properties. To begin the process for a particular project, the RM submits a Cultural Resource Compliance Review (CRCR) form to the M&O CRC. The CRCR package, consisting of the form and supporting documentation, includes a project description, figures (maps, photographs, and/or drawings), and project location(s), including all access roads and equipment staging areas. The project description is sufficiently detailed to accurately identify the area of potential effects (APE), which is the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist (see "Area of Potential Effects" sidebar).

The M&O CRC will forward the CRCR package to the Cultural Resource SME. The Cultural Resource SME will review the project description and determine if an undertaking has any potential to affect historic properties (if any exist in the project area), or if the project is otherwise exempt from Section 106 consideration under executed agreement documents, such as a memorandum of agreement (MOA) or PA. A key purpose of involving a Cultural Resource SME early in project planning is to facilitate the timely modification of project plans to minimize the APE and avoid any possible adverse effects to historic properties as planning goes forward.

If the Cultural Resource SME determines that the project has no potential to affect historic properties or if the project is otherwise exempt from further review and consultation, the Cultural Resource SME informs the CRPM and CRC that no further Section 106 review is required, and the RM may proceed with the undertaking.

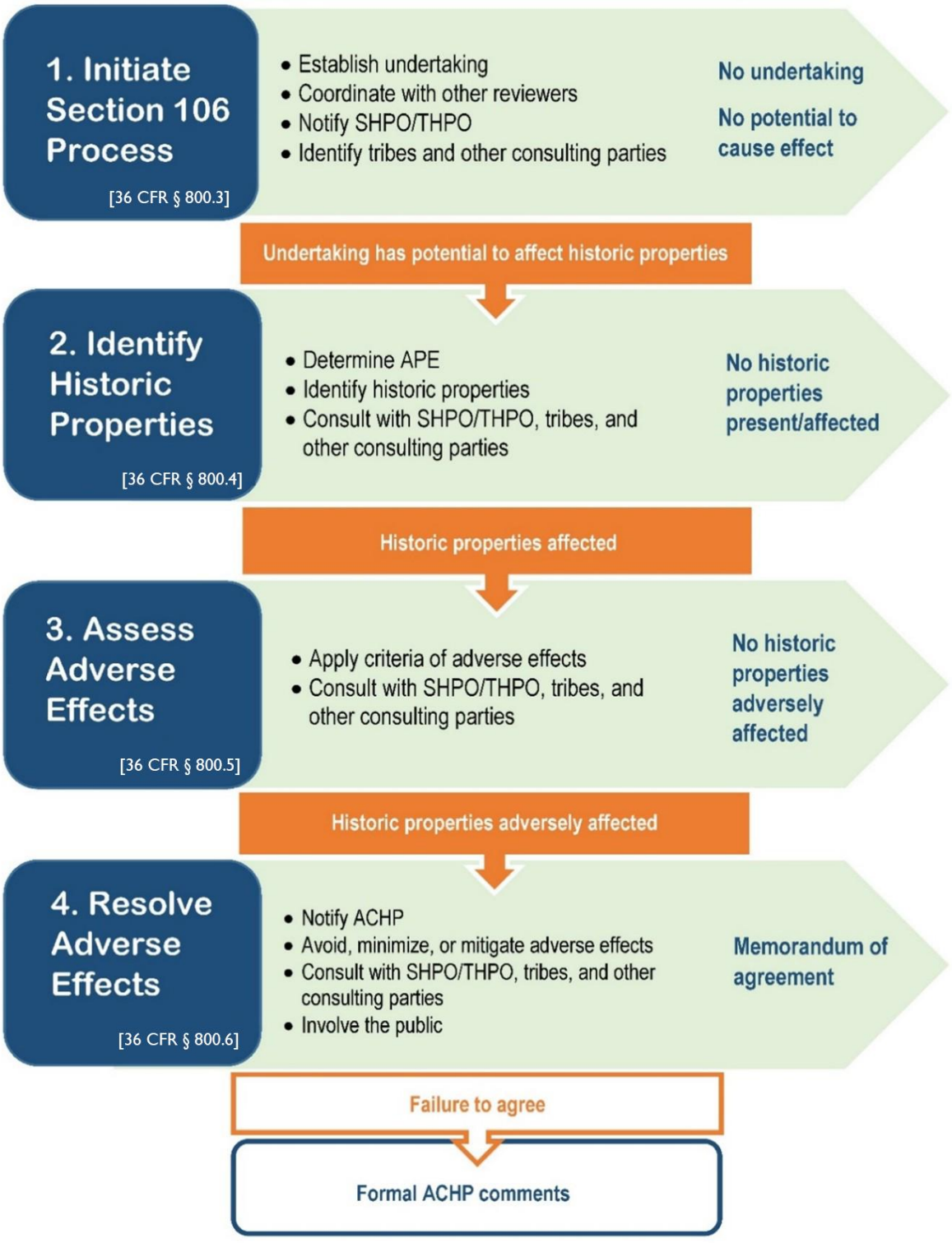

Figure 4.1 Section 106 compliance process (DRI 2024).

Area of Potential Effects (APE)

Section 106 defines the APE to be "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking" (36 CFR § 800.16(d)). Several parts of this definition are important in determining the APE.

1) The APE is undertaking specific and is therefore defined by the potential effects of an activity, not by general alterations or changes to historic properties with age. Such general alterations are better treated as part of an agency's obligations to protect and preserve historic properties under Section 110.
2) The APE's definition depends on the potential to affect historic properties within an area, not whether historic properties are known to exist within that area. In defining the APE, the nature of the undertaking is most important, not the knowledge of possible effects to specific historic properties. The presence of historic properties is assumed until specific steps are made to identify such properties within the defined APE.
3) An undertaking may result in different kinds of effects, all of which are considered when defining an APE. An effect occurs if the undertaking could directly or indirectly alter any of the characteristics of a historic property that qualify it for the NRHP in a manner that would diminish the property's integrity (see "Assessing Effects of an Undertaking" sidebar). Adverse effects result in the alteration, loss, or diminution of the characteristics that make the property eligible for listing in the NRHP, damaging or destroying the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Included are physical damage as well as the introduction of atmospheric, audible, or visual elements that adversely impact a property's historic integrity. Adverse effects may also include reasonably foreseeable impacts caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.

The ACHP emphasizes that determining the APE of an undertaking needs to be documented in a manner that enables reviewing parties (such as the SHPO or ACHP, another consulting party, or a member of the public) to understand its basis through photographs, maps, drawings, and descriptions of the scope of the undertaking.

If the Cultural Resource SME determines the proposed federal action is an activity that has the potential to cause effects to historic properties and the undertaking is not exempt from further consideration, the Cultural Resource SME informs the CRPM and CRC that a Section 106 review is necessary. The CRPM and Cultural Resource SME then take the next steps in the Section 106 process:

1) Determine and document the APE;
2) Identify any historic properties within the APE; and,
3) Identify which consulting parties should participate in the review process and plan how to involve the public. Consulting parties typically include the SHPO, possibly the ACHP, the Tribes, and "others with an interest in the preservation outcomes of the project or those with a legal or economic interest" (https://www.achp.gov/protecting-historic-properties/section-106-process/initiating-section-106).

Identify and Evaluate Historic Properties

Historic properties are those properties listed in or eligible for listing in the NRHP, as defined by eligibility criteria identified in 36 CFR § 60.4. These historic properties may include prehistoric archaeological sites, traditional cultural properties, buildings and engineered structures, significant historic objects, districts composed of several related properties, and historic landscapes. Usually, the term "historic" in this context refers to elements more than 50 years old. Properties less than 50 years old but of exceptional historic significance may also be considered NRHP eligible as defined in 36 CFR § 60.4, Criteria Consideration G. Much of the built environment at the NNSS is intrinsically connected to nuclear weapons testing during the Cold War era, recognized as an important period in national and world history. Many of these properties are considered eligible for the NRHP based on their historic significance in this context, even though they may be less than 50 years old.

If an undertaking has the potential to affect historic properties, the Cultural Resource SME determines the scope of appropriate identification efforts and proceeds to identify historic properties in the APE. This identification process involves a combination of the following:

- Archival and literature searches, including prior cultural resource research and identification work in and around the APE;

- Interviews with knowledgeable persons and consultations with interested parties and knowledgeable individuals and organizations, including affiliated Native American groups who may confer religious and cultural significance to properties in the APE;
- Examination of maps and aerial imagery; and,
- In-field examination and survey of the APE.

Cultural resources found within the APE are documented according to established guidelines using a series of standardized forms. These include an NNSS-specific version of the Nevada Intermountain Antiquities Computer System (IMACS) form for archaeological resources, the Architectural Resource Assessment (ARA) form for individual architectural or engineered resources, and the District Resource Assessment form for historic and archaeological districts. Other forms or tables may be used to record specific types of resources (e.g., rock writing or isolated artifacts). Useful guidelines for completing IMACS forms may be found in the Bureau of Land Management (BLM) Nevada State Office "Guidelines and Standards for Archaeological Inventory" (BLM 2019). Guidelines for inventory of architectural resources are provided in "Nevada Architectural Survey and Inventory Guidelines." Instructions for completing ARA Forms are found on the Nevada SHPO's Forms page (SHPO 2013). Guidelines to the architectural lexicon used in filling out the ARA Form may be found in the "Nevada Architectural Lexicon" in Appendix D of the Nevada State Register of Historic Places Instructions and Guidelines (SHPO 2017). Once finalized, the resource forms are incorporated into the Nevada Cultural Resource Information System (NVCRIS) by the NV SHPO.

Using information gathered during the identification phase, the Cultural Resource SME evaluates and recommends if the properties identified in the APE are listed or eligible for listing in the NRHP, based on the eligibility criteria identified in 36 CFR § 60.4, their integrity (see sidebars "Eligibility Criteria" and "Aspects of a Property's Integrity" in Chapter 3), and their importance in relation to relevant historic contexts of the NNSS (Appendix B). NNSA/NFO makes determinations considering the Cultural Resource SME's recommendations, provides the SHPO with documentation for all properties in the undertaking's APE, and requests the SHPO's concurrence with its determinations.

If the Cultural Resource SME finds that no properties in the APE are known historic properties or require evaluation as potential historic properties, then the Cultural Resource SME recommends a finding of No Historic Properties Affected and notifies the CRPM. If the CRPM agrees with the finding, the CRPM retains all copies of reports and documents used to make the finding as part of NNSA/NFO's administrative record. SHPO concurrence is not required in this case pursuant to the NNSS PA Stipulation V.A, and the RM may proceed with the undertaking after receiving notice from the CRPM.

If, however, the Cultural Resource SME and CRPM conclude that at least one historic property (i.e., a resource that is eligible for or listed in the NRHP) is in the APE for the undertaking, then they proceed to the next step in the Section 106 process, assessment of effects.

Assess Effects to Historic Properties

The Cultural Resource SME assesses how historic properties might be affected by the undertaking and whether any effects might be considered adverse based on the criteria of adverse effect found in 36 CFR § 800.5(a) (see "Assessing Effects of an Undertaking" sidebar). An adverse effect occurs if the undertaking diminishes any of the characteristics of a property that qualify it for inclusion in the NRHP. Adverse effects include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.

The Cultural Resource SME provides the CRPM with a report documenting the effect assessments. If the Cultural Resource SME recommends a finding of No Adverse Effect with Standard Conditions because either (a) all historic properties in the APE will be avoided by the undertaking or (b) the undertaking complies with the SOI Standards for the Treatment of Historic Properties, and the CRPM agrees with the finding, the CRPM retains all copies of reports and documents used to make the finding as part of NNSA/NFO's administrative record. An internal avoidance or action plan may be required to ensure no adverse effect occurs; however, SHPO concurrence is not required in this case pursuant to

NNSS PA Stipulation VI.A.1-2. The RM may proceed with the undertaking after receiving notice from the CRPM.

Alternatively, if the Cultural Resource SME recommends a finding of No Adverse Effect without Standard Conditions per NNSS PA Stipulation VI.A.3, and the CRPM agrees with this finding, the CRPM submits the documentation to the SHPO for a 30-day review period and notifies the Tribes and interested parties. If the SHPO concurs with the finding and other consulting parties do not object, the Section 106 review is concluded, and the undertaking may proceed.

If an adverse effect to one or more historic properties is determined to be a likely outcome of the undertaking, the CRPM (with support from the Cultural Resource SME) consults with the SHPO, the ACHP (if involved), the Tribes, other interested parties, and the public as necessary to seek ways to avoid, minimize, or mitigate the effects to the property or properties.

Assessing Effects of an Undertaking

An effect of an undertaking is adverse if it alters any of the characteristics that qualify the property for inclusion in the NRHP in a way that diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. This includes direct physical effects, as well as atmospheric, cumulative, and visual effects. The following list provides examples per 36 CFR § 800.5(a)(2):

- Physical destruction or damage to all or part of the property.
- Alteration of the property that is inconsistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties.
- Removal of a property from its historic location.
- Change in the use of a historic property.
- Change to the physical features within the property's setting that contribute to its significance.
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's character-defining attributes.
- Neglect that leads to deterioration (except where neglect and deterioration are recognized qualities of a property of religious or cultural significance to an American Indian tribe or Native Hawaiian organization).
- Transfer, lease, and/or the sale of a property out of federal ownership or control without sufficient enforceable measures in place to ensure the long-term preservation of the property's significance.

Resolve Adverse Effects

For undertakings determined to have an adverse effect to one or more historic properties, the NNSA/NFO will develop a plan to resolve the adverse effect (36 CFR § 800.6[b][1]). This plan may include (but not be limited to): (1) modifying the undertaking to avoid the property, (2) modifying the undertaking to minimize adverse effects to those characteristics that make the property eligible for the NRHP, (3) documenting in detail the historic property if it is a historic building or structure, and/or (4) conducting archaeological data recovery if the property is an archaeological site (see "Archaeological Data Recovery" sidebar). For standard property types and activities, the NNSS PA provides standard mitigation in its Appendix D, which NNSA/NFO may propose to use per Stipulation VII.A. When standard mitigation is not appropriate or feasible, the CRPM works with the SHPO (and the ACHP in some cases) on a formal agreement to develop measures to resolve adverse effects, typically an MOA. NNSA/NFO then completes all stipulations in the MOA prior to allowing the undertaking to proceed. Active MOAs for NNSS undertakings can be found on the Nevada SHPO website (www.shpo.nv.gov).

Archaeological Data Recovery

NNSA/NFO routinely redesigns undertakings that would affect unique or important sites, particularly if a site has a complex prehistoric component. If effects are unavoidable, mitigation often requires data recovery to obtain archaeological or historical information from a property that would otherwise be damaged or lost. The Cultural Resource SME prepares a data recovery plan and submits it to the CRPM for consideration as part of the MOA to resolve adverse effects. The CRPM will forward the plan to the SHPO and other consulting parties for review. If data recovery is to be conducted at a prehistoric or ethnohistoric archaeological site, the plan is sent to the Tribes for review as consulting parties. In the past, data recovery involved collecting artifacts, analyzing them in a laboratory, and curating the materials in the NNSA/NFO curation facility located at DRI in Las Vegas, where many items remain in storage. The current protocol is to analyze artifacts at the site and leave them where found. Procedures for this type of in-field data recovery have been developed by the Cultural Resource SME staff and approved by NNSA/NFO. Removal of artifacts is generally not permitted but may occur if necessary and only with written approval from NNSA/NFO.

Data recovery for both prehistoric and historic archaeological sites usually includes mapping, photographing, measuring, and describing artifacts, features, buildings, or structures. The methods used for the data recovery effort 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 mining claim or an open lithic scatter). The SME also uses specific research objectives developed for the work to guide methodology selection.

Upon the completion of fieldwork, a technical report is prepared in accordance with standards in Appendix F of the NNSS PA.

4.3 Streamlining Aspects of the NNSS PA

There are four main ways in which the NNSS PA streamlines the Section 106 process for undertakings on the NNSS: (1) identifying undertakings not requiring SHPO review; (2) identifying property types that are categorically not eligible for the NRHP and therefore not historic properties as defined by Section 106; (3) identifying categories of effect findings not requiring SHPO review; and (4) providing standard mitigation for resolving adverse effects to certain property types.

Undertakings Not Requiring SHPO Review

As part of negotiating the NNSS PA, NNSA/NFO, the SHPO, and the ACHP agreed that certain routine activities and operations associated with the maintenance and repair of grounds and buildings have no potential to affect historic properties. They fall into two tiers. Tier I activities are routine and typically minor. They do not require review by an SOI-qualified Cultural Resource SME and are not reported to the SHPO in any form. A list of these activities is provided in Appendix E.1.1. Tier II activities require review by an SOI-qualified Cultural Resource SME to ensure that no effects to historic properties will occur. A list of these activities is provided in Appendix E.1.2.

For projects with Tier II activities in their scopes of work, project plans are submitted to the Cultural Resource SME through a CRCR package. If the Cultural Resource SME determines the project plans meet the criteria for exemption and therefore will not result in adverse effects, the NNSA/NFO CRPM permits the work to proceed as planned without SHPO consultation. NNSA/NFO reports its Tier II reviews to the SHPO in summary form in the NNSS PA annual report.

Properties Considered Categorically Not Eligible for the NRHP

As part of negotiating the NNSS PA, NNSA/NFO, the SHPO, and the ACHP agreed that certain types of properties are categorically not eligible for listing in the NRHP and therefore do not require detailed documentation and evaluation when located in the APE for an undertaking. A list of these property types is provided in Appendix E.2. These property types are recorded in tabular format during the identification phase of an undertaking, but are not evaluated on inventory forms, unless the Cultural Resource SMEs determine that there is a compelling reason to do so.

Effect Findings

The NNSS PA streamlines effect findings by eliminating SHPO review requirements under the following circumstances: undertakings having no eligible and/or potentially eligible properties in the APE; undertakings with eligible properties in the APE that will be avoided; and undertakings that comply with the SOIS for the Treatment of Historic Properties. Each circumstance is summarized in Section 4.2. More detail regarding the NNSS PAs requirements for avoidance and SOIS compliance are in Appendix E.3).

Standard Mitigation

As part of negotiating the NNSS PA, NNSA/NFO, the SHPO, and the ACHP agreed that certain standard mitigation measures are sufficient for mitigating adverse effects to Cold War-era, nuclear testing-related property types eligible for the NRHP under Criteria A, B, and/or C (Appendix E.4). They do not apply to properties eligible under Criterion D.

When applicable, NNSA/NFO notifies the SHPO, the ACHP, the Tribes, and other consulting parties of its intention to use standard mitigation to mitigate adverse effects. NNSA/NFO ensures that standard mitigation is completed prior to project initiation. The purpose of applying standard mitigation is to minimize the number of repetitive, project-specific MOAs executed for undertakings on the NNSS.

The standard mitigation procedures differ based on whether a property is individually eligible for the NRHP; a contributing element to a recorded, NRHP-eligible historic district; or an element of an unrecorded and unevaluated historic district.

There are also procedures for historic properties that are part of multiple-element classes (i.e., part of a class or category of buildings or structures that are very similar to, identical, and redundant in design and function), for which documentation of one or a few elements sufficiently represents the whole class.

Annual Reporting

By the end of January each year, NNSA/NFO submits an annual implementation report to the SHPO that summarizes actions taken pursuant to the NNSS PA in the previous federal fiscal year. Among other pertinent matters, the report includes succinct information on:

- Projects reviewed as exempt Tier II undertakings;
- No Historic Properties Affected findings; and
- No Adverse Effect with Standard Conditions findings.

4.4 Unanticipated Discoveries

Despite the use of advance surveys and other identification efforts, some important cultural resources may unexpectedly be encountered during ongoing projects. This is most often the case with buried resources, but the category may also involve structures or objects exposed by dismantling or demolition activities.

Pause Work authorities are used by contractor organizations to provide mechanisms for protecting inadvertently discovered cultural materials from damage. All NNSS employees are trained to recognize their right and obligation to stop any work process that could adversely affect safety or the environment, which includes exposing or threatening cultural resources. Employees are also encouraged to contact the NNSA/NFO CRPM whenever they have questions or concerns about cultural resources, or if they find something they think may be of interest.

When NNSS employees suspect important or sensitive cultural materials have been identified or uncovered, or previously identified cultural resources are subject to unanticipated impacts, they are trained to stop or redirect their activities and immediately contact the NNSA/NFO CRPM. The project's RM establishes a buffer of at least 10 meters around the discovery. The CRPM then schedules a site visit with the Cultural Resource SME to evaluate the situation. If human remains are encountered, the NNSA/NFO CRPM will also immediately notify the appropriate county sheriff's office and initiate compliance with the NAGPRA, as appropriate.

Once notification has been made through the NNSA/NFO CRPM, the CRPM will notify other parties as the situation demands. For prehistoric archaeological sites, these parties will include (but not necessarily be limited to) the SHPO and the Tribes. An invitation to consult on the resolution of adverse effects to the identified resource and participate in any associated activities will be included with this notification. Specific timelines for notifications and reports are provided in the NNSS PA under the Post-Review Discoveries Stipulation X. NNSA/NFO also follows the principles within the ACHP's Policy

Statement on Burial Sites, Human Remains, and Funerary Objects as applicable: https://www.achp.gov/treatment-burial-sites.

4.5 Emergency Situations

Emergency response activities are those declared by the president, state governor, or NNSA/NFO as necessary to safeguard human health and the environment during declared disasters, emergencies, or national security threats. Compliance with historic preservation requirements is temporarily waived during emergency situations at the NNSS in order to preserve human health or property. However, emergency responders can carry on the spirit of the mandates by consistently trying to minimize the overall impact of their activities. Emergency responders are also trained and reminded that activities completed in anticipation of emergency situations (e.g., waste and radiation containment, flood control, fire control and controlled burns, emergency road construction or realignment) and those conducted after termination of the emergency are not exempt from cultural resource review.

Although activities conducted prior to termination of an NNSS emergency are exempt from advance cultural resource review and consideration, the effects of those activities must be evaluated when it is deemed safe to do so. Once an emergency has ended, the NNSA/NFO CRPM notifies the Cultural Resource SME, who may then complete archive searches and field inventories, as appropriate, to identify and assess impacts to cultural resources in the affected areas.

5 CONSULTATION

Consultation is a cornerstone of historic preservation, giving stakeholders, the Tribes, and the public a voice in the protection of their heritage. It is through active consultation—which includes seeking, discussing, and considering the views of others—that NNSA/NFO engages with stakeholders and interested parties on management of historic properties at the NNSS. Because the NNSS is a restricted-access facility and not open to the public, consultation plays a particularly important role in sharing information about historically and culturally significant properties at the site.

Historic preservation has been a public cause since before the beginning of the twentieth century. Public outcry about the destruction of spectacular archaeological sites led to the enactment of the Antiquities Act of 1906, which established protections for important sites and established national monuments. When large-scale federal programs during the New Deal of the 1930s threatened other historic buildings and sites, Congress passed the Historic Sites Act of 1935 in response to widespread citizen concern.

After World War II, the construction of the interstate highway system and the incentives for urban renewal resulted in the demolition of many historic properties by federally initiated programs. Citizens became concerned with the nationwide destruction, which prompted the enactment of the NHPA in 1966. This law is the most far-reaching historic preservation legislation ever passed. It requires federal agencies to evaluate the effects of all federally funded or permitted projects on historic properties through the Section 106 review process, and it requires them to consult with stakeholders, Tribes, state and local governments, and interested organizations and individuals.

5.1 SHPO and ACHP Consultation

NNSA/NFO consults regularly with the Nevada SHPO on matters pertaining to undertakings as part of its Section 106 obligations (see Chapter 4). Consultation with the SHPO occurs throughout the Section 106 process and in accordance with the stipulations of the NNSS PA as formal communications via letter or email; informal communications via telephone or email; and periodic virtual and in-person meetings that typically include the NNSA/NFO CRPM, Cultural Resource SMEs, the M&O CRC, other NNSA/NFO personnel, and SHPO staff.

After consulting with the SHPO, NNSA/NFO CRPM may invite the ACHP to participate in the consultation process for complex projects or the development of agreement documents. Should the ACHP elect to participate, the NNSA/NFO CRPM includes the ACHP in notifications, negotiations, and decisions in the same manner as the SHPO.

5.2 Consultation and Coordination with Other Agencies

For NNSA/NFO projects that may affect properties managed by other agencies, the NNSA/NFO CRPM consults with the relevant agency authorities and reaches an agreement on how effects will be resolved. Likewise, the NNSA/NFO CRPM is the liaison for consultations with other agencies that may have projects affecting properties on the NNSS. Depending on the project, either NNSA/NFO or the other agency will take the lead in consultations with the SHPO and ACHP.

NNSA/NFO may team with other agencies to develop multiagency approaches for the coordinated management and treatment of cultural resources that extend beyond the boundaries of the NNSS. The NNSS is bound by lands administered by the DOD and the BLM. Region-wide coordination of cultural resource management goals and strategies may result in cost-effective solutions that enhance the protection of the shared cultural resource base. The NNSA/NFO CRPM is the liaison for coordinating such efforts on behalf of NNSA/NFO.

5.3 American Indian Consultation and Engagement

Sixteen Tribes and organizations representing major affiliated ethnic groups from Arizona, California, Nevada, and Utah have cultural and/or historic ties to the NNSS (see Appendix D). Collectively, this group comprises the American Indian Tribes and other concerned American Indian organizations who participate in the NNSA/NFO American Indian Consultation Program (AICP).

The NNSA/NFO AICP was initiated in 1991 to facilitate compliance with federal laws pertinent to American Indian concerns regarding archaeological, plant, and animal resources, as well as sites of religious and cultural importance at the NNSS (Beck et al. 2000; Pippin 1991; Stoffle et al. 2001). Based on a government-to-government relationship, the program is conducted according to applicable laws and regulations: DOE Order 144.1A, "DOE Requirements for Consultation and Engagement with Federally Recognized Indian Tribes and Alaska Native Claims Settlement Act Corporations Pursuant to DOE 144.1," issued in 2024; executive orders, such as Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments," issued in 2000, and 14112, "Reforming Federal Funding and Support for Tribal Nations to Better Embrace Our Trust Responsibilities and Promote the Next Era of Tribal Self-Determination," issued in 2023; and presidential memoranda, "Presidential Memorandum on Uniform Standards for Tribal Consultation," issued in 2022. The NNSA/NFO AICP has been an effective communication and management tool for more than three decades, and the program is intended to be maintained over the long term.

The goal of the NNSA/NFO AICP is to consult with the Tribes to identify the values and resources that are important to them and to develop recommendations for the protection and management of properties. The AICP includes formal and informal correspondence, quarterly letters summarizing current and ongoing Section 106 projects, annual meetings, and periodic field visits to important sites at the NNSS. It also includes subcommittees of tribal representatives to support specific NNSS activities on an ad hoc basis, as well as a standing Tribal Planning Committee (TPC).

Tribal Planning Committee

The TPC is composed of six members, two from each of the three major ethnic groups affiliated with the NNSS lands. The purpose of the TPC is to facilitate direct interaction among NNSA/NFO personnel and tribal representatives in between larger AICP annual meetings. The TPC meets with NNSA/NFO quarterly and attends up to three field visits to the NNSS per year. The TPC receives and gives updates during the quarterly meetings and prepares written perspectives and management recommendations for NNSA/NFO following the field visits. The TPC members also report back to the Tribes they represent and provide a presentation on recent activities each year at the annual AICP meeting.

Tribal Contacts

NNSA/NFO consults with the Tribes on a government-to-government basis. Officially, tribal chairpersons are the principal points-of-contact in formal agreements and information sharing. A tribal government will often designate a THPO to perform historic preservation duties on the tribe's behalf, and NNSA/NFO works with this individual during consultations. In addition, individuals who can provide valuable cultural insight may be involved in certain consultations as knowledgeable persons.

Meetings

NNSA/NFO holds quarterly meetings with the TPC, as discussed previously, to review the status of ongoing projects of potential concern to the Tribes, seek input on proposed projects, and discuss other matters of mutual concern. These quarterly meetings supplement the AICP Tribal Update Meeting (TUM) which NNSA/NFO hosts annually. The TUM includes NNSA/NFO management, Tribal representatives from all 16 affiliated Tribes, Cultural Resource SMEs, Biological Resource SMEs, and other M&O representatives. The annual meeting provides a forum for obtaining advice and opinions, discussing proposed NNSS activities, resolving controversial issues, and developing management recommendations (Figure 5.1).

Field Visits

NNSA/NFO hosts between two and three field visits to the NNSS for the TPC on an annual basis and one field visit every two years as part of the TUM. Many locations of interest to the Tribes are in areas that are difficult, if not impossible, to access via bus or large vehicle. The smaller TPC visits of between six and nine representatives are made via truck caravan and provide tribal members with access to these difficult to reach locations (Figure 5.2). The visits often involve substantial hikes to remote sites. The biennial field trips included in the TUM involve a coach bus carrying over 20 people on average and provide representatives from all Tribes with access to the NNSS. NNSA/NFO selects the locations for all tribal visits based on recommendations from the Tribes.

Management Recommendations

As part of the annual TUM, tribal representatives develop recommendations for the mitigation, protection, and management of traditional, cultural, and natural resources important to their Tribes. They present the recommendations to NNSA/NFO management in person, and then the AICP Coordinator finalizes them in writing and submits them to the NNSA/NFO CRPM. The CRPM works with NNSA/NFO management to develop written responses to the recommendations. The feasibility of implementing tribal recommendations depends on whether the recommendations remain within the federal statutes and regulations that govern land management decisions and on physical and financial constraints. NNSA/NFO's written responses are provided to the Tribes via email and hard copy in the annual TUM summary report. It is important that NNSA/NFO and Tribal representatives maintain a productive working relationship, and that future consultations build upon and incorporate lessons learned from previous consultations. The AICP annual meetings and formal process of writing and responding to recommendations fosters continued collaboration and learning.

NAGPRA Consultations

Formal consultations concerning NAGPRA issues related to NNSS archaeological collections were conducted with Tribal representatives in 1994-1996 and in 1999-2000. These discussions resulted in the repatriation of approximately 630 items determined by Tribal members to be sacred objects or unassociated funerary objects (Stoffle et al. 2001). These objects were re-buried at the NNSS during two ceremonies led by Tribal representatives in 1996 and 2002 respectively.

Consultations related to NAGPRA issues have occasionally been conducted when funerary items have been identified in the field. During these situations, the CRPM follows NAPGRA regulations, stopping any work in the vicinity of the find, contacting the Cultural Resource SME and Tribal representatives to schedule investigations, and developing plans to ensure the remains are not disturbed. If possible, the remains are left in place, and any planned activities that may occur in the vicinity are designed to avoid the

find and its setting. If avoidance is not possible, formal plans for respectful repatriation are developed and followed.

In 2024, NNSA/NFO initiated development of a NAGPRA Plan of Action (POA) to address unanticipated discovery of NAGPRA items in the future, in accordance with the updated 2024 NAGPRA regulations (43 CFR Part 10). NNSA/NFO will consult with the Tribes throughout the POA development, and once it is complete, the POA will be added to this plan as Appendix C.

5.4 Interested Parties Consultation

NNSA/NFO consults regularly with interested parties regarding undertakings affecting historic properties on the NNSS via written correspondence. NNSA/NFO sends quarterly letters to groups and organizations with known interest in the NNSS and its history. The letters summarize current and ongoing projects and their progress in the Section 106 process. The same parties are also contacted whenever an undertaking will adversely affect historic properties. NNSA/NFO invites them to participate in agreement documents to resolve adverse effects and considers any and all comments received.

Figure 5.1 NNSA/NFO Tribal Update Meeting participants (DRI 2019).

Figure 5.2 Tribal representatives on an NNSS field visit to Topopah Spring (DRI 2024).

6 GOALS OF THE NNSA/NFO CRM PROGRAM

This chapter describes several short- and long-term goals and the associated tasks needed to achieve them. The goals prioritize ongoing cultural resource management responsibilities, identify NNSS-specific needs and important preservation opportunities, and recognize opportunities for programmatic development to maintain and supplement an integrated, effective, and legally compliant CRM program. The intent is to respond to legal and policy requirements consistent with long-term stewardship, stakeholder involvement, and tribal interests.

Of note, the NNSA/NFO CRM program has been in continuous existence since the 1970s and has many accomplishments. See Appendix F for examples and highlights from its decades of work. They have been selected to illustrate the truly unique and valuable historical and cultural heritage that is contained in the tangible archaeological and built environment preserved at the NNSS.

6.1 Programmatic Goals

The CRM program has several major goals for the next ten years. New goals may be added and will be prioritized in response to changes in the NNSS mission and operations, the regulatory framework that drives compliance activities, comments and advice from the Tribes and stakeholders, and available funding.

Goal 1: Effectively manage the anticipated Section 106 compliance workload.

NNSA/NFO and its contractors have an ambitious agenda of future projects and operations at the NNSS, many of which will require compliance with Section 106. A major goal of the NNSS CRM program is to effectively manage the Section 106 workload within the timeframes required by NNSA/NFO and contractor organizations. The agency will carry out the following key tasks to accomplish this goal:

- Integrate Section 106 requirements into overall project planning, ensuring that project plans are communicated to the NNSA/NFO CRPM, M&O CRC, and Cultural Resource SME in a thorough and timely manner so that each Section 106 review process can be completed within project schedule constraints.
- Maintain an adequate number of Cultural Resource SME staff to cover Section 106 review needs as mandated by project workloads.

Goal 2: Identify preservation needs and implement appropriate preservation, protection, or mitigation measures for key historic properties.

Certain historic properties at the NNSS are especially significant as tangible representatives of important events and themes in national history. Many of these are unique nuclear testing-related buildings and structures from the Cold War era and only exist at the NNSS. It is important to focus preservation, protection, or mitigation efforts on these highly significant properties.

Examples of such important properties include:

- Structures on Frenchman Flat built to test the effects of atmospheric nuclear explosions.
- Model houses built as part of Apple-2 tests to gauge the effects of nuclear explosions.
- CP-1, which served as the command-and-control center for decades of nuclear testing.
- Smoky Historic District, the location of the best-preserved post-shot atmospheric nuclear tower test.
- The B. M. Bower Cabin, an example of early ranching and mining structures at the NNSS and the retreat of Bertha Muzzy Sinclair, who wrote under the pseudonym B. M. Bower.
- Cane Springs, the site of a Native American village jointly occupied by Southern Paiute and Shoshone families and called *Pagax mbuhan* and *Hugwap*, as well as the known camp of a large party of the Death Valley ’49ers, the earliest American emigrant group known to have traversed the NNSS.

- Ethnohistoric Native American camps, village sites, and seasonal habitations in various locations, including Oak Spring, Captain Jack Spring, Tippipah Spring, Topopah Spring, Ammonia Tanks, *Wungiakuda*, *Mutsi*, *Sivahwa*, and Landmark Rock.

In some situations, long-term exposure to desert climatic conditions is degrading these properties; in others, building closures and abandonment may result in long-term adverse effects. In these situations, often the only effective solution to mitigate this cumulative damage is to properly record the buildings or structures in their present condition before they fall into further disrepair and collapse.

NNSA/NFO and its contractors, in consultation with the Cultural Resource SME, will identify NNSS cultural resources that fall into this category; establish baseline conditions and preservation needs; and formulate plans to effectively preserve, protect, and manage these properties or to document them as part of the mitigation process.

Goal 3: Update and develop historic contexts and research themes for historic properties as our understanding continues to evolve.

The historical significance and importance of certain cultural resources may change as our understanding of past events and themes develops and as historians and the public ask new questions about our heritage. Appendix B provides a general historic context for the NNSS, covering American Indian and Euro-American occupation histories from regional and national perspectives. One of the ongoing goals of the NNSS CRM program is to update these broad historic contexts and research themes to reflect current information and address new research questions for specific situations, as needed. This historic context will continue to be developed in connection with future revisions to this CRM plan.

Goal 4: Enhance lines of formal consultation with interested parties and build on programs of community and stakeholder outreach and education.

As discussed in Chapter 5, the NNSA/NFO has developed a multifaceted approach for reaching out to stakeholders, interested parties, and communities surrounding the NNSS. NNSA/NFO is committed to enhancing its efforts to interact with stakeholders and the interested public, while being mindful of the necessary national security and confidentiality constraints that are required at the NNSS facility. NNSA/NFO will seek novel ways to enhance outreach efforts so that interested parties may learn more about and comment on the important historic events that have occurred at the NNSS.

Goal 5: Complete the necessary reporting documentation and updates required under PAs, the Preserve America Program, DOE directives, and other regulatory and programmatic drivers.

The NNSA/NFO has responsibilities to report on its progress in meeting various obligations under the CRM program. These include (1) annual reports on the progress of the Mercury and NNSS PAs, (2) periodic reports on accomplishments under programs such as the Preserve America Program, (3) reports on findings and determinations of specific projects to various agencies and stakeholders, (4) annual reports on activities related to curation of NNSA/NFO artifact collections and GIS database maintenance, and (5) annual reports on tribal engagement and consultation.

NNSA/NFO also has a responsibility to update this CRM Plan every ten years, as specified in the NNSS PA. The update will include updated goals, accomplishments, historic contexts and research questions, and agreement documents, along with updates related to new or revised cultural resource laws, regulations, executive orders, DOE orders, and policies.

NNSA/NFO intends to ensure that reporting and update requirements are tracked and met in an adequate and timely manner, and that adequate SME support is provided to meet this goal.

Goal 6: Ensure long-term maintenance of cultural resource records, databases, and collections.

As noted in Chapter 3, NNSA/NFO and its Cultural Resource SME maintain extensive cultural resource records and databases along with collections of artifacts that have accumulated over several decades as part of ongoing CRM program activities. These materials are a critically important part of the historic record of the NNSS, and NNSA/NFO is committed to meeting its legal obligations to effectively manage and protect these resources, as well as those left *in situ* at the NNSS. The specific plans for these

materials are to modernize aging records to ensure they are still useable as database technology evolves, continue to develop a photograph archive, and revisit selected NNSS cultural resource sites to ensure that information about the content and condition of historic properties is up to date.

In light of the updated NAGPRA regulations published in 2024, NNSA/NFO also plans to review its artifact collections to determine if any items or collections require revisiting and ensure that compliance with NAGPRA is maintained moving forward.

Goal 7: Plan for the protection and management of cultural resources as NNSS missions evolve in the next five to twenty years.

Missions and activities planned for the NNSS evolve over time, with lead time in preparation occurring years to decades in advance. NNSA/NFO is committed to integrating its CRM program into these long-term planning processes and ensure that planners are notified of the agency's obligations under the law to include cultural resource protection and preservation as part of its mission. The agency will develop strategies for meeting the CRM program goals during the medium- to long-term evolution of the functions and missions of the NNSS.

6.2 Cultural Resource Projects for Future Consideration

As a result of information gained from the previous decades of CRM at the NNSS, a number of specific cultural resource projects are under consideration to enhance preservation objectives and contribute to increased knowledge of the national history represented on the NNSS. Many of the projects relate to fulfilling Goals 2, 3, and 7, above.

Prehistoric and Ethnohistoric

- Aerial and ground-level recording of geoglyph sites in Fortymile Canyon and Area 16.
- Sample survey of Cane Springs Wash.
- Evaluation of the trail/connection between Landmark Rock and Ammonia Tanks and development of a related ethnohistoric context.
- Pottery sourcing study integrating American Indian knowledge to understand processing, sourcing, and importance of color selections.
- Evaluation of Shoshone Mountain archaeological sites recorded during inventory for a proposed wind farm.
- Condition assessment of petroglyphs in the upper Fortymile Canyon.
- Virtual tour creation of sites important to the Tribes but to which access is infeasible, to be distributed to the Tribes only for the purposes of providing a better understanding of their current conditions and obtaining their perspectives and management recommendations.

Early Historic Era

- Complete the documentation of White Rock Spring.
- Expand the historic ranching, mining, and military contexts for the NNSS as additional historic information becomes available.

Cold War Era Resources

- Complete the Apple-2 houses condition assessment and treatment plan.
- Record current condition of the Frenchman Flat historic district.
- Record the 1950s trenches in Frenchman Flat and Yucca Flat.
- Record the Annie atmospheric test location.
- Document the resources associated with the Peacekeeper (MX) missile program.

- Record and/or develop a historic context for the Plowshare high-explosive and nuclear cratering experiments on Frenchman Flat, Yucca Flat, and Buckboard Mesa.
- Document Icecap and its associated resources as a potential historic district.

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Appendix A. Legal and Regulatory Requirements, Standards, and Guidelines

As a federal agency, NNSA/NFO 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 goal. The focus of these laws and regulations is to identify cultural resources on federal lands and provide mechanisms to manage and protect them and their historic and scientific values. They also delineate American Indian rights to express religious freedom; provide a process for the repatriation of American Indian human remains, sacred items, and objects of cultural patrimony; and ensure the participation of tribal groups in the cultural resource management process.

A.1. Statutes

Antiquities Act of 1906 (16 USC §§ 431-433) was among the first laws directly mandating the federal government to protect and manage cultural resources located on public lands. It allows the President to set aside certain areas containing especially important historical and archaeological sites as national monuments and historic landmarks. It established that objects of antiquity on federal lands must 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. The law required that artifacts and associated documents be cared for in public museums, that a system be created to establish national monuments, and that criminal penalties be assessed for violations by any person who excavates, obtains objects from, damages or destroys any historic ruin or monument on federally owned or controlled land without permission from the federal agency.

Historic Sites, Buildings, and Antiquities Act of 1935 (16 USC §§ 461-467) established a national policy of preserving historic sites, buildings, and objects of national significance. It gave the Secretary of the Interior authority to acquire, restore, and maintain such sites; and it 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, and the Historic American Engineering Record.

National Historic Preservation Act of 1966, as amended (54 USC § et seq.; formerly 16 USC § 470 et seq.) firmly 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 created the Advisory Council on Historic Preservation (ACHP) 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 processes by which significant cultural resources are recognized and protected from potential adverse effects of undertakings.

> **Section 106** (54 USC § 306108) requires federal agencies to consider in the planning stages of undertakings the potential impacts on historic properties listed in or eligible for the NRHP and provide consulting agencies, including the SHPO and the ACHP, sufficient information and time to comment on the effects of the undertaking. Implementing regulations are found in 36 CFR Part 800 Protection of Historic Properties.
>
> **Section 110** (54 USC §§ 306101-306107; §§ 306109-306114) requires federal agencies to inventory and evaluate cultural resources under their jurisdiction, 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, whether they may be affected by planned undertakings or not. Guidelines for meeting the requirements of Section 110 are found in 63 FR 20496, listed in "Federal Standards and Guidelines," below.

Section 112 (54 USC § 306131) requires agency and contractor personnel conducting cultural resources investigations to meet specific professional qualifications and that their investigations meet certain industry standards. In addition, this section requires that all data and records for historic properties be maintained and available for research purposes.

Section 304 (54 USC § 307103) directs federal agencies, after consultation with the SOI, 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 vandalism.

National Environmental Policy Act of 1969, as amended (42 USC § 4321 et seq.) requires federal agencies to evaluate 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. Implementing regulations are codified in 40 CFR 1500-1508, with counterpart DOE regulations at 10 CFR 1021. These regulations recommend combining NEPA compliance with the requirements for cultural resource management, AIRFA, and NAGPRA.

American Indian Religious Freedom Act of 1978 (42 USC § 1996) reaffirms American Indian religious freedom rights under the First Amendment and sets national policy to protect and preserve the inherent and constitutional right of American Indians to believe, express, and exercise their traditional religions. The law allows these groups access to sites on federal properties integral to religious ceremonies and traditional rites. It also directs agencies to consult with American Indian groups and leaders to develop and implement policies and procedures to protect and preserve cultural and spiritual traditions and sites.

Archaeological Resources Protection Act of 1979, as amended (16 USC § 470aa et seq.) 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 obtained from federal land. Criminal and civil penalties for violations are mandated, which include 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 American Indian tribes or organizations 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 Graves Protection and Repatriation Act of 1990, as amended requires federal agencies to consult with tribes regarding human remains and materials in their collections. It acknowledges tribes' rights related 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. Implementing regulations are found in 43 CFR Part 10.

A.2. Regulations

36 CFR Part 60, *National Register of Historic Places.* The National Historic Preservation Act of 1966, 80 Stat. 915, 16 USC § 470 et seq., as amended, "authorizes the Secretary of the Interior to expand and maintain a National Register of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering and culture. These regulations set forth the procedural

requirements for listing properties on [sic] the National Register" (36 CFR § 60.1, Authorization and expansion of the National Register). The regulations include criteria for evaluation and the nomination process.

36 CFR Part 63, *Determination of Eligibility for Inclusion in the National Register of Historic Places.* "These regulations have been developed to assist Federal agencies in identifying and evaluating the eligibility of properties for inclusion in the National Register. The regulations explain how to request determinations of eligibility under section 2(b) of Executive Order 11593 and the regulations of the Advisory Council on Historic Preservation (36 CFR Part 800) for implementation of sections 1(3) and 2(b) of Executive Order 11593 and the National Historic Preservation Act of 1966, as amended Federal agencies request determinations of eligibility in considering historic properties on lands under their jurisdiction or control or on lands to be affected by proposed actions" (36 CFR § 63.1, Purpose and authorities).

36 CFR Part 65, *National Historic Landmarks Program.* "The purpose of the National Historic Landmarks Program is to identify and designate National Historic Landmarks, and encourage the long range preservation of nationally significant properties that illustrate or commemorate the history and prehistory of the United States. These regulations set forth the criteria for establishing national significance and the procedures used by the Department of the Interior for conducting the National Historic Landmarks Program" (36 CFR § 65.1, Purpose and authority). In the Historic Sites Act of 1935 (45 Stat. 666, 16 USC § 461 et seq.), Congress declared "it is a national policy to preserve for public use historic sites, buildings and objects of national significance for the inspiration and benefit of the people of the United States."

36 CFR Part 68, *The Secretary of the Interior's Standards for the Treatment of Historic Properties.* In response to the requirements of the NHPA and other statutes, these regulations "set forth standards for the treatment of historic properties containing standards for preservation, rehabilitation, restoration and reconstruction" (36 CFR § 68.1, Intent).

36 CFR Part 78*, Waiver of Federal Responsibilities under Section 110 of the National Historic Preservation Act.* "Section 110 of the National Historic Preservation Act of 1966, as amended ("Act"), sets forth certain responsibilities of Federal agencies in carrying out the purposes of the National Historic Preservation Act of 1966. Subsection 110(j) authorizes the Secretary of the Interior to promulgate regulations under which the requirements in section 110 may be waived in whole or in part in the event of a major natural disaster or an imminent threat to the national security. Waiver of responsibilities under section 110 does not affect an agency's section 106 responsibilities for considering the effects of emergency activities on properties included in or eligible for the National Register of Historic Places and for affording the Advisory Council on Historic Preservation an opportunity to comment on such activities" (36 CFR § 78.1, Authorization).

36 CFR Part 79, *Curation of Federally-owned and Administered Archaeological Collections*. "The regulations in this part establish definitions, standards, procedures and guidelines to be followed by Federal agencies to preserve collections of prehistoric and historic material remains, and associated records, recovered under the authority of the Antiquities Act (16 USC §§ 431-433), the Reservoir Salvage Act (16 USC § 469-469c), section 110 of the National Historic Preservation Act (16 USC § 470h-2) or the Archaeological Resources Protection Act (16 USC § 470aa-mm)" (36 CFR § 79.1, Purpose).

36 CFR Part 800, *Protection of Historic Properties*. These regulations set forth the purposes, participants, and procedural requirements of the section 106 process as called for in the NHPA, as well as program alternatives to that process. Appendix A to Part 800 specifies criteria for Council involvement in reviewing individual section 106 cases.

43 CFR Part 7, *Protection of Archaeological Resources.* These regulations set forth the requirements for protection of archaeological resources as required under ARPA.

43 CFR Part 10, ***Native American Graves Protection and Repatriation Regulations.*** These regulations set forth the procedural requirements for repatriating human remains, funerary objects, sacred objects, or objects of cultural patrimony as required under NAGPRA.

A.3. Executive Orders and Memoranda

Executive Memorandum, "Uniform Standards for Tribal Consultation," 30 November 2022, emphasizes the significance of Tribal consultation, recognizing the nation-to-nation relationship between federally recognized Tribes and the United States, as well as the U.S. treaty and trust responsibilities to Tribes. It requires an annual training for agency employees who work with Tribal Nations or on policies with tribal implications.

Executive Memorandum, "Guidance for Federal Departments and Agencies on Indigenous Knowledge," 30 November 2022, recognizes the value of Indigenous Knowledge and the critical importance of ensuring the federal departments' and agencies' consideration and inclusion of said knowledge is guided by respect for the sovereignty and self-determination of Tribal Nations; the Nation-to-Nation relationship between the United States and Tribal Nations and the United States' trust responsibility; and the need for the consent of and honest engagement with Tribal Nations and Indigenous Peoples. The memorandum provides guidance to assist federal agencies in understanding and applying Indigenous Knowledge, as well as growing and maintaining relationships with Tribal Nations and Indigenous Peoples.

Executive Memorandum, "Tribal Consultation and Strengthening Nation-to-Nation Relationships," 26 January 2021, reaffirms the policy in the Presidential Memorandum of November 5, 2009 (Tribal Consultation), requiring each agency to prepare and periodically update a detailed plan of action to implement the policies and directives of Executive Order 13175 (see respective memorandum and order summaries below).

Executive Memorandum, "Tribal Consultation," 5 November 2009, emphasizes the commitment to regular and meaningful consultation and collaboration with tribal officials in policy decisions that have tribal implications including through complete and consistent implementation of Executive Order 13175.

Executive Memorandum, "Government-to-Government Relationship With Tribal Governments," 23 September 2004, seeks to ensure that the rights of sovereign federally recognized American Indian Tribes are fully respected by requiring federal agencies to operate within a government-to-government relationship with tribal governments, including assessing potential impacts of plans, projects, and activities on tribal trust resources and working directly and effectively with tribal governments to address specific needs of tribal communities.

Executive Order 11593, "Protection and Enhancement of the Cultural Environment," 13 May 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, identifying, and nominating cultural resources to the NRHP.

Executive Order 13007, "Indian Sacred Sites," 24 May 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 is to be maintained by the federal agency and their physical integrity is not to be adversely affected.

Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments," 6 November 2000, reaffirms the federal government's commitment to tribal sovereignty, self-determination, and self-government. Its purpose is to ensure that all Executive departments and agencies consult with American Indian tribes and respect tribal sovereignty as they develop policy on issues that impact American Indian communities.

Executive Order 13287, "Preserve America," 3 March 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 directed to maximize their efforts to integrate the

policies, procedures, and practices of the NHPA and this order into their program activities and to advance the protection, enhancement, and contemporary use of federal historic properties and to promote partnerships for the preservation and use of historic properties. The Omnibus Public Land Management Act of 2009 permanently authorized the Preserve America program.

A.4. Department of Energy Directives

DOE Policy 141.1, "Department of Energy Management of Cultural Resources," 2001, ensures that the DOE maintains a program to meet the intent and spirit of cultural resource legal mandates. Specific objectives of the policy direct that (1) DOE management raise the level of awareness within the agency and its contractors concerning the importance of the DOE's cultural resource-related legal and trust responsibilities, and that (2) DOE programs and field offices effectively integrate cultural resource management into their missions and activities.

DOE Order 144.1A, "DOE Requirements for Consultation and Engagement with Federally Recognized Indian Tribes and Alaska Native Claims Settlement Act Corporations Pursuant to DOE P 144.1," 7 October 2024, supersedes and cancels previous DOE Order 144.1. It expands and clarifies DOE policy on consultation with Indian Tribes and Alaska Native Claims Settlement Act (ANCSA) Corporations and acknowledges the provisions for conducting consultation in compliance with applicable statutes. The order gives direction to DOE officials, staff, and contractors regarding training, consultation, engagement, reporting, and fulfillment of trust obligations and responsibilities.

A.5. Other Relevant Federal Standards and Guidelines

"Secretary of the Interior's Standards and Guidelines for Federal Agency Preservation Programs Pursuant to the National Historic Preservation Act," 63 FR 20496 (24 April 1998): NHPA Section 110.

"Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation," 48 FR 44716 (29 September 1983).

National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation.

National Register Bulletin 22: Guidelines for Evaluating and Nominating Properties that have Achieved Significance within the Past Fifty Years.

National Register Bulletin 36: Guidelines for Evaluating and Documenting Archeological Properties.

National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties.

National Register Bulletin 39: Researching a Historic Property.

National Register Bulletin 42: Guidelines for Identifying, Evaluating and Registering Historic Mining Properties.

Appendix B. Historic Context and Research Questions

Cultural resources are evaluated for NRHP eligibility with reference to important historic contexts and research issues. According to National Register Bulletin 15, historic context is

> "an organizing structure for interpreting history that groups information about historic properties that share a common theme, common geographical area, and a common time period. The development of historic contexts is a foundation for decisions about the planning, identification, evaluation, registration, and treatment of historic properties, based upon comparative historic significance" (NPS 1997).

This Appendix provides historic contexts and research issues relevant to the NNSS that may be used to evaluate cultural resources. The contexts and themes discussed are current but not all-inclusive. Our understanding and appreciation of history changes as new information emerges, and new perspectives evolve. Relevant historic contexts and research questions may be augmented, modified, re-considered, or retired. In the future, this Appendix may be modified to reflect changing cultural and historic information and concerns.

The Appendix is divided into three parts, corresponding to three major cultural traditions. Research questions are outlined for each period to help provide a framework for evaluation of archaeological resources. The first major tradition relates to the long history of American Indian occupation of the NNSS. It is primarily represented by archaeological remains, augmented by traditional historic accounts and ethnographic literature.

The second major cultural tradition concerns the early Euro-American exploration and settlement period up to the early 1950s. This tradition is represented primarily by archaeological sites dating through the early twentieth century, which often have scant historic documentation. Several research themes are relevant, including early exploration and travel, mining and ranching in the area, and military history.

During the 1950s through the early 1990s the NNSS was the nation's premier Cold War-era nuclear weapons testing facility. This third major tradition is represented by both the built environment of the nuclear testing landscape and by extensive contemporary historic records (writings, engineering drawings, maps, photographs, etc.) that constitute the foundation for historical understanding and evaluation. Among the major historic contexts important to the NNSS are its role in nuclear weapons research and other nuclear programs, biomedical research on the effects of radiation on humans, animals, and ecosystems, and the administrative and social history associated with the Cold War era.

B.1. American Indian Occupation History

The historic context for Great Basin prehistory and ethnohistory is discussed below, followed by a listing of major research areas and some common research questions pertinent to each subject.

Human occupation of the area extends at least 13,000 years into the prehistoric past, starting with the late Pleistocene and progressing through the Holocene period to today. Native peoples inhabited the NNSS and surrounding areas making use of available natural resources spread throughout the region. Table B.1 and Figure B.1 present the major periods of prehistoric occupation at the NNSS (Pippin 1995, 1998a).

The oldest known archaeologically dated occupations in the region are represented by diagnostic spear points and other stone tools that date at least 13,000 years ago (Beck and Jones 1997, 1999; Warren and Phagan 1988; Goebel and Keene 2014). Distinctive fluted points (also referred to as Western Fluted) are among the oldest, but their precise age range in the Great Basin is poorly constrained. Goebel and Keene (2014) give a range of 13,200-12,650 calendar years for dated fluted point sites in the western United States, and this time frame may also apply to the Great Basin, but secure evidence from buried sites is largely lacking in this region. Fluted point types include large lanceolate concave-based forms, often with one or more channel flakes removed from the base into the blade faces (Beck and Jones 2009). Fluted points have been found at the Nevada Test and Training Range, nearby Lake Tonopah, Mud Lake, and other localities in the region (Campbell and Campbell 1940; Crownover 1981; Pendleton 1979; Tuohy 1968). Fluted points are very rare at the NNSS, with only a few isolated surface finds along Fortymile

Wash near Yucca Mountain, at the base of Rainier Mesa, and near Timber Mountain (Buck et al. 1998; Jones and Edwards 1994; Reno 1985). Pippin (1998a) called the occupation represented by fluted points the Rattlesnake Ridge period. Based on the lack of other preserved material remains, it can be assumed that use of the NNSS during this time period may have been sporadic.

Table B.1. Major periods of prehistoric occupation at the NNSS (Pippin 1998a).

Approximate Age (calendar years BP [cal yr bp])	NNSS Sequence	General Stage/ Adaptive Strategy	Main Diagnostic Artifact Types
< AD 1850 (100 cal yr bp)	Split Ridge	Ethnohistoric	Historic artifacts
AD 1850 – 1150 (100-800 cal yr bp)	Silent Canyon	Late Prehistoric	Desert and Cottonwood series points, Brownware ceramics
AD 1150 – 550 (800 – 1400 cal yr bp)	Rainier Mesa	Late Archaic/ Puebloan-Fremont	Rosegate series points, Ancestral Puebloan and Fremont ceramics
AD 550 – 1250 BC (1400 - 3200 cal yr bp)	Pahute Mesa	Middle Archaic/ Late Archaic	Elko series points, Gypsum points
1250 – 3800 BC (3200 – 5750 cal yr bp)	Dead Horse Flat	Middle Archaic	Elko series, Humboldt series, Gatecliff Split-stem points
3800 – 6900 BC (5750 – 8850 cal yr bp)	Prow Pass	Early Archaic	Pinto series, Large Side-notch series points
6900 – 10,500 BC (8850 – 12,450 cal yr bp)	Barren Wash	Pre-Archaic	Western Stemmed series points, Crescents
10,500 – 11,400 BC (12,450-13,350 cal yr bp)	Rattlesnake Ridge	Paleoindian	Western Fluted, Concave Base series points

Western Stemmed points are much more common than fluted points. They are large foliate (leaf-shaped) or lanceolate points with thick extended stems. These come in a variety of forms (Beck and Jones 1997, 2009). The oldest stemmed point types may be contemporaneous with fluted points and perhaps even older (their antiquity is subject to current debate; see Beck and Jones 2010, 2012; Davis et al. 2019; Goebel and Keene 2014), but they also persist much later in time, extending into the early Holocene after 10,000 years ago and perhaps as late as 8,000 years ago (Basgall and Hall 2000; Beck and Jones 1997, 1999; Warren and Crabtree 1986). Stemmed point types are widespread in the Mojave Desert and throughout the Great Basin (Beck and Jones 1997; Goebel and Keene 2014; Sutton et al. 2007; Warren and Crabtree 1986), and are often found with artifacts such as crescents, large thick bifaces, unifacial scraper planes, and various other formed flake tools indicative of a flexible, curated tool kit (Beck and Jones 1997, 1999). Basalt, welded tuff, and other fine-grained volcanic toolstone are often used for large bifaces and unifaces, indicating the tools were used for robust tasks requiring strong edges not prone to breakage (e.g., Buck et al. 1998). Projectile points and crescents are most often formed on obsidian and cryptocrystalline silicates that are more brittle but easier to fashion into fine forms (Beck and Jones 2009).

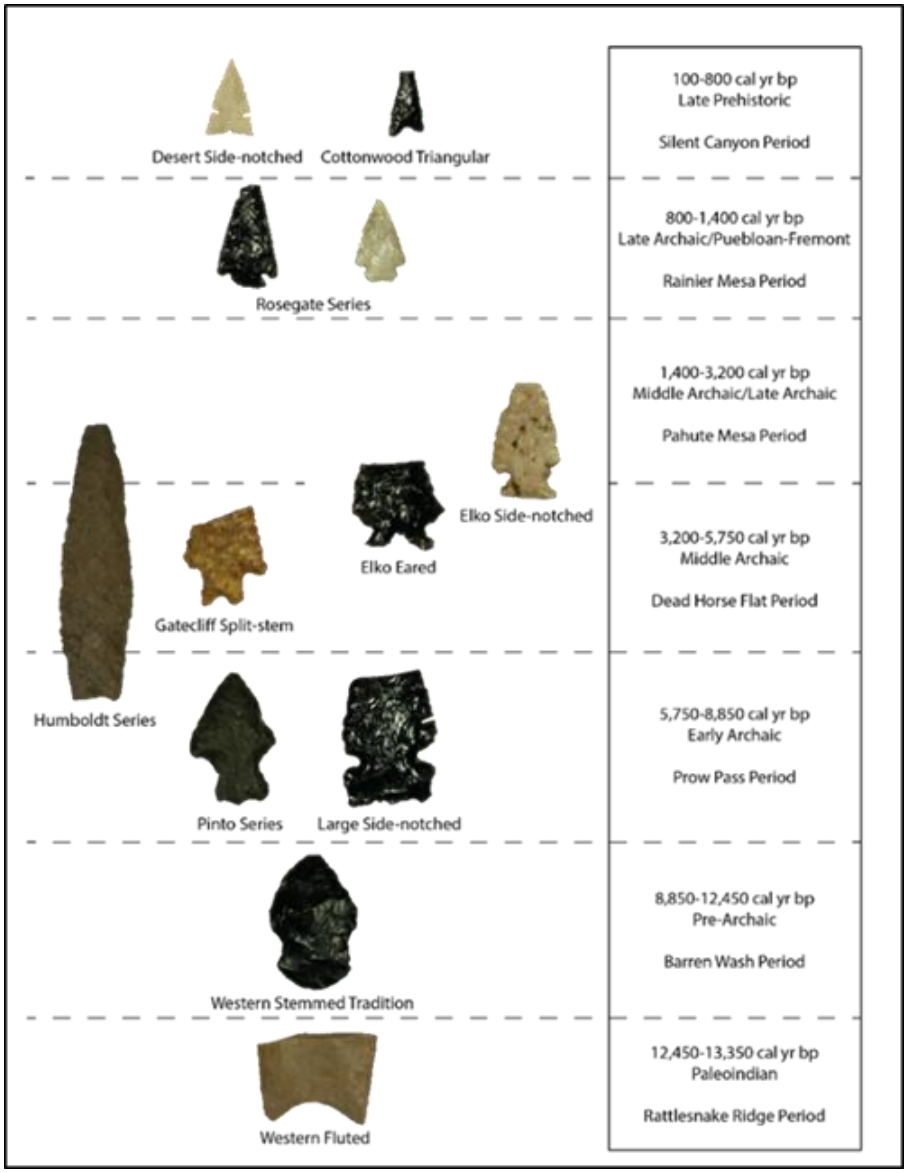

Figure B. 1 Major occupation periods and projectile point types.

The technology tends to exhibit evidence of highly mobile populations and a generalized subsistence base (Basgall 1993, 2000; Beck and Jones 2011; Warren and Crabtree 1986; Simms 2008). Sites from this period are often located along playa margins, ancient streambeds, and active or former springs, indicating a wetland-focused subsistence and settlement pattern (Beck and Jones 1997; Kelly 1997).

At the NNSS, the occupation period represented by stemmed points is called the Barren Wash period. Occupation sites dating to this period are common along Fortymile Wash and at lower elevations in the southern part of the NNSS, but also mark the initial use of the higher elevation mesa tops in the northern NNSS before 9,000 years ago (Pippin 1998a).

Milling stones rarely occur at sites containing stemmed points (Basgall 1993; Giambastiani and Bullard 2010), suggesting that intensive seed processing and consumption was a negligible part of the overall diet (Rhode et al. 2006). Sites from this period may belong to an early "Pre-Archaic" adaptive orientation in that they lack important food-getting technologies such as milling stones, coiled basketry, and notched points; all hallmarks of later "Archaic" foraging lifeways. Alternatively, some archaeologists see the generalized foraging subsistence orientation at these sites to be representative of the "Paleoarchaic" stage, which is basically an early form of the subsequent Archaic lifeway. Both views are partly correct,

but the lack of those hallmark Archaic subsistence technologies does signal a significant shift in subsistence orientation after the Paleoamerican period (see papers in Graf and Schmitt 2007; Jones and Beck 2014).

The following occupation period, the Early Archaic, features the true onset of the generalized Archaic foraging subsistence adaptation that persisted in various forms for the next several thousand years. Occurring during the arid middle Holocene, it is called the Prow Pass period at the NNSS (Pippin 1998a). This period is characterized by the introduction of corner- or side-notched points with indented or split-stem bases (Pinto points), large side-notched points, lanceolate or foliate Humboldt points, coiled basketry, and milling stones. The latter indicates the rising importance of seed-grinding and other plant food processing (Basgall and Hall 2000; Holmer 1986; Jones and Beck 2014; Kelly 1997; Thomas 1981; Warren and Crabtree 1986).

Early Archaic sites tend to be more common and distributed in more diverse habitats than the early Pre-Archaic sites, reflecting a larger population using the landscape more frequently and with a broader subsistence orientation (Basgall 1993; Warren and Crabtree 1986). Flaked stone artifact assemblages include foliate bifaces, formalized unifacial tools, various core types, and simple expedient flake tools (Basgall 1993; Delacorte et al. 1995). Milling stones are typically well-formed and relatively thin, which made them suitable for portability (Basgall 1993, 2000). Stone tool forms found at these sites are geared for flexibility and high mobility, and the number of different raw materials represented at certain sites also indicates the occupants covered broad home ranges. Rockshelters and caves appear to have been first occupied during the Early Archaic (Kelly 1997). The middle Holocene in the Great Basin was generally a period of warm and dry climate, and this aridity may have limited the resource base and provisioning of populations or forced some groups to seek subsistence in higher, cooler environments such as the central Great Basin rather than the lower and hotter Mojave Desert (Grayson 2011; Louderback et al. 2011; Wigand and Rhode 2002).

The following Middle Archaic period, which occurred in the early part of the Late Holocene (~3500-1500 years ago), continues the subsistence adaptations introduced during the Early Archaic period but with some dramatic changes (Bettinger 1999; Kelly 1997; McGuire and Hildebrandt 2005). The initial part of the Middle Archaic at the NNSS is known as the Dead Horse Flat period, and it continues with the Pahute Mesa period (Pippin 1998a). These periods are together distinguished from earlier time frames by different types of large spear points and dart points.

Sites of both periods are abundant at the NNSS, particularly on Pahute and Rainier Mesas. Cooler and moister conditions improved the subsistence base, allowing human populations to increase (Grayson 2011; Miller and Wigand 1994; Wigand and Rhode 2002). In the southwestern Great Basin, the Middle Archaic is marked by diagnostic Elko, Gatecliff, Humboldt, and Gypsum projectile points (Kelly 1997; Thomas 1981). Increased representation of milling equipment (milling slabs and bedrock grinding slicks, handstones in various forms, and mortars and pestles) indicate increasingly specialized processing and use of vegetal foods in the diet (Basgall 1993; Warren and Crabtree 1986). As the landscape filled with people adapted to specific regions, mobility of those populations declined, and regional cultural diversity developed (Elston 1986; Warren and Crabtree 1986).

Middle Archaic sites are variable in size and complexity, with large residential villages in some localities. The functional variation of Middle Archaic occupations is also striking, with a wide range of task-specific site types in virtually all available habitats. The prevalence of rock writing also increases, perhaps signaling cultural group or territorial markers, and other signs of religion and ceremonialism proliferate as well (e.g., split-twig animal figurines, incised stones, and other objects found as offerings in caves and rockshelters) (Warren and Crabtree 1986; Thomas 2019). As mobility and home range size decreased, inter-regional interaction and exchange networks increased, allowing the flow of trade goods and social ties to grow across large expanses and from the Great Basin into California and the Southwest (Gilreath and Hildebrandt 1997, 2011; McGuire et al. 2012, 2013; Roberts and Ahlstrom 2012a, 2012b).

Beginning about 1,400 to 1,800 years ago, the introduction of two novel technologies, the bow and arrow and ceramics, together with long-term population growth, further intensified subsistence pursuits

(Bettinger 1999, 2013; Eerkens et al. 2002). The introduction of bow and arrow technology is usually marked by small corner-notched or side-notched Eastgate and Rose Spring arrow points (often collectively called Rosegate points). Ceramics initially include wares introduced from the eastern Great Basin and the Virgin and Colorado River drainages, indicating long-range exchange or visitation with neighboring pottery-making peoples (Madsen 1986; Roberts and Ahlstrom 2012b). This period is considered Puebloan in southeastern Nevada, as it is tied to the rise of sedentary or semi-sedentary villagers known as Ancestral Puebloans and Fremont peoples who practiced farming of maize and other crops (Ahlstrom and Roberts 2012; Lyneis 1982, 1995; Madsen and Simms 1998; Shutler 1961). At the NNSS, this is called the Rainier Mesa period, represented by the introduction of Rosegate series arrow points and occasional Ancestral Puebloan and Fremont ceramics. Here and in much of the western and central Great Basin it is considered Late Archaic, where people continued a mobile hunting and gathering economic strategy, did not practice maize horticulture, and where Puebloan influence was scant to negligible (Elston 1986; Thomas 1982). Compared with the preceding Middle Archaic periods, sites of the Rainier Mesa period are very abundant at the NNSS, nearly doubling in number per century on the mesas (Pippin 1998a).

The Silent Canyon period at the NNSS began about 800 years ago and is widely thought to be the archaeological representation of the Western Shoshone and Southern Paiute inhabitants first encountered by Euro-American explorers and settlers in the late eighteenth and nineteenth centuries (Fowler and Garey-Sage 2016; Kelly 1934, 1964; Kelly and Fowler 1986; Steward 1937, 1938; Thomas et al. 1986). The archaeological sites and associated material culture closely match the occupations and technologies observed in historic times (Pippin 1998b; Steward 1938, 1941; Stewart 1942). Arrow points are of the small triangular Desert Side-notched and Cottonwood types, and ceramics are a plain utilitarian type known as Intermountain Brownware (Eerkens 2012; Lockett and Pippin 1990; Pippin 1986; Rhode 1994). Basketry forms found during this period include waterproofed pitch-covered bottle-shaped water containers, seed beaters, and twined winnowing trays (Bettinger and Baumhoff 1982; Sennett-Graham 1989; Warren and Crabtree 1986). Sites dating to the Silent Canyon period are widespread at the NNSS, particularly on the mesas.

After Euro-American occupation of the region, sites like those of the previous period often contain historic artifacts (glass, metal, cloth), and these sites belong to the subsequent ethnohistoric Split Ridge period (Johnson et al. 1999; Pippin 1998b; Reno and Henton 1991). Western Shoshone and Southern Paiute families occupied several camps and winter villages situated near major springs and tanks in the NNSS area, and neighbors occasionally visited to collect various food items and participate in hunts, take part in social gatherings and meet relatives, and connect to the land's spiritual power (Steward 1938:93-99; Fowler and Garey-Sage 2016; Stoffle et al. 2001). Some groups may have used the area as a refuge from the vast cultural changes that accompanied the intrusion of Euro-American people into the region, while others participated in ranching and mining activities associated with Euro-American occupation.

With this outline of American Indian occupation history in place, we now turn to important areas of archaeological research and key questions to be addressed, beginning with one of the most fundamental research areas: the placement of archaeological materials into a temporal framework.

Chronology

Historic properties must be placed in a secure time frame to be useful for examining cultural change through time, establishing secure connections to important periods and trends, and addressing important research questions. If a property cannot be adequately situated in time, then it will likely not meet the criteria for inclusion in the NRHP (with some exceptions). Several different methods of determining chronological placement are useful at NNSS sites, including artifact cross-dating from temporally diagnostic artifact styles, radiocarbon dating, luminescence dating, obsidian hydration dating, dendrochronology, and other techniques.

Artifact types that enable archaeologists to narrow the time frame in which a site was occupied include projectile points, ceramics, obsidian artifacts, basketry and other preserved organic materials, etc.

Material Technology, Tool Manufacture and Use

How people were able to settle in the NNSS area and make a living off the resources available there depended on the kinds of tools they made and used. Most of the archaeological record is composed of durable stone tools, so archaeological research questions center on stone tool technology: how raw material (toolstone) was obtained, how stone tools were made, and how they were used in various pursuits. The same questions relate to other major tool categories as well: basketry, ceramics, clothing, domestic structures, fire hearths, storage bins, hunting features, and so on.

- How were specific tool types made and used? What attributes of individual tool types reflect specific cultural traditions (heritage), and what aspects reflect the constraints of functional requirements?
- What kinds of useable toolstone (for flaked or ground stone implements) occur geologically within the project area? Were any of them quarried? Which raw materials were preferred for the production of the various tool types? Does raw material use change through time, and do changes in raw material use indicate changes in functional needs, changes in access or patterns of regional movement, or interactions with other groups (e.g., trade)?
- What is the character of the stone tool assemblage at a site? How do stone tool assemblages reflect site function, duration of occupation, tool production vs. maintenance, etc.?
- What evidence of various activities is found at the site, which may include milling stones, ceramics, basketry, hunting paraphernalia, structures, and features, etc.?
- Some parts of the NNSS have sites with circular stone features. What were these features used for – houses, food-processing platforms, storage features, ceremonial or ritual structures? Elsewhere at the NNSS, what was the purpose of stones or clusters of stones placed on boulders or bedrock outcrops?

Subsistence Practices and Diet

The varied strategies and practices used to obtain food and water, and the kinds of foods prepared and consumed, are crucial to human survival and strongly influence the development of particular social configurations. Knowledge of subsistence and dietary practices is essential to understanding cultural patterns and trends in prehistory.

- What were the key dietary items used, and how did the use of these items change through time? Did the number of different food resources (diet breadth) or subsistence practices expand or contract through time?
- What is the long-term history of use of large game (mountain sheep, antelope, deer) in the diet at the NNSS and how did this use change through time and under different environmental conditions? How does this compare to elsewhere in the Great Basin?
- What is the long-term history of use of small game such as rabbits, rodents, tortoises and other reptiles, insects, etc.?
- At the NNSS, what is the time range of the use of pinyon pine nuts, other small seeds, geophytes (root and bulb foods), and other plant foods such as cacti, yucca, and agave?
- What were the main hunting strategies used at the NNSS (e.g., game drives, intercept hunting stations, trapping, individual vs. cooperative hunts), and how and where did they occur? What evidence of communal hunting structures or complexes is present, and what is their age?
- What kinds of milling tools are represented at a site? Does the presence of mortars and pestles and/or slab milling stones and handstones reflect the on-site processing of different plant (and animal) resources?

- Is there evidence for roasting pit technology at the NNSS, and for what resources? How did their use change through time and in response to what factors (e.g., environmental change, population pressure, social organizational changes, etc.)?

Settlement and Mobility

Understanding broad-scale prehistoric settlement patterns requires examining the distribution of different functional site types spread across a landscape. Identifying these different functional types (e.g., residential bases, special-purpose procurement camps, temporary bivouacs and tool maintenance stations, hunting or plant processing facilities, quarries, built structures and rockshelters) is a necessary first step. Settlement mobility may involve both 'residential mobility,' in which a group frequently moves its base camps as food resources shift, and 'logistical mobility' that involves special-purpose groups leaving a residential base to collect resources and bringing them back to the central base. The use of both mobility strategies is an important aspect of overall settlement patterns (Binford 1980). For foraging societies:

- What are the major residential bases at the NNSS through time, and what is their long-term history? What are the main material indicators of residential occupation? Are habitation features (house floors, hearths, storage pits, etc.) buried at these sites?
- How do long-term residential sites relate to the distribution of water sources?
- What are the origins of logistical settlement systems at the NNSS, and what resources were the targets of logistical settlement camps through time?
- What is the long-term history of the use of upland regions at the NNSS? When did people first occupy this habitat zone on a sustained, residential basis?
- How did resource storage practices change through time? How did these practices affect social and settlement dynamics?
- What was the spatial organization of residential camps and special-use sites?

Economic and Social Interaction Networks

People living at the NNSS interacted broadly with groups all around the region, exchanging goods, establishing social and family relations, and learning new technologies and strategies for survival. The nature of intergroup interactions in the area is an important aspect of prehistoric research (Rhode 2012).

- Do residential sites in the area contain artifacts that were typically traded (e.g., shell and glass beads, turquoise, pottery, exotic obsidian or other toolstone)? Are there differences in the distribution of exotic materials across the NNSS that represent variations in the use of the region by surrounding groups or of interactions between NNSS residents and surrounding groups?
- Where are the locations of major congregation sites at which different groups interacted? What evidence is found at these sites to demonstrate inter-group activities?
- How are prehistoric or ethnohistoric sites distributed relative to trails and natural travel routes?
- What evidence is there of tool exchange? If present, did this vary through time in terms of distance, direction, or regularity? What do beads, ceramics, etc. tell us about changing patterns of interactions among the groups within and around the NNSS through time? Are changes in the use of different toolstones related to changes in exchange systems? How was exotic toolstone transported to the NNSS—via direct procurement or exchange, as raw material, or as finished tools?

Spiritual, Ceremonial, and Artistic Expression

Tangible evidence of people's conceptual interactions with spiritual worlds, the human propensity for self-expression, and emblems of group identity are represented by various cultural items, places, and constructions, which may include rock writings (e.g., Drollinger et al. 2000; Zedeño et al. 1999), incised prayerstones and other portable objects (Thomas 2019), placed stones and sticks (e.g., Richard Arnold, personal communication; Cook 2009; Giambastiani and Middleton 2016; Stoffle et al. 2008), geoglyphs,

funerary elements, sacred objects, objects of cultural patrimony, or design elements on artifacts that reflect individual or cultural identity.

- What types of artifacts make up spiritual and ceremonial archaeological assemblages at the NNSS? What kinds of archaeological features can be attributed to ceremonial activities?
- Do ceremonial features occur in regular association with any specific site types or landscape settings? Do identified ceremonial features demonstrate any spatial patterning, either within sites, between sites, or across broader areas?
- What is the age, settlement distribution, and cultural affiliation of different rock writing, geoglyph, and intaglio motifs, or portable art objects such as incised stones, pendants, and other artifacts?
- Is there significance in the use of pictographs over petroglyphs in certain spaces? What is the relevance of different colored pigments? Are the pigments sourced locally or obtained through trade?
- Rock overhangs, shelters, prominent boulders, and ledges in the region often contain items such as wooden sticks placed in crevices, cairns or placed rocks, or various kinds of offerings that may reflect engagement with certain powers present in the landscape. What is the distribution of such sites, and do they correlate with particular settings or contexts? How do they relate to cultural features such as pilgrimage trails or power sites? What is the age of such items and practices?
- What knowledge can American Indian consultants share about these features?
- For management purposes, how can human interments or funerary objects be recognized and not cause undue damage and disruption to them?

Demography and Migration

The archaeological study of demography, which concerns the sizes and distributions of populations over time, involves characterizing settlement patterns and using the statistical analyses of proxies considered useful for gauging the abundance of people in an area. Such proxies may include the number of archaeological sites per thousand years, the results of a collection of radiocarbon dates, or counts of projectile points representing defined time periods. These studies typically do not apply to specific sites, but rather to larger compilations of archaeological data collected on a regional basis. Migration relates to the movement or expansion of a group of people from one area to another that may be reflected archaeologically by culturally distinct artifact styles or settlement configurations.

- What is the long-term distribution of radiocarbon dates, projectile points, sites of different time periods, obsidian hydration readings, etc., and how do these relate to possible demographic histories?
- Is there evidence for migrations in the archaeological record as represented by the introduction of new diagnostic artifact styles or other indicators?
- What evidence is there of the so-called Numic expansion (Madsen and Rhode 1994), the possible late Holocene Basin-wide migration of populations speaking Numic languages (Shoshone, Southern Paiute, and others)? What is the estimated age of that possible expansion? Is there evidence of population replacement?

Environmental Change and the Cultural Niche

The natural environment has changed significantly since the earliest human occupation of the NNSS area, and environmental change has profoundly influenced human subsistence and settlement patterns and affected demographic trends. Likewise, human occupation significantly altered natural habitats in parts of the Great Basin, likely including the NNSS. In archaeology and biological sciences this is referred to as niche construction theory (Laland and O'Brien 2010). The interplay between environmental change influencing long-term human behavior and the creation of an anthropogenic 'niche' is a long-standing research area in Great Basin studies.

- How did climate or other environmental change in the NNSS area affect the abundance and distribution of important subsistence resources and water?
- How did middle Holocene aridification affect population levels and settlement patterns at the NNSS?
- What evidence is there of human modification of portions of the NNSS landscape? How did human occupation of certain areas alter those locations? Did this alteration result in persistent positive (niche construction) or negative (patch degradation) environmental effects?

Euro-American Interactions

The early post-contact period is a fruitful area of research that relates to reactions of American Indian groups to the intrusions of Euro-Americans having very different technologies and economic orientations. Remote locales such as the NNSS may have served as refuges for native groups seeking to avoid Euro-American settlers (e.g., the site of *Wungiakuda*; Johnson et al. 1999). Investigations in the area have revealed numerous ethnohistoric occupation sites, some containing Euro-American-derived artifacts that date well into the twentieth century (Pippin 1998b). How the NNSS served as a place of refuge for Native groups during the historic period is an important question relating to American Indian and Euro-American relationships.

- Do sites contain American Indian assemblages that also include Euro-American items?
- Where on the landscape are ethnohistoric sites located? What is the overall composition and structure of these sites?
- What are the ages of American Indian ethnohistoric sites? How late in the twentieth century were American Indians residing at the NNSS? What evidence is there for use of the NNSS as a refuge area for American Indians during the period of Euro-American settlement of southern Nevada?

Questions Pertaining to Major Occupation Periods

Additional research questions relate to human occupations and adaptations of a single major period or the transition between one period and another. Some of these questions are outlined by period below.

Paleoamerican Stage: The Rattlesnake Ridge and Barren Wash Periods. These periods contain the earliest known occupations at the NNSS. Rattlesnake Ridge period occupations are indicated by the presence of Western Fluted and Concave Base series projectile points and correlate to the Clovis period in eastern North America. This period is known only by rare isolated fluted points, found in both upland and lowland settings. They may reflect extremely sporadic hunting-related visits or could alternatively have been early fluted points scavenged and re-used by later people who passed through the NNSS area. No camps associated with fluted points have been found to date. Any such camps showing evidence of intact cultural deposits containing fluted points could provide very important information about this relatively undocumented period at the NNSS.

The Barren Wash period is better known than its predecessor because of the numerous recorded archaeological sites containing artifacts associated with this interval, particularly at lower elevations along Fortymile Wash and its tributaries (Buck et al. 1998; Haynes 1996), but also in some upland settings. The Barren Wash period is marked by Western Stemmed series points (Figure B.2) and temporally related artifact types, which include crescents, large dome-shaped scraper planes, and other distinctive tools.

Figure B. 2 Western stemmed point at a site along Cane Springs Wash (DRI 2018).

Property types at the NNSS known from this period include (a) large surface lithic scatters that may represent areas re-occupied as short-term camps, such as the extensive surface scatter along Fortymile Wash near Yucca Mountain; (b) toolstone quarry sites such as the Alice Hill Site, a large welded tuff quarry also near Yucca Mountain (Buck et al. 1998); and (c) isolated stemmed point artifacts found in both lowland and upland settings (Henton and Pippin 1988; Pippin 1998a). Barren Wash properties could also include short-term camps that may contain a diverse lithic assemblage and possible intact buried deposits with datable materials and evidence of subsistence pursuits. Examples of two such sites are located just southwest of the NNSS (Haynes 1996). Encountering sites like these would be very important for better understanding the people who occupied the NNSS region in the early Holocene.

- What are the ages of these occupation periods? How long did different technologies (fluted points, stemmed points, and other tool forms) persist in the region? Do fluted point forms pre-date stemmed points, do they overlap in time, or do stemmed points predate Clovis (cf. Beck and Jones 2010, 2012; Davis et al. 2012, 2019; Goebel and Keene 2014; Jenkins et al. 2012)?
- How does the timing of these occupations at the NNSS compare with early occupation histories of the Mojave Desert to the south and the higher-elevation central Great Basin to the north? Are these lowland versus upland occupation patterns similar at the NNSS? What is the occupation chronology in each environment?
- What were the settlement strategies adopted by early occupants of the NNSS, and how may they have varied under different resource constraints?
- What were the main elements of peoples' diet during these periods? Did extinct Pleistocene megafauna (such as mammoth, camel, ground sloth) play any role? Did Paleoamerican groups focus on or target wetland resources? How generalized was the diet, and what role did plant foods play in it?
- Different groups manufactured stone tools in very different ways during these early periods, possibly reflecting different cultural traditions (Davis et al. 2012, 2019; Beck and Jones 2009, 2010, 2012, 2015). What were the stone tool manufacturing processes used in the NNSS region? How did toolstone type and availability (local vs. non-local) affect manufacturing trajectories? What types of toolstone were favored during these periods for different tools with different functions, and what were those functions?
- Jones et al. (2003) suggest that obsidian stone tools found on early sites are made of geochemically distinctive raw material (toolstone) from very distant sources, indicating large

"lithic conveyance zones" and corresponding large home ranges. For example, some early projectile points from Yucca Mountain were made of raw material derived from southern Idaho and western Utah (Buck et al. 1998). Other investigators suggest that conveyance zones were probably significantly smaller, and that long-distance transport was rare (e.g., Smith 2010; Madsen et al. 2015). What evidence is there for large lithic conveyance zones and for extensive group mobility during these early periods? Where does the NNSS fit within these lithic conveyance networks?

Archaic Stage: Prow Pass, Dead Horse Flat, and Pahute Mesa Periods. The subsequent Archaic period covers much of the middle and late Holocene. Archaic foraging lifeways expanded in complexity and diversity with the introduction of milling equipment for processing seeds and other plant foods, different types of hunting technology involving notched spear or dart points and the throwing stick (atlatl), different forms of basketry, and other inventions. The Prow Pass period marks the Early Archaic at the NNSS, with the introduction of basal-notched Pinto series points. It is succeeded by the Dead Horse Flat period with a different set of notched points (Gatecliff and Large Side-notched series) and by the Pahute Mesa period (Elko series and Gypsum points). The number of known archaeological sites increases over the Archaic, indicating generally growing populations. These populations increasingly appear to have settled into their home ranges, rather than move extensively across regions. Archaeological sites known or expected at the NNSS during these periods include residential camps of various sizes and degrees of permanence, extractive localities in a wide array of habitats devoted both to hunting and plant collecting, toolstone quarries and tool manufacturing workshops, ceremonial sites and rock writing locales, and other site types.

- Subdivisions of the Archaic stage are defined using assumed chronological placement of different series of large projectile point styles based on evidence from surrounding regions. The chronology of these points is subject to continued debate. What is the chronology of large Archaic point types at the NNSS? How do Early Archaic Pinto points relate to earlier stemmed series points? Are they divisible into more than one temporal series?
- When did milling stone and coiled basketry technologies (hallmarks of Archaic subsistence adaptations) arrive at the NNSS?
- Thomas (2019) has presented a "prayerstone hypothesis" that links incised stone slabs as material representations of Shoshonean cosmology, epistemology, and spiritual beliefs and practice. According to this hypothesis, these incised slabs were votive offerings connecting supernatural powers to a personal vow or prayer. Different longstanding ritual practices involving incised stones occur both in the central Great Basin north of the NNSS and in the Spring Mountains south of it. What is the evidence at the NNSS of ritual practices involving incised stones? What is the antiquity of these practices? In what contexts were incised stone slabs offered and deposited? How do other objects (e.g., pendants, etched pebbles, figurines, etc.) relate to the distribution of incised stone slabs? At least one etched pendant or palette with motifs identical to incised stone slabs has been identified from a Pahute Mesa period site located in the Fortymile Wash area on the NNSS (Varley and Rhode 2004).

Late Archaic/Puebloan Stage: The Rainier Mesa Period. This period is most akin to the Late Archaic because strictly Puebloan and Fremont village sites have not been found at the NNSS to date. The Rainier Mesa period is recognized by the introduction of bow and arrow hunting technology and the occasional presence of Fremont and Puebloan ceramics.

- How do Late Archaic sites at the NNSS relate to Puebloan or Fremont occupations known to exist further east? Is there evidence of Puebloan/Fremont period settlement at the NNSS, and how do these sites compare to Archaic settlement patterns?
- What is the age of Fremont, Puebloan, and Patayan (lower Colorado River/Mojave Desert) ceramic technologies at the NNSS? What site types contain Puebloan/Fremont ceramics? Do

these sites reflect far-flung Puebloan or Fremont occupation at the NNSS or trade with local inhabitants? Is there evidence that ceramics of these designs were made locally?

- When was the bow and arrow introduced at the NNSS? What is the temporal relationship between bow and arrow technology and earlier hunting technologies (i.e., hand-thrown dart and spear weaponry)? How did the adoption of the bow and arrow affect hunting and mobility strategies?
- Early arrow points at the NNSS are Rose Spring, Eastgate, and similar forms. How do these compare morphologically with similar forms in surrounding areas? What are the age ranges of these forms and of Cottonwood Triangular forms? When did they decline in use (if they did)?
- Do Late Archaic sites reflect changes in settlement patterns or changes in social configurations? How do such changes reflect demographic expansion/contraction or environmental changes associated with periods such as the Medieval Climatic Anomaly?

Post-Puebloan Late Prehistoric and Ethnohistoric Stage: The Silent Canyon and Split Ridge Periods. The post-Puebloan period is the archaeological representation of native Shoshone and Southern Paiute peoples who occupied the region prior to the earliest historically documented record of Euro-American contact. Great Basin anthropologists, archaeologists, and linguists have long debated whether Shoshone and Paiute people occupied the Great Basin for many millennia or whether they migrated through the Great Basin, displacing Puebloan and Fremont peoples as they colonized the region in the past two millennia (Madsen and Rhode 1994; Thomas 2019, 2020). The NNSS is close to the putative homelands of the ancestral Numic-speaking peoples (Lamb 1958; Fowler 1983), and the archaeological record of the NNSS may be highly significant in addressing this long-standing issue. Arrow points associated with this stage are small triangular Desert Side-notched and Cottonwood types, and ceramics are plain or fingernail-decorated utilitarian brownwares.

- What is the archaeological manifestation of Shoshone and Southern Paiute occupation at the NNSS, and what is the earliest age of that representation?
- What is the age range of Desert Side-notched projectile points, a type that is often used as a marker of the post-Puebloan Late Prehistoric? Did it replace or augment the Rosegate style point?
- When did brownware ceramics begin to occur at the NNSS? Were brownware ceramics made at the NNSS or brought in from elsewhere? How did the introduction of ceramics affect subsistence, settlement patterns, and social dynamics?
- What evidence is there for cultivation or use of domesticated plants at the NNSS?
- Do Late Prehistoric settlement patterns diverge from those that came before, as suggested by Bettinger (1999; Bettinger and Baumhoff 1982) and others?

B.2. Euro-American Entry and Occupation History

The context for the Euro-American history of the area currently encompassed by the NNSS and the broader surrounding region of the southern Great Basin and northeastern Mojave Desert is provided below. Historical themes provide the organizational framework for the discussion; however, the topics are presented in a rough chronological order of their occurrence in the region. Potential research questions follow each of the thematic summaries.

Although the land encompassing Southern Nevada had been claimed by Spain since the 16th century, there was no notable effort to colonize or even cursorily explore the inland regions of "Alta California" prior to the Mexican War of Independence in 1822 (Hulse 1991). A few horse traders and fur trappers found their way into the southern and northern portions of the territory and the terrain that would become Nevada beginning in the late 1820s, but it wasn't until the land became part of the United States in 1848 that Euro-Americans took a more active interest in the arid region between the western slopes of the Rocky Mountains and the Sierra Nevada (Cline 1988).

Exploration and Early Travel

Situated away from major natural trails and travel corridors, the NNSS area did not play a significant role in the expansion of Spanish and later Mexican and American populations into the American West. Because the landscape offered rugged terrain, with few reliable water sources, limited precious metal outcrops and only minimal viable rangeland, the NNSS area never attracted significant populations of settlers.

The best-known early crossing of the NNSS, that of the Death Valley 49ers, occurred largely by accident (Koenig 1967; Long 1950). In the autumn of 1849, a large emigrant caravan of 107 wagons left Salt Lake City aiming for southern California and the California gold fields via the Old Spanish Trail/Mormon Road. The caravan split up in southern Utah over a dispute regarding a possible short cut; several parties headed west seeking a more direct route and got themselves badly lost. Different parties made various paths across what is now the NNSS. One party stayed for several days at a small native camp near Cane Spring, taking advantage of the food stores and fattening their oxen at the villagers' gardens. Another party made their way to Tippipah Spring and then southward down Topopah Wash to reach the Amargosa River. A third family followed Fortymile Canyon down to the Amargosa, losing wagons along the way; the remains of these early emigrant wagons were later found near Cat Canyon (Worman 1969). The various parties all eventually ended up in a place that, for their miseries, we now know as Death Valley (Manly 1894).

Subsequent sporadic explorations of the NNSS area are recorded from the 1860s and 1870s. In 1866 Nevada's first governor, Henry Blasdel, and his party sought a route between western Nevada and the Pahranagat mining district in the southeastern part of the state. Blasdel's group passed through the vicinity of the NNSS (Stretch 1867). Later, in 1869, George M. Wheeler and his Geographical Expedition went through Indian Springs Valley southeast of the NNSS (Wheeler 1872, 1889; Winslow 1996). Then, in July 1871, the Wheeler Expedition crossed what is now the NNSS, starting from the mining districts at Pahranagat and Groom in southeastern Nevada and traveling southwest for "three days of the most severe marching" (Wheeler 1872:16) to reach Oasis Valley at the upper Amargosa River drainage (north of present-day Beatty). Wheeler's route passed by White Rock Spring and Tippipah Spring, across Fortymile Canyon (already known by that name) and southern Timber Mountain (Winslow 1996).

As settlement of southern Nevada slowly expanded in the late nineteenth and early twentieth centuries, travel routes across the NNSS developed to connect communities in the eastern part of Nevada with settlements in the southwest part of the State. This thin web of wagon roads and stagecoach stops are poorly mapped but tended to follow old native trail systems, located primarily along major drainages and across low passes in the mountains, running between generally reliable springs and watering holes. Stage stops have been noted at a few localities at the NNSS, such as Buckboard Mesa and Cane Springs.

Early travel routes and abandoned properties related to the so-called Death Valley 49ers and other early emigrant parties could be significant for their connections to early explorations and travel. McBride (2002) identifies specific research areas, as well as conditions of integrity and significance, that may be useful in evaluating properties such as emigrant camps, stage stops and railroad sidings, trail and road segments, and isolated or scattered artifacts.

Specific questions related to historic transportation routes could be addressed using a combination of archaeological and documentary sources.

- Is there good correspondence between the known archaeological alignments of the historic-era roads and trails at the NNSS and the routes depicted on early maps of the area? Do the historic maps indicate other potential travel routes or trails that have not been identified in the field?
- What can the artifact assemblages distributed along the transportation routes indicate about their periods and intensity of use?
- How do the physical characteristics and periods of use of the NNSS transportation network relate to the transportation system of the surrounding southern Nevada area and to the broader Mojave Desert and Great Basin region?

Mining

Mining was a crucial economic driver in the early Euro-American settling of southern Nevada. Mining booms of the nineteenth and early twentieth centuries at Pioche, Groom, Tonopah, Goldfield, and Rhyolite largely skirted the NNSS, although prospectors searched the area for the next big strike. Likewise, ranching operations were constrained at the NNSS, primarily because of limited water supplies and the distance to markets.

An early rush of mining in southern Nevada was stimulated by the grand finds of the Comstock in northern Nevada. As early as 1861, Mormon miners may have worked a gold mine on the south side of Bare Mountain, just west of the NNSS (Tingley 1984). The Groom lead and silver mineral lode, approximately 25 miles (40 kilometers) to the east, was discovered and mined in 1864, the same year Nevada was granted statehood (Humphrey 1945). This first flush of mining successes increased in the 1870s but went bust by 1880, starting a two-decade lull that left Nevada in near collapse (Lincoln 1923; Lingenfelter 1986). Beginning in 1900, a second southern Nevada minerals boom commenced with gold and silver strikes at Tonopah, Goldfield, Rhyolite, and Beatty (Elliott 1966; McCracken 1992; Zanjani 1992). This boom also lasted less than two decades, and by 1915, the once high-flying town of Rhyolite was nearly abandoned.

While it lasted, the boom spurred interest in the mineral potential of the NNSS area and helped establish a few travel routes through the region. In 1905 William Clark started the Las Vegas and Tonopah rail line to connect the mines at Tonopah, Goldfield, and Beatty with Las Vegas (Myrick 1963). The Las Vegas and Tonopah Railroad (LV&T) followed an old stage road along the southern edge of the NNSS. Amargosa and Charleston, a couple of rail stops that also supplied nearby mining camps along this route, were located adjacent to what is now the NNSS (Rafferty 1993; Serpico 2017). However, hard economic times and the end of the regional mining boom led to the demise of the LV&T after slightly more than a decade. This rail line was finally abandoned in 1918. The steel rails were pulled and sold for scrap, and the ties were sometimes re-purposed for use in ranch and mine structures in the NNSS area (Drollinger 2003).

In 1919, the Nevada Department of Highways purchased the LV&T right-of-way to build a "modern auto road." Today that route is known as U.S. Route 95 (Serpico 2017). One of the few remnants of the original LV&T railroad grade cuts through the NNSS, forming the main road through Camp Desert Rock in Area 22 (Edwards 1997).

A few short-lived mining camps and mining districts, sprang up near what are now NNSS lands, but mining at the NNSS was not especially productive or profitable. Among the more prominent mining districts were Mine Mountain, west of Yucca Flat; Oak Spring in the Belted Range north of Yucca Flat; and Wahmonie, located near Lookout Peak east of Jackass Flats in Area 26. Limited mining also occurred in the Calico Hills north of Jackass Flats (Ball 1907; Quade and Tingley 1984).

Mine Mountain. Located on the flanks of Mine Mountain southwest of Yucca Flat, this mining district (also known as Tippipah Spring) began in the late 1920s and focused on mercury, lead, silver, and antimony (Tingley 1992). According to Cornwall (1972:39), "four adits and two shallow shafts indicate a modest exploration effort." The remains of a substantial stone-built lead and mercury retort are still standing (Figure B.3).

Figure B. 3 Mine Mountain stone-built lead and mercury retort (DRI 2018).

Oak Spring. The Oak Spring mining district is the earliest formal record of prospecting on what is now the NNSS, dating to the 1880s (Drollinger 2003). The district was centered around Oak Butte and focused on gold, silver, and chrysocolla (copper) mining (Ball 1907:128-130; Lincoln 1923; Quade and Tingley 1984; Stager and Tingley 1988:144-148). Lincoln (1923:178-179) states that copper ore containing some silver was shipped from the Horseshoe claim in 1917 and that minor amounts of tungsten were mined. However, the Oak Spring district proved unproductive, and the ore was not rich enough to offset the costs of shipping it to the nearest railhead at Caliente, Nevada (Hall 1981).

In 1920, Bertha Muzzy Sinclair-Cowan, a noted western author best known by her pen name B.M. Bower, moved from Los Angeles with her husband, Bud Cowan, and her family and took up residence at a mining camp near Oak Spring (Drollinger 2003; McLane 1996). Bower was a prolific writer, publishing a series of short stories, novels, and screenplays over a 40-year career, some of which became the basis for early western-themed movies in Hollywood. While living at the camp, she wrote eleven novels, incorporating some of the surrounding geographic features, such as Oak Butte and the camp itself, into the stories. Applications for claims to various springs in the area under the Bower name date to as early as 1915. The family also formed the El Picacho Mining Company and filed assessment work for the claims from 1922 to 1928. The Bowers moved to Las Vegas around 1926 but worked the mining claims sporadically over the next couple of years until they finally abandoned them during the Great Depression. The stone-built Bower cabin that she used for writing still exists, although it has since collapsed.

Tungsten was rediscovered in the Oak Spring district in 1937, and claims were located as the Climax mining group (Kral 1951:139; Stager and Tingley 1988:145). Two companies leasing the claims, Goldfield Consolidated Mines Company and U.S. Vanadium Corporation, conducted preliminary sampling from 1938 to 1940. Later in 1941, the Pacific Bridge Company leased the claims and constructed roads and a new exploratory adit, but most of the operations ended when the federal government closed the area to establish the LVBGR (Kral 1951; Quade and Tingley 1984; Stager and Tingley 1988). The last known mining operation at the Climax claims was from December 1956 to May 1957, which involved a co-use agreement between the Atomic Energy Commission (AEC) and the Climax Tungsten Corporation (McLane 1996; Quade and Tingley 1984). The agreement was eventually terminated, and no legal mining has since been conducted at the NNSS.

Wahmonie. In 1928, the mining town of Wahmonie was established approximately six miles (10 kilometers) west of Cane Spring, between Mine and Skull Mountains (Jones et al. 1996; Paher 1970), and leant its name to the surrounding mining district. Most of the mining occurred on the southern flanks of

Lookout Peak. According to some unverified accounts, prospecting in the area began as early as the 1850s (Quade and Tingley 1984:31), and the Horn Silver mine operated in the area during the early 1900s (Ball 1907).

In 1927, Mark Lefler reportedly extracted high-grade silver-gold ore from the old Horn Silver mine (Carlson 1974). Lefler and his partner, W. R. McCrea, promoted the find and by early 1928, they had organized the Wahmonie mining camp (McLane 1995; Quade and Tingley 1984). The camp soon grew to have boarding houses, tent stores, and cafes; the Silver Dollar Saloon and the Northern Club were two of the more notable entertainment enterprises (Long 1950). Most miners lived in small tents. By June 1928, 1,451 claims had been filed in the district, and the population varied between 500 and 1,500 persons (McLane 1995). George Wingfield, a well-known mine owner and banker in Nevada, purchased a portion of the Lefler claim and incorporated the Wahmonie Mining Company. However, the strike was not as rich as first believed and people began leaving by early 1929. Wingfield decided to cut his losses by selling his portion, signing over all of his shares to McCrea for a dollar. McCrea retained his shares and continued to work on the claim into early 1931. Small amounts of prospecting in the Wahmonie district continued into the 1930s and 1940s, but by then the townsite had been abandoned (Figure B.4).

Mining operations were carried out in districts at Oak Spring and neighboring White Rock Springs, Mine Mountain, Wahmonie, and Calico Hills (Table B.2). Some claims in the Timber Mountain area may date to as early as 1869 (Angel 1958 [1881]:486), but most mining activity occurred in the early twentieth century. Except for the short-lived boom town at Wahmonie, these ventures were small-scale operations working marginal ore bodies, a pattern that often prevailed during depressed times after the big strikes elsewhere had petered out. Supplies and needed equipment were often long distances away and shipping the ore to market was costly (Hall 1981:217; Drollinger 2003:14).

Figure B. 4 Historic photo taken at Wahmonie mining town circa 1928 (photo by N. E. (Ned) Johnson, Beatty, Nevada).

Table B.2. Mining districts at the NNSS.

District	Other Names	Discovered	Area	Main commodities
Oak Spring	Climax	1886, 1905	SE Belted Range north of Yucca Flat	Tungsten, molybdenum, gold, silver, copper, lead
White Rock Springs	Oak Spring	1927	Tongue Wash and Captain Jack Spring	Silver
Wahmonie	Horn Silver	<1905, 1928, 1950	Lookout Peak, Skull Mountain	Silver, gold, later travertine
Mine Mountain	Tippipah Spring	1928	Mine Mountain west of Yucca Flat	Mercury, lead, silver, antimony
Calico Hills		1941	Fortymile Canyon north of Jackass Flats	Copper, magnesite, silver, iron

Typical mining property types include prospect holes, claims, adits, shafts, ore processing facilities (such as the mercury retort at Mine Mountain), heavy equipment, spoil piles, tent pads, domestic quarters for more affluent district employees and sometimes their families or households, equipment yards, and possibly stables for mules or other draft animals (Cornwall and Norberg 1978; Drollinger 2003; Hardesty 1988). Some limited mining operations continued into the mid-1950s, even after nuclear weapons testing had begun. Archaeological remains of mining operations have been recorded at Oak Spring (Drollinger 2003), near Mine Mountain and Tippipah Spring (Jones et al. 2005), and Wahmonie (Jones et al. 1996). Research questions that arise concerning mining operations at the NNSS include the following:

- What were the early mining activities that occurred at the NNSS, and what were the principal commodities? How large were the operations, and how long did they last? Were they tied to mining booms elsewhere in the State, or did they follow after the booms had subsided?
- What was the social fabric of the Wahmonie townsite? Very little is documented about the nature of the mining community, its composition, or its layout. Can the archaeological record provide an indication of the kinds of people who lived there and the kinds of social groups that made up the short-lived community?
- A common perception is that single males were the sole exploiters of the more ephemeral mineral resources of the Great Basin, but what can the archaeological and historical record for the mining sites reveal about the household composition of the individuals that worked the ore deposits at the NNSS? Can these sources provide insight concerning the socio-economic status and gender composition of the occupants of the NNSS mining districts?
- How extensive was a given mining operation? What kind of mineral extraction technology was used? Were excavations done by hand or with the assistance of machinery? Are there refuse dumps, extraction machinery, domestic structures, or any other remains indicative of a mining camp?
- Do the refuse dumps contain information about the supply network that supported the mining efforts? Is there evidence of interactions with both the local prospectors of the neighboring mines or districts and the larger regional market centers?
- Do the mining sites contain any evidence to indicate its occupants may have engaged in secondary economic activities such as ranching, logging, cargo hauling, or other pursuits to supplement their economic needs?
- Do the artifacts and features at any of the mines reflect a transition from small-scale, non-mechanized mining technology to mechanized mining during the renewed tungsten extraction efforts in the Oak Springs District around 1940? Is there evidence indicative of ore processing at any of the mining sites?
- Do any wells, roads, tanks, or other such features contain artifacts showing evidence of use during the peak periods of mining at nearby districts? If so, do artifacts reflect a narrow or broad period of manufacture?
- Besides Wahmonie, is there evidence of businesses coming to the area to offer services or supplies to the miners?

Ranching

The introduction of ranching in southwestern Nevada coincided with the mining booms to supply miners with meat, but when the mines went bust, ranching became an alternative way to make a living (Lingenfelter 1986; McCracken and La Rue 2012). Livestock grazing surrounding the NNSS area may have been introduced as early as the 1870s, with the establishment of nearby ranching operations at Alamo, Panaca, Oasis Valley, Ash Meadows, Indian Springs, and other locations with access to water around the region (Edwards et al. 2012).

Much of the NNSS area lacked sufficient supplies of water, and forage was negligible in the desert areas. Better grass and water could be had on the highland mesas to the north, and the main springs and watering holes on Pahute and Rainier Mesas were claimed early on as part of both local and more wide-ranging ranching interests. Ranching activities below the mesas in the NNSS area centered around natural springs such as Topopah Spring, Tippipah Spring, Cane Spring, Oak Spring, Ammonia Tanks, White Rock Spring, Tub Spring, Captain Jack Spring, Reitmann Seep, and others (DuBarton and Drollinger 1996). Many of these springs were modified and improved, and several have the remains of corrals and cabins. These springs were, of course, home bases of American Indian families and had been for millennia (Steward 1938; Johnson et al. 1999), and the ranching operations sometimes displaced these families.

At first, control of different rangeland areas at the NNSS was probably based simply on rights of occupation, range improvements, and traditional usage. By the 1910s, though, formal applications for water rights claims were filed for many of these springs by the Clay Springs Cattle Company, started up by William T. Stewart and his business partner George W. Hail of St. George, Utah. By 1920 this extensive operation (which had by then changed its name to the Naquinta Cattle Company) claimed nearly all the rangelands on what is now the NNSS (Figure B.5).

The Clay Springs/Naquinta operation sometimes overran smaller ranchers, literally claiming their springs out from under them. One local claimant, a prospector named William E. Beck, complained in 1915 that the Clay Springs Cattle Company had obtained rights to springs that he had located, recorded, and improved for the previous 15 years; he also noted that the company had claimed “White Rock Springs which Indians have lived and have had horses and built houses and developed it and used it for 35 years 15 years that I know of and others will swear for 35 years they are most of them half breads [sic] and make their own living” (letter on file, State of Nevada Division of Water Resources). Like other huge livestock operations in the region (McCracken and La Rue 2012), the Naquinta Cattle Company ran into hard times in the late 1920s and 1930s and dissolved its holdings in the area; soon other parties claimed the water and grazing rights. Whether actual ranching operations changed very much because of the change in control from local ranchers to the large corporate cattle company and back again is not known.

Open-range ranching continued into the 1950s, ten years after the area had been withdrawn to become the LVBGR. Even after the land became the NTS and the first atmospheric testing series began in early 1951, existing ranches and some of the mines were allowed to continue operating much as they had in the past. However, within a few years, the AEC bought up the ranchers’ livestock, and the cattle became part of a government herd, which was managed via controlled grazing until the 1960s. In 1964, the animals became some of the founding stock for an experimental farm in Area 15, designed to study the transport of radioisotopes through the agricultural food chain (Black and Smith 1984; Johnson and Goldenberg 1998).

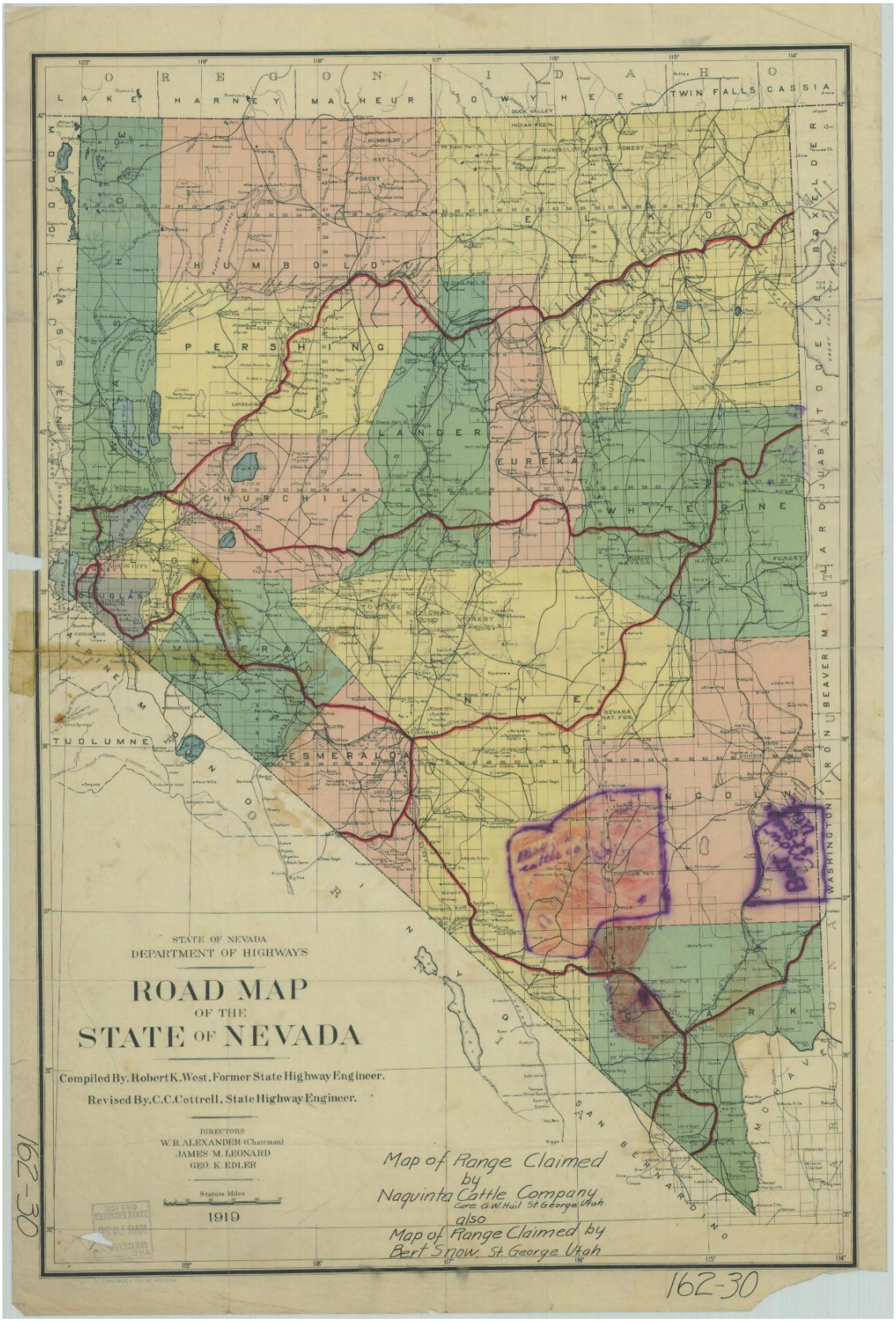

Figure B. 5 Map of the grazing lands claimed by the Naquinta Cattle Company, ca. 1920. Source: http://images.water.nv.gov/images/range%20maps/162-30.pdf.

A more detailed examination of the ranching history and resources at the NNSS could address a range of research issues.

- Are there any unrecorded historic ranching sites or facilities in the area? If so, what are their ages and inferred functions?
- Do historic ranching sites contain diagnostic artifacts or dateable construction attributes? How do these properties compare to other ranching sites in the surrounding region and the rest of Nevada?
- Are there any historic ranching sites that indicate the former presence of seeps or springs? What types of water control features were developed to support the NNSS ranches?
- What kinds of livestock were raised at the NNSS? Did the types of livestock change through time?
- Were historic ranching operations at the NNSS involved in the surrounding economic and political networks, or did their geographic location isolate them from full participation in regional markets and information exchange?
- Do the ranching sites contain any evidence to indicate their occupants may have engaged in secondary economic activities such as mining, transportation, or other pursuits to supplement their income?
- How did ranching and mining operations interact and co-exist? Do ranching sites indicate historic use by American Indian groups, and how did these groups relate to ranching operations? Did American Indian people work their own ranches, or were they employees of the Euro-American operations? How did ranching operations managed by American Indian groups relate to traditional American Indian settlement patterns, and how were they integrated into the historic Euro-American social and settlement pattern?
- How did ranching operations change as a result of major consolidation with the Naquinta Cattle Company in the 1910s, or after Naquinta dissolved in the 1930s?
- What evidence is there for ranching after the NNSS was withdrawn for use as a nuclear testing site?

Military Training

In 1940, the federal government withdrew the NNSS area from public use to create a military training ground. Originally named the Tonopah Bombing Range, the NNSS was in active use for air combat, air-to-ground support, strategic bombing, and air-to-air gunnery practice commencing in 1942 and lasting until the end of World War II (WWII) (Beck et al. 1996; Myhrer 2012). Camps and runways supporting the mission were located at Las Vegas, Tonopah, Indian Springs, and other locations, including landing strips at Yucca Lake and at Fortymile Wash (Beck et al. 1996:12). Although much of the training mission involved various forms of air combat, the range was also used to train Army, Navy, Marine, and (later) allied troops. After WWII, the range underwent a series of administrative changes. In 1950, it was renamed the Nellis Bombing Range and supported Nellis Air Force Base (NAFB) in Las Vegas (Beck et al. 1996:13).

In 1950-51, the core of what is now the NNSS was withdrawn to create the NPG (later the NTS and the NNSS). The mission was devoted primarily to the testing of nuclear weapons and other technology, but military training and experiments have also been conducted in various areas of the restricted-access site, sometimes associated with nuclear tests. Various military training and readiness activities continue at the NNSS today. Camp Desert Rock (now in Area 22), a U.S. Army camp, was constructed in 1951 to house multi-service personnel supporting the work at the NPG/NTS (Edwards 1997). Located just outside the boundary of the testing ground, the camp had about 100 temporary buildings and more than 500 tents, supporting 5000+ troops during the atmospheric testing period.

At the conclusion of the atmospheric test Operation Plumbbob in October 1957, Camp Desert Rock was placed in standby status to await the next series of tests. However, a temporary Test Ban began the

following year and the facility was mothballed. The airstrip adjacent to the abandoned garrison was improved and expanded in 1963 to accommodate President John F. Kennedy's visit to the rocket development facility in Area 25. The land was incorporated into the NTS with administrative control transferring to the AEC in June 1964 (Edwards 1997). Most of the camp's buildings were moved to other areas or demolished, although the concrete foundations and camp infrastructure remain in place.

Historic property types associated with military training activities at the NNSS may include landing strips and associated structural remains, bombs and bomb fragments, spent ammunition, firing posts, remains of bivouacs and other constructions, trenches, and various types of targets and military equipment, as well as the remnants of Camp Desert Rock and other residential camps.

Properties associated with military training activities during the WWII era are incompletely documented. As Beck et al. (1996:13) note, "vestiges from this era are few. Landmark Rock, near Pahute Mesa, is riddled with bullet holes from practice strafing rounds, and ordnance is scattered here and there, particularly in the Yucca Flat area." Several air-to-ground strafing targets have been recorded on Yucca Flat in Area 1, west of Mercury Highway. Two WWII-era training and emergency runways fall within the current NNSS boundaries. Indian Springs Auxiliary Field #4 (later renamed Pahute Mesa Airstrip) is located in Area 18. Indian Springs Auxiliary Field #5 extended north from the northwest corner of Yucca Lake in Area 6 (not to be confused with the later era runway marked off on the playa surface). Other military buildings or structures from the 1940-1950 period have not been identified to date. Military training-related properties from 1951 through the early 1960s are better represented in the archaeological record and historic literature (Beck et al. 1996; Edwards 1997; Fehner and Gosling 2006; Johnson et al. 2000; Jones et al. 2005), but there has not been a focused effort to systematically record and interpret the physical remains of the early Cold War-era military activities in the forward areas of the NNSS.

Because few specifics are known about the military's use of this landscape for training during the 1940s, research questions for the military's WWII and immediate post-War component of the archaeological record focus on basic information.

- Are there any WWII-era military sites or facilities in the area? If so, what are their ages and inferred functions?
- How are the cultural resources associated with the military's WWII-era use of NNSS lands distributed?
- Did the military invest in infrastructure development during its WWII use of the land? Were any improvements made by the military in the 1940s re-used when the land was withdrawn for nuclear testing?

Early Cold War military activities at the NNSS were extensive and left a more robust footprint than WWII actions. Research efforts could focus on documenting the following resources and evaluating them in relation to the changing patterns of military organization, the introduction of new battlefield tactics and training, and the technological evolution of weapons systems.

- The surface features and historic context of the main cantonment of Camp Desert Rock has been well-documented (Edwards 1997), but the peripheral features, including the animal holding area, the surrounding infrastructure, and the camp's landfill, have not been recorded. The landfill could provide significant insight into the supply network and consumption habits of a field encampment that churned 5,000 to 8,000 troops through its facilities during individual Desert Rock military exercises. An examination of the camp's animal holding compound might yield information on the use of animals in the weapons effects experiments associated with many atmospheric nuclear tests.
- During the aboveground testing period, the military had an extensive presence in the forward areas of the NNSS. Beginning in 1951 through the end of 1957, Army personnel deployed virtually all the military equipment for the weapons effects test. They built test structures, dug observer trenches, ran communication lines across Frenchman and Yucca Flats, and conducted military maneuvers in conjunction with the atmospheric tests. Only a limited number of the

remnants of these resources have been recorded. During this period, the Army altered its warfighting strategies, shifting from defending against conventional weapons to establishing the "Pentomic Army," designed to respond to and operate with nuclear armaments. Can activities associated with this type of operational unit be observed in the archaeological record? The atmospheric testing locations may help answer that question.

When aboveground testing ended, the DOD terminated its maneuver exercises but continued its presence at the NNSS. Military leadership adapted quickly to the underground testing protocol and continued to sponsor multiple weapons tests for its research and development programs (see summary below in *National Laboratories, Facilities, and Federal Agencies*).

Because military training activities at the NNSS span two distinct periods—WWII and the Cold War—comparisons between the resources of different eras can be useful for exploring shifting political and military priorities.

- What are the similarities and differences between the military training sites associated with these eras? Do military resources from the two periods occur in overlapping locations or in disparate areas of the NNSS?
- Is there evidence of the continued use of the WWII training facilities and/or infrastructure into the Cold War nuclear testing period?

B.3. The Cold War and Nuclear Testing

In the late 1940s, a search was conducted to establish a test site in the continental United States that was remote from major population centers but near the nuclear research laboratories (Fehner and Gosling 2006; Titus 1986). Upon the withdrawal of the land that became the nation's major nuclear proving ground, the NNSS achieved national and international historic significance as a key battlefield in the Cold War between the United States and its North Atlantic Treaty Organization (NATO) allies, versus the Soviet Union and its allies (Fehner and Gosling 2000, 2006). From 1951 to 1992, 100 atmospheric and 828 underground nuclear tests were conducted in the various area divisions at the NNSS. Table B.3 presents a list of the operations, the years they occurred, and their locations (NNSA/NFO 2015).

The NNSS played a crucial role in the nuclear testing programs of America and its allies during the Cold War. An escalating arms race for weapons superiority led to the need for nuclear weapons testing carried out by the United States, the former Soviet Union, and other foreign nuclear powers. The AEC (now the DOE) and the DOD conducted these tests for the United States. Most of the American atmospheric and underground tests occurred at the NNSS, with a few other nuclear testing grounds scattered in the United States and even worldwide (e.g., the Pacific Proving Grounds at the Marshall Islands). The major purposes of nuclear testing were weapons related (testing a device intended for a specific weapon system); weapons effects (evaluating the civil or military effects of a detonation); safety experiments (confirming a nuclear detonation would not occur from an accidental detonation of the high explosive associated with the device); joint United States–United Kingdom testing; and a program named Vela Uniform (improving the ability to detect, identify, and locate underground nuclear detonations) (NNSA/NFO 2015).

During the nuclear testing era, a host of other scientific and technological programs were conducted at the NNSS. These included research on the development of nuclear-powered rockets, studies on spent fuel storage, and pioneering studies on the effects of radiation on human health, the health of agricultural food streams, and on desert ecosystem functions, among others.

The closed village of Mercury was the residential and administrative center of the NNSS, providing a full range of services to personnel involved. At its zenith in the early 1960s it held over 10,000 residents, the largest of any population center in Nye County, Nevada. It had a post office; a host of entertainment facilities including a movie theatre, bowling alley, recreation building, cafeteria and steakhouse; a hospital; a non-denominational church; a sheriff's office; a schoolhouse and library; shops, stores, and a laundromat; and other features typical of towns of that size. How this closed town functioned to support NNSS workers is another historic context related to the overall nuclear testing enterprise.

Table B.3. Locations of nuclear tests at the NNSS by Operation and Area.

Operation	Period	NNSS Area																
		1	2	3	4	5	6	7	8	9	10	11	12	15	16	18	19/20	30
Ranger	1951	■				■												
Buster-Jangle	1951							■		■	■							
Tumbler-Snapper	1952	■	■	■	■	■		■										
Upshot-Knothole	1953	■	■	■	■			■										
Teapot	1955	■	■	■	■	■		■		■	■							
Project 56	1955-1956											■						
Plumbbob	1957	■	■	■	■	■		■		■			■					
Project 58+58a	1957-1958			■									■					
Hardtack II	1958			■		■			■	■			■					
Nougat	1961-1962			■						■			■	■	■	■		
Sunbeam	1962					■										■		
Storax	1962-1963		■	■								■						
Niblick	1963-1964		■	■	■								■					
Whetstone	1964-1965		■	■		■		■						■	■	■	■	
Flintlock	1965-1966		■	■				■	■	■	■	■	■	■	■		■	
Latchkey	1966-1967		■	■		■		■		■	■	■	■				■	
Crosstie	1967-1968		■	■	■	■	■	■					■				■	■
Bowline	1968-1969		■	■				■		■		■			■		■	
Mandrel	1969-1970		■	■				■	■	■	■	■	■		■		■	
Emery	1970-1971		■	■				■		■	■		■					
Grommet	1971-1972	■	■	■				■			■	■	■		■			
Toggle	1972-1973		■	■				■			■		■				■	
Arbor	1973-1974		■	■	■						■		■					
Bedrock	1974-1975		■	■	■			■		■	■		■				■	
Anvil	1975-1976		■	■	■			■		■			■				■	
Fulcrum	1976-1977		■	■	■			■			■							
Cresset	1977-1978		■	■	■			■	■	■	■		■				■	
Quicksilver	1978-1979		■	■	■			■			■						■	
Tinderbox	1979-1980		■	■				■	■								■	
Guardian	1980-1981		■	■				■	■	■	■		■				■	
Praetorian	1981-1982		■	■	■			■	■	■	■		■				■	
Phalanx	1982-1983		■	■	■			■			■		■				■	
Fusileer	1983-1984		■	■	■			■			■		■				■	
Grenadier	1984-1985		■	■	■			■	■	■							■	
Charioteer	1985-1986		■	■	■			■					■				■	
Musketeer	1986-1987			■	■		■						■				■	
Touchstone	1987-1988		■	■	■		■				■		■				■	
Cornerstone	1988-1989		■	■	■		■	■	■				■				■	
Aqueduct	1989-1990	■	■	■			■	■					■				■	
Sculpin	1990-1991				■			■					■				■	
Julin	1991-1992			■						■			■				■	

Table B.4. Historic Districts with SHPO Concurrence at the NNSS.

District Name	SHPO ID	DRI Report	Authors
Apple-2	D380	TR99	Johnson and Edwards (2000)
Area 6 Control Point	D395	TR121	O'Neill et al. (2021)
Area 1 Subdock	D377	TR120	Collins et al. (2022)
Area 12 Camp	D372	TR119	Reno et al. (2021)
Frenchman Flat	D204	TR97	Johnson et al. (2000)
Mercury	D230	TR115	Reno et al. (2018)
Nuclear Rocket Development Station	D424	TR122	Reno et al. (2023)
Pluto Control Facility	D19	HE041305-1	Drollinger et al. (2005)
Pluto Test Bunker Facility	D434	TR125	Brannan et al. (2023)
REECo Maintenance Compound	D417	SR092921-1-MIT	Haynes and Person (2022)
Shasta	D145	TR110	King (2015)
Smoky	D104	TR108	Jones et al. (2014)
Test Cell C	D346	TR117	Reno et al. (2019)
U12g	D444	SR120122-1	Menocal et al. (2023)
U12n	D84	TR106	Drollinger et al. (2011)
U15	D143	TR109	Drollinger et al. (2014)
U16a	D158	TR107	Jones et al. (2013)

The Cold War

The Cold War was a conflict between the United States and its allies, and the communist block of nations led by the Soviet Union. It lasted from shortly after the end of WWII in 1945 until the dissolution of the Soviet Union in 1991 (Anders 1978:4; Blohm 2003; Loeber 2002:80; Ogle 1985:20). The conflict pivoted around themes of ideology, imperialism, strategic issues, and the nuclear arms race (Puzio 2013). It was a war fought via economic and cultural means, as well as a series of proxy wars by the United States and the former Soviet Union and their allies from 1947 to 1991 (Gaddis 2005; Walker 1995). Various events of this period have been used to mark both the beginning and end of the Cold War, so there are no universally agreed-upon starting and ending dates for the conflict.

Property types associated with nuclear testing are hugely diverse and complex and include non-weapons-related research programs as well. An indicator of this complexity is the large number of recorded and potential historic districts at the NNSS related to specific events and themes (Table B.4). In addition to these districts, a vast network of infrastructure was developed to make the missions of nuclear testing and scientific and technological research possible. This infrastructure network includes roads, airstrips, residential areas, satellite camps, storage yards, power, communications, water and sewer, and security.

The historic significance of buildings, structures, and accessory elements at the NNSS is evaluated in the broader context of the Cold War era and nuclear testing and research, and in association with specific events (e.g., individual nuclear tests or in relation to other historic contexts connected to the NNSS area).

Soviet military forces occupied central and eastern Europe during the closing months of WWII, and, using its military and political power, Soviet forces swiftly expanded into Eastern Europe and established governments favorable to the Soviet Union (Leffler 2007:32; Perkins 1991:8; Shreffler and Bennett 1970:1). After the eastern block was secured, the Soviets turned their attention westward and elsewhere. The spread of Soviet communism became of increasing concern to the United States. Following the Truman Doctrine proposed in 1947 and the National Security Council Paper NSC-68 of 1950, the United States began rebuilding Western Europe through the Marshall Plan of 1948 and, with its allies, established NATO in 1949, the Southeast Asia Treaty Organization in 1954, and the Middle East Central Treaty Organization in 1955 to contain communist expansion efforts (Leffler 2007:65; Perkins 1991:8; Powaski 2000:4). NATO served as a guarantee of American military support, which included the use of nuclear weapons (Pifer 2011). The Soviet Union and its Eastern European allies formed the Warsaw Pact, a similar type of mutual defense agreement, in 1955 (Perkins 1991:9; Walker 1995:104).

Atomic Energy Commission. The AEC was established by the Atomic Energy Act of 1946 following the use of nuclear weapons to end WWII. The purpose of the act was to address government control of fissionable material, nuclear experiments for military applications, and regulations pertaining to the release of scientific and related data. The aim of the AEC was to maintain civilian government control of the research, development, and production of nuclear energy, including nuclear weapons (Anders 1978:2; Buck 1983:1; Fehner and Gosling 2006:29). The AEC took over the research and production facilities built by the Manhattan Engineer District during WWII and set about refurbishing them. These facilities in New Mexico became the Los Alamos Scientific Laboratory, later named the Los Alamos National Laboratory (LANL) (Loeber 2002:154). Development and production of the weapons took place at Sandia Laboratory, now called Sandia National Laboratory (SNL), in Albuquerque, New Mexico; the Y-12 Plant in Oak Ridge, Tennessee; the Hanford Site in Washington; and the Rock Island Arsenal in Illinois (Anders 1978:3; Brady et al. 1989:18-19; Buck 1983:2; Stapp 1997).

Containment Strategy. A containment strategy, proposed by President Harry Truman in 1947 and essentially followed by the United States throughout the entire Cold War, provided the rationale for a nuclear arms buildup. These weapons were thought to represent the most effective means for deterring the Soviet Union by confronting it with the prospect that aggression on its part could result in an escalation to strategic levels and the threat of total annihilation. After WWII, the United States accelerated its nuclear weapons program and the growth of its weapons stockpile. American officials from the President to members of Congress and military advisors encouraged the further development of the weapons that ended WWII, with the military leading the offensive, and nuclear weapons being deployed in key global locations, especially in Western Europe (Powaski 2000:5).

Department of Defense. The National Security Act of 1947 established the DOD by consolidating the War Department, the Navy Department, and the newly created Department of the Air Force. The Armed Forces Special Weapons Project was formed that year as the principal agency for nuclear weaponry within the DOD. The agency, with its Field Command located at Sandia Base in Albuquerque, New Mexico, had a continuing role in the testing of nuclear weapons at the Pacific Proving Grounds and later at the NNSS (DTRA 2002).

Early Days of Nuclear Testing. As some scientists predicted (Langmuir 1946; Seitz and Bethe 1946; Urey 1946), after the use of the first atomic weapons to end WWII, a nuclear arms race began in 1949 when the Soviet Union detonated an atomic device (Bundy 1988:199; Friesen 1995:4; Reed and Stillman 2009:33). After that date, the Soviet Union built up its own nuclear warfare capability as rapidly as possible. Following the first nuclear detonation by the Soviet Union, increased efforts on research and production were implemented in the United States (Anders 1978:4; Ogle 1985:20). In 1951, the United States detonated an even more powerful thermonuclear device, often referred to as the hydrogen bomb (Blohm 2003:40; EG&G 1954; Fehner and Gosling 2006:84; Herken 2002:257; Miller 1991:116). The

Soviet Union soon followed suit. Tensions mounted and the arms race between the two superpowers accelerated.

National Laboratories, Facilities, and Federal Agencies. The Lawrence Livermore National Laboratory was created in 1952 as a branch of the University of California Radiation Laboratory at Livermore, California, to conduct nuclear research, which was broadly similar in scope to the LANL activities (Brady et al. 1989:18; Friesen 1995:5). Both became national laboratories in 1979 (Loeber 2002:154). Other facilities added to the nuclear weapons complex included manufacturing plants at Rocky Flats near Golden, Colorado; the Kansas City Plant in Missouri; the Burlington Army Ordnance Plant in Iowa; the Pinellas Plant in Largo, Florida; Mound Laboratory in Miamisburg, Ohio; the Savannah River Site in South Carolina; and the Pantex Plant near Amarillo, Texas (Anders 1978:4; Loeber 2002). Research facilities were also established at the Argonne National Laboratory in Illinois for reactor development, at the Oak Ridge National Laboratory in Tennessee for radioisotopes, and at the Brookhaven National Laboratory in New York for reactor physics, high-energy accelerators, and the biomedical sciences (Buck 1983:2).

The Armed Forces Special Weapons Project evolved over the years through reorganizations and mission changes into a succession of entities: the Defense Atomic Support Agency, the Defense Nuclear Agency, the Defense Special Weapons Agency, and since 1998, the Defense Threat Reduction Agency. This agency's first mission when initially formed was to train military personnel in the assembly, storage, and firing of the atomic weapons, tasks previously conducted by civilian scientists. Soon, the agency was assigned the tasks of studying radiological warfare and the effects of nuclear weapons on targets underwater, underground, and in the atmosphere (DTRA 2002:71-72). More tasks soon followed as the nuclear weapons industry became more adept. The agency began to provide specialized training and technical support, coordinated storage and oversight of the nuclear weapons stockpile, and became more involved in the planning and operation of the weapons tests (DTRA 2002:80, 104). Most importantly, representing the DOD, the agency participated in the development of nuclear weapons and associated systems and served as an integral information source in Cold War strategy for the United States. In the late 1970s and early 1980s, during the buildup of the military and national defense of the United States, the objective for the agency was survivability from a nuclear weapons attack (DTRA 2002:259). Efforts were made to improve and harden communication systems, airplanes and their components, missiles and their components, and underground bunkers. Today, a primary focus for this agency is combating weapons of mass destruction, including biological, chemical, and nuclear threats.

In 1974, the AEC was divided into the Nuclear Regulatory Commission for regulating the nuclear power industry and the Energy Research and Development Administration to manage programs for nuclear weapons, naval reactors, and energy development (Buck 1983:8). In 1977, the Federal Energy Administration, the Energy Research and Development Administration, the Federal Power Commission, and programs of various other agencies were combined to form the DOE. The role of the newly created department was to manage the nuclear infrastructure and administer energy policy. The NNSA, a subagency within DOE, was created in 2000 by the U.S. Congress, and its primary missions are to maintain the safety and security of the nuclear weapons stockpile, promote nuclear nonproliferation, participate in counter proliferation and counterterrorism activities, safeguard against domestic and international radiological threats, and supply naval reactors for the U.S. Navy. The NNSA currently oversees the Nevada Field Office and the NNSS.

U.S. Nuclear Testing. Nuclear weapons tests for civil and military effects and to improve the science behind the weapons were conducted worldwide in the atmosphere, underwater, underground, and in outer space (NNSA/NFO 2015; Norris and Arkin 1996). As the weapons were modified to be more destructive, they could also be delivered faster and more accurately (Hoffman 2009:15). At the outset, it took hours to deliver a nuclear bomb to its target by aircraft. By the end of the Cold War, a missile could deliver a bomb within minutes.

The United States has conducted 1,026 nuclear tests and another 28 with Great Britain, totaling 1,054 tests (NNSA/NFO 2015). Five of these were conducted underwater, 210 were atmospheric tests, and 839

were underground tests. Tests were conducted in the south Atlantic (n=3), at the Pacific Proving Grounds (n=106), at the NNSS (n=928), and at various other places within the United States (n=17).

Nuclear Weapons Testing at the NNSS

Nuclear testing has been a major and important part of the history of Nevada and the United States (Tlachac 1991a, 1991b). Much of this activity revolved around the NNSS, where most of the developments and experiments in nuclear weapon design and engineering were tested both above and belowground. The consequences of this activity have been felt worldwide, playing a vital role in the national defense of our country and helping to shape modern geopolitics.

With the decision to accelerate the development of nuclear weapons in the late 1940s, it became apparent that testing within the boundaries of the continental United States would significantly decrease the time and effort needed to conduct the tests and at less cost (Campbell et al. 1983:171; Lay 1950; Ogle 1985:44; Tlachac 1991a). Beginning in the late 1940s, both low and high yield nuclear tests had been conducted at the Pacific Proving Grounds in the Marshall Islands, but the need for a permanent continental base for carrying out tests soon became apparent. The Armed Forces Special Weapons Project conducted a top-secret feasibility study named Project Nutmeg to find a suitable nuclear test site in the continental United States (Fehner and Gosling 2006:36). The Korean War, which began in 1950, also provided an impetus to find a continental testing site because of security concerns for the Pacific testing site (DTRA 2002:77; Friesen 1995:4). The ideal continental test site would have favorable and predictable weather and terrain conditions to allow testing year-round, the land would be under federal control, and it would have an infrastructure already in place (Lay 1950; Tlachac 1991a). Other factors were security, remoteness from populated areas, and be located relatively close to the scientific laboratories in New Mexico. The LVBGR in southern Nevada was considered the best place meeting these conditions (Fehner and Gosling 2006:43). The range had large flat terrain for conducting the tests, easterly prevailing winds away from the densely populated west coast, and natural topographic barriers to screen the test areas from public viewing. Based on the recommendations of the LANL, the AEC, and the National Security Council, President Truman approved the new test site location on December 18, 1950.

The AEC made use of the existing nearby facilities and services of the U.S. Air Force to prepare for the first tests at the new test site (Fehner and Gosling 2000:50). Lacking facilities at the site, the McKee Construction Company and REECo were hired to begin preparing for the first tests, focusing most of their attention on the Frenchman Flat (Campbell et al. 1983:174; Fehner and Gosling 2000:51, 64). Both companies worked as construction contractors at the LANL in New Mexico and were familiar with the proposed tasks. The Ranger nuclear test series began with the Able test on January 27, 1951, and ended with the Fox test on February 6 (Fehner and Gosling 2000:70, 75; NNSA/NFO 2015; Ogle 1985:43-44; Titus 1986:58). The primary testing area was moved from Frenchman Flat to Yucca Flat as a safety measure for the next series of tests scheduled for the fall of 1951. Construction of permanent facilities began with utility and operational structures, communications, a control point, and additional accommodations (Fehner and Gosling 2000:81). Haddock Engineering constructed Buildings CP-1 and CP-2 at the Control Point, the first structures at Camp Mercury, and the test sites in Yucca Flat for Operation Buster-Jangle that autumn (Campbell et al. 1983:175). The first land withdrawal by the AEC establishing the official nuclear weapons testing ground in southern Nevada occurred February 12, 1952, under Public Land Order 805. Additional land parcels were obtained under later public orders and memorandums of agreement.

Nuclear testing at the NNSS can generally be divided into two types: atmospheric tests from 1951 to 1962 and underground tests from 1957 to 1992. Two exceptions are crater type underground tests, the Uncle test in 1951 and the Effects SubSurface test in 1955. For atmospheric tests, nuclear devices were initially dropped from airplanes, but later were placed closer to the ground on top of towers and were eventually elevated by balloons to the desired height. The main objectives of this early testing were to monitor and measure results, perfect testing methods, and improve nuclear weapon technology. Another objective was to determine the physical effects of nuclear weapons, which was typically carried out by the DOD (DTRA 2002). These effects tests were an extensive part of the testing program in the 1950s (Ogle

1985). Test objectives also included studying the physical effects of detonations on structures and objects. Experiments measured damage to airplanes, tanks, jeeps, automobiles, clothing, docks, houses, underground structures, and radio and radar transmissions, among other items. In Frenchman Flat, structures and buildings were constructed and tested to improve civil defense practices. These included underground shelters, domed subterranean structures, concrete and brick buildings, a school, a metal bridge, and a bank vault (Fehner and Gosling 2006; Johnson et al. 2000; Scammell 1999). U.S. military personnel, crouching in foxholes and trenches, participated in many of the atmospheric tests in Yucca Flat and Frenchman Flat to prepare for nuclear warfare (Edwards et al. 1985; Goetz et al. 1985; Harris et al. 1981; Massie et al. 1982; Miller 1991; Ponton et al. 1981; Viscuso et al. 1981).

The first underground nuclear test, named Uncle, was a crater test in Yucca Flat in November 1951. Crater tests were designed to create a large pit by placing a device beneath the surface at a depth calculated to produce a throw-out of earth when the device was detonated (NNSA/NFO 2015). Several years later, underground containment of nuclear explosions became a major focus to protect workers and reduce public concerns (Carothers 1995; Johnson et al. 1959; Malik et al. 1981). Initially, underground testing posed a new engineering challenge and learning experience, and not all tests could be adequately contained.

Both the United States and the Soviet Union ceased nuclear testing in 1958 with self-imposed moratoria at the urging of internal and external forces (Ogle 1985:30-31), but by 1961, both superpowers were once again conducting tests. Except for a few surface and near-surface tests, most of the tests after the moratoria were conducted underground. On August 5, 1963, the United States, Soviet Union, and Great Britain ratified the Limited Test Ban Treaty, banning all nuclear test detonations in the air, underwater, and in outer space. Testing from this point forward would only be conducted underground (Friesen 1995:6).

Most underground tests at the NNSS between 1963 and 1992 were conducted in vertical shafts or in horizontal tunnels at Yucca and Frenchman Flats, around Shoshone Mountain, and in Buckboard, Pahute, and Rainier Mesas. Most vertical shaft tests were for the purpose of developing new weapon systems. Tunnel tests were generally designed to evaluate the effects of radiation from a nuclear explosion on military hardware and systems (Brady et al. 1989; OTA 1989; Wolff 1984). The vertical shaft tests were the most common, representing over 90 percent of the tests, and were primarily placed on Yucca Flat or on Pahute Mesa if they were large-yield tests. The borehole of a vertical shaft test was up to 10 feet in diameter and from 89 feet to 4,765 feet deep (OTA 1989). Some horizontal tunnels extended over a mile in length from the portal.

The first underground shaft test, code-named Pascal-A, took place in an unstemmed hole in July of 1957 in Yucca Flat (NNSA/NFO 2015; Fehner and Gosling 2006). The first underground tunnel test, code-named Saturn, took place in August of the same year. The Rainier nuclear weapons-related tunnel test a month later was the first underground test that contained a nuclear detonation with no radioactive release detected (Carothers 1995; NNSA/NFO 2015; Fehner and Gosling 2006; Jones et al. 2013). The Hunters Trophy test in 1992 was the last nuclear weapons effects tunnel test at the NNSS. On September 23, 1992, the Divider event took place in a vertical shaft at Yucca Flat, becoming the last nuclear weapons test conducted at the NNSS (NNSA/NFO 2015).

In all, a total of 928 nuclear tests were conducted at the NNSS. Of these, 119 were performed in the 1950s, and, following a short moratorium between 1958 and 1961 agreed to by both the United States and the former Soviet Union, another 809 tests took place (Friesen 1995, NNSA/NFO 2015).

In 1992, the United States established a second self-imposed moratorium on nuclear testing. In 1995, President Clinton announced a total ban on all critical U.S. nuclear weapons testing. In September 1996, the United Nations approved the Comprehensive Test Ban Treaty, which prohibited any nuclear explosion; however, the U.S. Senate failed to ratify this treaty (Medalia 2003).

The archaeology and architecture of nuclear testing is a complex record reflecting the evolution of the scientific and technological processes, as well as the political climate, that drove weapons research from its mid-century beginnings through its current iteration. As Schiffer (2011; 2013) notes, facilities focused

on "Big Science" research such as the NNSS offer exceptional opportunities to investigate the cultural behaviors that influence the way science and technology develop and innovation occurs.

Using a synthesis of data gleaned from the material culture combined with the documentary record, research questions on nuclear testing can explore a wide range of topics from broad cultural trends to the spatial patterning of a single nuclear experiment. The questions can be global in their perspective or narrowly focused on a single experimental process or a specific technical apparatus. Investigations can also examine the contributions of key individuals to the development and sustainability of the nuclear testing program.

Below are a few examples of research questions representing a range of topics that would be useful as a foundation for more in-depth studies.

- What types of nuclear testing experiments are represented in the archaeological and built-environment records, and does each type produce distinctive spatial patterning? Are specialized classes of instrumentation or structures associated with specific testing protocols?
- Is the built environment associated with nuclear testing distinctive? If so, in what way? What testing activities required support facilities with unique engineering designs and technological capabilities? What activities did not?
- Did national and local political and socio-economic trends influence the material culture of nuclear testing? How are these trends represented in the archaeological record at the NNSS? For example, how did the ebb and flow of federal funding impact facility construction? Were projects started and then abandoned? Did public concern over radiological issues result in the development of new monitoring technology and the deployment of additional instrumentation?

Other Nuclear Experiments. In addition to weapons testing, the NNSS served as the location for an array of notable non-defense-related nuclear research and development programs. This other type of Cold War-era research ran the gamut from nuclear-powered space vehicles to experimental civil works projects to radiation dosimetry studies. In the mid-1950s, the AEC and the National Aeronautics and Space Administration (NASA) selected Jackass Flats as the site of the NRDS and constructed a network of cutting-edge facilities to develop and test nuclear thermal propulsion systems for space missions to Mars and beyond (Dewar 2004) (Figures B.6 and B.7).

During the same period, the NNSS became involved in the Eisenhower Administration's Plowshare Program. The concept focused on using nuclear explosives for peaceful purposes, such as nuclear excavation for massive civil engineering projects (dam, harbor, road cut, and waterway construction) and industrial applications (oil and gas stimulation, geothermal power, and underground storage/waste disposal cavities) (Beck et al. 2011).

The Plowshare Program created a unique collection of landscape features at the NNSS and at other locations across the United States (Beck et al. 2011). At the NNSS, program activities mainly consisted of cratering experiments to develop viable methods of employing nuclear devices for earthmoving civil works projects. The NNSS Plowshare research included both nuclear explosive experiments and large high explosive tests designed as smaller modeling experiments generating results that could be upscaled to simulate nuclear excavation.

Research questions applicable to other nuclear experiments include:

- What does the documentary record reveal about the experimental design and engineering modifications needed to develop nuclear devices suitable for earthmoving applications? Was there an evolution of the designs?
- Plowshare tests at the NNSS were conducted in different geological formations. How did the environmental conditions affect an experiment's organization, execution, and data gathering processes?

- How do the NNSS Plowshare experiment sites compare with the off-site Plowshare experiment locations? Were the goals and methods the same? Were the environmental concerns comparable between NNSS and off-site locations?
- What specific factors influenced the design and construction of the NRDS as a massive complex of facilities serving the unique purpose of nuclear propulsion for deep space exploration?

The Nevada facility was also the site of several landmark dosimetry studies focused on determining radiation dose rates and enabling more accurate risk assessments and health monitoring of the survivors of the Hiroshima and Nagasaki bombings. The data gleaned from these programs continue to inform contemporary research studies, providing a foundation for future investigations (Bennett 2018; Cullings et al. 2006; Kerr et al. 2015; Short 2004; Williams 2017).

The historical dosimetry studies created their own unique experimental landscapes at the NNSS. Some experiments were conducted during the atmospheric testing period. Others, executed in the 1960s, relied on tower-mounted reactors to simulate particle emissions from a nuclear blast (Edwards and Goldenberg 2007; Edwards and Wedding 2019).

Research questions geared toward understanding the nature of the dosimetry research and assessing its historical significance could start with the identification and characterization of the physical remains of the dosimetry experiments during Operation Hardtack II in 1958. The dosimetry experiments from the 1960s have been well-documented (Edwards and Goldenberg 2007; Johnson and Edwards 1996a, 1996b), but an archaeological evaluation of the Hardtack experiments has not been completed.

A comparison of the early atmospheric testing dosimetry studies with the later Bare Reactor Experiment Nevada and High Energy Neutron Reactions Experiment programs could address questions related to the evolution of the investigations in terms of both the testing apparatus and research design as, well as the policy and practical implications of the results.

Additional comparative research could be undertaken by examining the dosimetry studies along with the experimental designs and testing equipment utilized for a series of radiological safety experiments, including Projects 56, 57, and 58, and Operation Rollercoaster (Edwards and Wedding 2019; Johnson and Edwards 1996b; Massie and Gravitis 1982) conducted during roughly the same period (i.e., late 1950s - mid 1960s).

Protest Movement. Concerns over radiological safety and ethical debates surrounding nuclear deterrence generated a global protest movement that would also impact the NNSS (Schofield et al. 2006). Shortly after the first nuclear test series in the 1950s, antinuclear demonstrations began taking place along the highway at the entrance to the NNSS, soon culminating in the establishment of a protestor's "Peace Camp." Although the intensity of the protests peaked in the 1980s, activists still sporadically occupy the camp to voice public opposition to the continued existence of nuclear weapons (Beck et al. 2007).

Organized dissent is another research domain where the archaeological and historical record can inform our understanding of the social and political impacts of nuclear testing. Some questions that can guide investigations of the protest movement include:

- How does opposition to nuclear weapons and the testing program manifest itself in the archaeological record? What can the archeological and historical records reveal about the evolution of protest behavior at the NNSS from its beginning in the 1950s to the present day?
- Can functional differences in the Peace Camp's organization be discerned from the spatial distribution of its features? Are gender-specific artifacts, features and behaviors associated with the protest movement? Can specific artifacts, features or protest behaviors be associated with specific ethnic groups?
- The documentary sources identify people with key leadership positions in the protest movement. Does the spatial patterning of the physical remains suggest a social hierarchy within the camp?

- Are there generic themes in the camp's protest graffiti or does the artwork represent more specific, time-sensitive issues? Are there recognizable spatial and temporal patterns in the distribution of the protest graffiti? Can the artwork be attributed to specific individuals?
- How does the government's response to the protest movement manifest itself in the organizational structure and the built environment of the NNSS? Is there evidence of a protest counter response by the NNSS workforce?

The Post-Cold War NNSS

Renamed the NNSS in 2010 to better reflect its current mission, the site continues to support the stewardship of the nation's nuclear capabilities, as well as provide nuclear and radiological emergency response expertise and training, contribute to key nonproliferation and arms control initiatives, and execute national-level experiments in support of the National Laboratories (NNSA/NFO 2018). In the decades to come, the policy decisions implemented and the critical activities conducted at the NNSS will continue to contribute to both the historical and archaeological record of this unique facility.

Figure B. 6 Overview of the Engine Maintenance and Disassembly facility at the NRDS (RSL 2013 D13_08081).

Figure B. 7 Test Cell C liquid hydrogen dewars at the NRDS (DRI 2019).

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Appendix C. NNSS Native American Graves Protection and Repatriation Act Plan of Action

[Draft in development as of May 2025; it will be added as Appendix C once finalized.]

Appendix D. Affiliated American Indian Tribes and Organizations

The following Tribes have cultural and historical ties to the lands now known as the NNSS. They are part of the NNSA/NFO AICP.

Table D.1. American Indian Tribes with NNSS Affiliations.

Southern Paiute
Las Vegas Paiute Tribe
Moapa Paiute Tribe
Pahrump Paiute Tribe
Kaibab Paiute Tribe
Paiute Tribe of Utah
Chemehuevi Tribe of California
Colorado River Indian Tribes
Western Shoshone
Timbisha Shoshone Tribe
Duckwater Shoshone Tribe
Ely Shoshone Tribe
Yomba Shoshone Tribe
Owens Valley Paiute & Shoshone
Benton Paiute Tribe
Bishop Paiute Tribe
Big Pine Paiute Tribe
Fort Independence Paiute Indian Tribe
Lone Pine Paiute/Shoshone Tribes

Appendix E. NNSS PA Exemptions, Ineligible Property Types, No Adverse Effect with Standard Conditions Findings, and Standard Mitigation Measures

In 2024, the DOE NNSA/NFO, the SHPO, and the ACHP negotiated a sitewide programmatic agreement describing certain alternate procedures related to Section 106 review and consideration of undertakings on the NNSS. The goal of the NNSS PA is to streamline aspects of the Section 106 process and to minimize consultations on routine and recurring undertakings. Among the streamlining provisions of the NNSS PA are (1) identification of certain types of routine maintenance and operations undertakings exempt from SHPO review, (2) identification of certain property types considered to be categorically not eligible for listing in the NRHP, (3) No Adverse Effect findings NNSA/NFO is permitted to make without SHPO review, and (4) standard mitigation measures for routine adverse effects to typical historic property types. This Appendix lists the exempt undertaking types, ineligible property types, effect findings not requiring SHPO review, and standard treatments agreed upon in the NNSS PA.

E.1. UNDERTAKINGS EXEMPT FROM SHPO REVIEW

The DOE, in consultation with the SHPO and the ACHP, have agreed that specific types of undertakings have no potential to affect historic properties, and therefore they are considered exempt from SHPO review. These undertakings fall in two categories: Tier I and Tier II exemptions.

Tier I Exemptions

These undertakings may be reviewed by Responsible Managers who do not meet the SOI Professional Qualifications; they do not require review by a Cultural Resource SME. These common tasks (a) do not alter the historic character of NRHP-eligible buildings, structures, and historic districts and (b) do not include ground disturbance. These undertakings are not subject to further Section 106 documentation. If there is a question whether a specific undertaking may have the potential to affect historic properties, the Responsible Manager should notify the CRPM who will consult with the Cultural Resource SME. The CRPM may delegate consultation with the Cultural Resource SME to other responsible managers or NNSS contractors for Tier I exemptions.

A. Issuing or renewing permits or rights-of-way (ROWs) where no new surface disturbance or modifications are authorized. Examples include renewing transmission line ROWs, communication site ROWs, and road or pipeline ROWs.

B. Routine operations, maintenance, upkeep and cleanup of buildings, structures, and associated exterior built environment where no new ground disturbance will occur in the following undertakings:

   1. Routine landscaping and cleanup (e.g., planting, pruning, mowing, watering, repair of watering systems in previously disturbed areas, weed control, pest abatement, debris collection and removal, snow removal, removal of fallen trees and branches, and grading and laying fill on previously disturbed ground).
   2. Disposal and management of trash and waste at existing landfill sites.
   3. Maintenance and repair of existing paved roadways, airstrips, shoulders, sidewalks, and parking areas where the proposed work will not extend beyond previously disturbed areas.
   4. Maintenance, resurfacing, repair, and cleanup of graveled or improved dirt roads, parking areas, vacant lots, equipment yards, staging areas, and laydown yards—including brush control and surface treatment, refilling, and regrading of previously disturbed areas—where the work will not extend beyond previously disturbed areas or involve grading or scraping of undisturbed substrate. Storage or removal of vehicles, machinery, equipment, containers, and supplies in actively used equipment yards and staging areas.
   5. Maintenance and repair of existing utility ROWs, firebreaks, well pads, and drill and geotechnical pads, including weed and brush control.

6. Maintenance, minor repair, and rehabilitation of ditches, drain ways, culverts, and retention basins—including dredging or removing debris—and stabilizing earth berms and retaining walls.
7. Maintenance and repair of existing power lines and poles—including upgrading and replacing crossarms, conductors, lines, insulators, and pole hardware—with like materials where no changes in routing pole placement occur.
8. Maintenance and repair of existing solar (photovoltaic) installations and their supporting infrastructure (e.g., batteries and transformers), when the work will not require ground disturbance.
9. Placement of construction fill on existing fill or on a previously disturbed surface where no new ground disturbance will occur, and the fill will not be placed on previously undisturbed ground surfaces.
10. Installation and removal of temporary barriers, fencing, and equipment where no new ground disturbance will occur.
11. Maintenance and repair of existing loading docks where no new ground disturbance will occur.

C. Routine building maintenance and operations, including laboratory and office activities, custodial activities, housekeeping services, upkeep, and minor repair activities, such as:

1. Repaint or touch-up of previously painted exterior surfaces with a like color if destructive surface preparation treatments are not used (e.g., pressure washing sandblasting, and/or chemical removal).
2. Maintenance and minor repair of existing common interior surfaces, flooring, interior stairs, furnishings, fixtures, and appliances.
3. Reconfiguration of modular furniture, offices, conference rooms, lunch and breakrooms, electronic media (i.e., televisions, projectors, and computers), and other equipment.
4. Equipment repairs, portable equipment and appliance replacement, and minor alterations or upgrades to active laboratories and other facilities.
5. Maintenance, operation, repairs, storage, removal, and replacement of routine laboratory equipment, associated systems, and supplies that postdate 1992 and are therefore not associated with legacy nuclear testing.
6. Changing replaceable/expendable supplies, such as light bulbs, filters, smoke detectors, etc.
7. Fire alarm system maintenance on existing systems and upgrades to existing systems in existing locations.
8. Fire suppression system maintenance (e.g. changing sprinkler heads, upgrading panels, upgrading wiring) on existing systems in existing locations.
9. Installation of basic, non-destructive interior window coverings (e.g., curtains, roller shades, and blinds) for the purposes of light and temperature controls.

D. Scientific testing, data collection, diagnostic monitoring, geotechnical exploration, and water and biological sampling that are noninvasive or minimally invasive. Examples include:

1. Ground penetrating radar, airborne remote sensing and mapping, and magnetometer surveys.
2. Water sampling at established wells and other sampling locations for radiological monitoring, and water characterization. This includes sampling from wells with dedicated pumps and associated plumbing at the wellhead and sampling from wells without pumps using a wireline bailer or portable pumping system. Ground disturbance must be limited to established well pads and access must be by existing roads. Removal or cleanup of legacy nuclear testing elements would require Cultural Resource SME Tier II review.

3. Routine well head maintenance including replacing locking mechanisms, sealing gaps around cover plates, sealing for rainwater, ice, or snow, installing lockable casing or security caps, replacement of borehole caps to provide better fit or coverage.
4. Air monitoring activities at established environmental samplers at or near historical or current operation sites on the NNSS.
5. Potholing in previously disturbed areas to determine and observe the configuration of buried utilities.
6. Clipping vegetation, setting animal traps, and installing cameras or other sensors.
7. Installing temporary weather gauges, radiation monitoring stations, traffic counters, or similar devices where no new ground disturbance is proposed.

E. Demarcation of various legacy sites throughout the NNSS, including the repair or replacement of radiological boundaries which may require installing new T-posts and replacing or installing signage.

F. Unmanned Aircraft Systems (UAS) activities that will not use or impact buildings or yield ground disturbance or require off-road driving.

G. Training exercises that will not use or impact buildings or yield ground disturbance or require off-road driving.

Tier II Exemptions

These are undertakings that the DOE and the SHPO agree require review by a Cultural Resource SME who meets the SOI Professional Qualifications Standards to ensure that no effects to historic properties will occur. If the Cultural Resource SME recommends that the undertaking will have no effect on historic properties, then the DOE CRPM may approve it without requiring additional review by the SHPO.

A. Modifications to or removal of buildings and structures that have been previously evaluated as individually not eligible to the NRHP with SHPO concurrence and are not located in a recognized or an unevaluated historic district.

B. Modifications to or removal of buildings and structures that post-date 1992, when the modifications or removal have no potential to impact historic properties. Examples include:

1. Interior modifications to a post-1992 buildings with no potential to possess exceptional significance under Criteria Consideration G (e.g. office buildings, housing, recreational facilities, warehouses, and storage buildings with no scientific or experimental associations), provided that the modifications will not be visible from the exterior.
2. Removal or exterior modification of a post-1992 building in an unevaluated district when the removal or modification has no potential to physically damage or alter potential district contributors in the vicinity and the building has no potential to possess exceptional significance under Criteria Consideration G (e.g. office buildings, housing, recreational facilities, warehouses, and storage buildings with no scientific or experimental associations).
3. Removal or exterior modification of a post-1992 building in an isolated location, not located in an unevaluated historic district, when the building has no potential to possess exceptional significance under Criteria Consideration G (e.g., office buildings, housing, recreational facilities, warehouses, and storage buildings with no scientific or experimental associations).

C. Activities involving surface or ground disturbance where eligible or potentially eligible properties are not present on the surface based on a previous pedestrian cultural resources inventory that meets current standards; the probability of finding buried historic properties is negligible; and potential visual, atmospheric, or audible adverse effects to known historic properties will not occur.

D. Activities in which proposed locations of small-scale ground disturbance are limited in size to no more than one square meter of surface disturbance and one cubic meter of subsurface disturbance. Individual undertakings may have no more than ten such ground disturbance areas and they may not be contiguous. Note: Cultural Resource SME review may require designating and/or approving specific appropriate locations of surface or subsurface ground disturbance.

E. Installation of temporary or portable signage, including roadway directional signage, traffic signage, safety and security signage, parking signs, and protective signage if such installation will not have a visual effect on historic properties.

F. Routine maintenance, operation, minor repairs, retrofitting, replacement, and upgrades to above and below ground utility systems, including communications, information, safety and hazard protection, security, traffic control, lighting, power and power delivery, water, plumbing, sewer, and HVAC. This work includes excavation to gain access to existing underground utilities to maintain, inspect, repair, or replace components provided the work is consistent with previous conditions and does not extend beyond the area excavated during the original installation.

G. Maintenance, repair, and rehabilitation of exterior features and foundations of historic buildings and structures provided the modifications do not affect historically significant or character-defining features. This work must use in-kind materials, designs, and methods of construction and ensure the modifications are not visible from the ground level of the primary façade.

H. Roof repair with materials that match or closely resemble the historic materials and form. Flat or shallow pitch roof repair or replacement where no portion of the surface of the roof is visible from the ground.

I. Installation or replacement of rain gutters, downspouts, and extensions provided the color and style are historically appropriate for the building.

J. Weatherization and sealing of air leaks of the building shell or around fixtures, including windows and doors, and threshold installation in a manner that does not harm or obscure historic windows or trim (spray foam must not be used). Installation of vents if they are not located on a primary roof elevation or not visible from ground level. Vents may also be installed in the foundation if they are painted or finished to match the existing foundation materials.

K. Maintenance, repair, and installation of thermal insulation in walls, floors, ceilings, attics, and foundations using methods that do not harm or damage historic fabric and do not result in visible holes drilled through the exterior siding or in a location where these holes may visibly alter the exterior. Pipes, water heaters, and ductwork may be insulated, but spray foam must not be used.

L. Installation of energy-efficient windows in a manner that does not change the appearance of the interior or exterior of the building. Window repair or window-glazing treatments that do not change the appearance of the building interior or exterior.

M. Installation of storm windows, storm doors, or wood screen doors in a manner that does not harm historic windows, doors, or trim. Repair and replacement of doors in a manner that does not change the appearance of the interior or exterior of the building. Replacement of elements on primary doors and doorframes that are deteriorated beyond repair with in-kind materials.

N. Replacement of existing common interior surfaces, furnishings, carpeting, fixtures, and appliances with like style, color, materials, and historic character.

O. Maintenance, operation, repairs, and storage of legacy nuclear testing laboratory equipment and associated systems that may be considered historic properties.

P. Removal or encapsulation of asbestos for safety and health concerns. Treatment is limited to pipe/ductwork, lagging, insulation, and flooring. Replacement of asbestos-containing building products with like or in-kind materials that maintain the historic character of the facility.

Q. Installation, maintenance, repair, or replacement of equipment used to comply with Occupational Safety and Health Act (OSHA) and Americans with Disabilities Act (ADA) regulations in a

manner consistent with the guidance provided by Preservation Brief #32 titled Making Historic Properties Accessible.

R. Maintenance, repair, and safety improvements to exterior walkways, paths, ramps, stairways, and curbs in a way does not detract from the defining character of adjacent historic properties.

S. Planting new landscaping that will require new ground disturbance or removing mature trees that does not affect the historic character of neighboring buildings or surrounding historic district.

T. Maintenance, repair, and upgrades of fire hydrants and post-indicator valves or pressure reducing valves.

U. Geophysical seismic survey, including installing geophones, seismic sensors, and support equipment (e.g., temporary, portable photovoltaic array, battery backup).

V. Modification or removal of legacy nuclear testing elements from wells, well pads, and other environmental monitoring facilities.

W. Removal or addition of rock or fill in existing borrow pits which have been previously reviewed for cultural resource compliance and found to contain no historic properties, or areas where the work will not extend beyond previously disturbed areas.

E.2. CATEGORICALLY INELIGIBLE PROPERTY TYPES

The DOE, the SHPO, and the ACHP agree that specific property types listed below are not eligible for the NRHP under any of the Secretary of Interior's Significance criteria. They will therefore be considered not eligible and do not require evaluation or consultation with the SHPO or other parties for the purposes of Section 106. During undertaking review the Cultural Resource SME will identify and record the presence of individual properties that are examples of resource types listed below as occurring in the APE. If the Cultural Resource SME advises the DOE CRPM that a particular member of one of these property types exhibits distinctive and exceptional archaeological, architectural, or engineering features warranting eligibility, then the DOE will evaluate the NRHP eligibility of that member.

Ineligible Property Types Not Requiring Individual Recordation Forms:

A. Underground storage tanks, septic tanks, buried pits and dumps, underground pipelines, sewer lines, and buried power and communication lines not associated with an eligible or unevaluated historic district.

B. Aboveground storage tanks, including those for fuel, water, and chemicals not associated with an eligible or unevaluated historic district.

C. Wellheads and pads, boreholes, drill pads, muck pits, and accessory structures not directly associated with a nuclear test.

D. Post-1950 graded areas, areas covered with fill or hard cap (e.g., asphalt, Portland cement, or concrete) not directly associated with specific nuclear tests.

E. Post-1950 material pits, quarries, or other borrow sources used for construction or landscaping material.

F. Parking lots, driveways, curbs, curb ramps, sidewalks, and paths not associated with an eligible or unevaluated historic district.

G. Post-1950 outdoor lighting, streetlights, light poles, T-posts and other posts, fence lines, and enclosures unless located in an eligible or unevaluated historic district.

H. Directional signage, mile markers, road reflectors, traffic signals and control devices, guardrails, traffic barricades, jersey barriers, and other safety and security barriers, such as steel or concrete bollards.

I. Segments of post-1950 unimproved two-track trails unless located in an eligible or unevaluated historic district. Unimproved two-track trails are ubiquitous on the NNSS.

J. Modern improved highways, roads, and streets that are currently in common use and subject to ongoing regular maintenance and upgrading not associated with an eligible or unevaluated historic district.

K. Post-1950 trash scatters, wire, cable, conduit, spools, milled wood, sheet or plate metal, metal fragments, pipe, rebar, cans, glass fragments, tile, ceramic fragments, asphalt, concrete, other construction debris, plastic, foil, paper, hazardous materials, and waste containers (drums, barrels) that are not directly associated with specific eligible or unevaluated historic properties (buildings and structures) or specific testing events. *Note: Specific items that are directly associated with a specific eligible historic property or historically significant event will be documented and evaluated as accessories to determine if they contribute to the NRHP eligibility of the property.*

L. Ammunition debris (e.g., bullets, shell casings, clips, and shrapnel) and unexploded ordnance (UXO) not associated with existing targets.

M. Isolated finds, defined as: (a) an individual artifact, or several pieces from an individual artifact (e.g., broken bottle or ceramic vessel fragments, or a stone core and associated flakes) separated by at least thirty (30) meters from the nearest adjacent artifact or feature; or (b) individual features not associated with related artifacts, separated by at least thirty (30) meters from the nearest adjacent artifact or feature. Isolated artifacts will be recorded in tabular format on a project-by-project basis, but they are considered ineligible for the NRHP and not subject to further Section 106 review and consultation.

Ineligible Property Types Requiring Individual Recordation Forms:

A. Telecommunication, transmission, and distribution lines; transformers; electrical substations; circuit boxes; and other structures used to support or enclose telecommunication systems that meet one or more of the following criteria: (a) postdate 1992, (b) lack unique engineered features associated with that segment of the line, and/or (c) lack integrity due to upgrading of the original poles or lines to the degree that they reflect post-1992 construction.

E.3. FINDINGS OF NO ADVERSE EFFECT WITH STANDARD CONDITIONS

Avoidance as a Standard Condition

The DOE may make a "Finding of No Adverse Effect with Standard Conditions" (FNAE-SC) when the following standard conditions are used to avoid adversely affecting historic properties within an undertaking's APE. For avoidance to be effective, all proposed activities, improvements, and disturbances associated with an undertaking shall be conducted in a manner that avoids historic properties and all historic properties shall be excluded from the undertaking's activity areas. No undertaking activities shall occur within identified avoidance boundaries, including any defined buffer zones, designed to protect historic properties. Portions of undertakings may need to be modified, redesigned, or eliminated to properly avoid historic properties.

The Responsible Manager, under the direction of the CRPM and Cultural Resource SME, shall implement some or all the following protection measures to avoid adverse effects to historic properties from undertakings under the NNSS PA.

A. Avoidance Principles and Methods

1. Undertaking redesign or relocation to avoid historic properties is the most effective technique and should be prioritized where possible. All changes to an undertaking designed to avoid historic properties (e.g., project modifications, redesign, or elimination; redefining maps or changing specifications of proposed activities; removing old or confusing project markings or engineering stakes within historic property boundaries), shall be completed prior to initiating any undertaking activities.

2. Temporary physical demarcation and barriers delineating a protected zone around historic properties are the next most effective techniques and may be adopted in cases where project activities cannot be relocated or redesigned.
3. Active real-time monitoring of project activities by a Cultural Resource SME should be used only in limited circumstances where other avoidance measures are not sufficient or in situations where the discovery of cultural materials is anticipated.
4. The minimum avoidance requirement for historic properties eligible only under the Secretary of Interior's Significance Criterion D (important for the information potential they contain) is the physical demarcation of the historic property boundary and its exclusion from an undertaking's proposed activity area.
5. For historic properties eligible under the Secretary of Interior's Significance Criteria A-C, when setting and feeling are aspects of integrity possessed by the historic property, the physical demarcation of the avoidance area will also include a buffer zone sufficient to ensure avoidance of all adverse visual, atmospheric, or audible effects of the undertaking. The Cultural Resource SME will conduct an analysis to determine an appropriate buffer size on a case-by-case basis to ensure avoidance of adverse effects. The analysis will include a combination of in-field observations, photographic analyses, and computer-generated analyses of viewsheds, sight lines, auditory, and atmospheric conditions. Visual simulations will be prepared when necessary to determine the extent of visual effects of an undertaking.
6. Physical demarcation may involve signage, coded flagging, temporary fencing, or other markers or barriers as determined necessary by the CRPM, in consultation with the Cultural Resources SME, to adequately protect the historic property.

B. Avoidance Plan and Procedures

1. All avoidance measures will be agreed upon by the CRPM and Responsible Manager prior to initiating any undertaking that may affect historic properties. The avoidance measures will remain in effect throughout the life of the undertaking to ensure that its effects on historic properties are avoided.
2. The Cultural Resource SME will recommend appropriate avoidance measures to the CRPM following the identification of historic properties, or potentially eligible cultural resources, in an APE that may be adversely affected by the undertaking.
3. The CRPM will consult with the Responsible Manager to determine appropriate administrative or physical measures to avoid adverse effects on historic properties within the APE and will include these measures as stipulations in the undertaking documentation.
4. The Responsible Manager will be required to agree to these stipulations prior to project authorization.
5. The Cultural Resource SME will delineate avoidance areas in a detailed avoidance plan that will include a map identifying all areas to be avoided and the avoidance methods to be employed and provide it to the CRPM.
6. The CRPM, by coordinating with the Responsible Manager, will ensure that the avoidance areas are properly protected in accordance with the plan prior to initiating the undertaking.
7. The Cultural Resource SME will inspect the avoidance area upon the completion of the undertaking to determine if historic properties were adequately avoided by the undertaking and will notify the CRPM of any findings.
8. At the direction of the CRPM, the undertaking's Responsible Manager will remove flagging and other markings and barriers as soon as possible after the undertaking is completed to avoid calling undue attention to historic properties.

9. The CRPM shall keep records of all correspondence and documentation related to the avoidance process in the administrative file. All undertakings resulting in a Finding of No Adverse Effect with Standard Conditions for Avoidance will be listed in the DOE's annual report to the SHPO per PA Stipulation VIII.A.4.c.

Secretary of the Interior's Standards for the Treatment of Historic Properties

Use of the Secretary of the Interior's Standards (SOIS) for the Treatment of Historic Properties – preservation, rehabilitation, restoration, and reconstruction – may be considered a standard condition to avoid adverse effects on historic properties when an undertaking's activities are limited to stabilization, maintenance, repairs, rehabilitation, or alterations and these activities are completed in a manner consistent with the SOIS, the applicable SOIS guidelines, and current Preservation Briefs.

The DOE may make a finding of "No Adverse Effect with Standard Conditions, Secretary of the Interior's Standards (FNAE-SC SOIS) for the Treatment of Historic Properties" with the following conditions and procedures:

A. Conditions Required for a FNAE-SC SOIS

1. All documentation must be prepared by a qualified Cultural Resource SME who meets the Secretary of the Interior's Professional Qualifications Standards for Architectural History and/or Historic Architecture (codified in Appendix A of 36 CFR Part 61) and approved by the CRPM.
2. Adequate information must be available to identify the character-defining features of the historic property and accurately determine the scope of construction activities and their effects on the property. Information on the historic property's character-defining or essential physical features may be obtained from the NRHP nomination form for a listed property, the NRHP determination of eligibility documentation, including the property's ARA form(s), or they may be identified as part of the Finding of No Adverse Effect with Standard Conditions report prepared for the undertaking.
3. The scope and design of the undertaking must be sufficiently developed and detailed to ensure that the proposed work can meet the SOIS, and an analysis of the proposed work and how it meets the specific SOIS must be prepared by a Cultural Resource SME.
4. All appropriate protection and avoidance measures must be defined, including whether any materials testing is necessary, in sufficient detail in the plans and specifications provided to the Cultural Resource SME preparing the SOIS analysis.
5. A clear chain of command must be established identifying specific tasks, responsibilities and contact information for DOE staff, contractors, consultants, or other responsible members of the project team.
6. A SOIS Action Plan must be developed as an attachment to the Finding of No Adverse Effect with Standard Conditions report to ensure that provisions for protection are carried out and will be documented and retained on file.

B. Procedures for a FNAE-SC SOIS

1. The Cultural Resource SME shall review project plans and identify potentially affected historic properties and their character-defining features.
2. The Cultural Resource SME shall identify the appropriate SOIS treatment (preservation, restoration, reconstruction, or rehabilitation) and analyze the scope for compliance with the applicable standards if the undertaking includes stabilization, maintenance, repairs, rehabilitation, or alterations.

3. The Cultural Resource SME shall prepare and submit supporting documentation to make a FNAE-SC SOIS to the CRPM for review and approval if the undertaking complies with the SOIS.
    a. The supporting documentation will include a detailed analysis of the proposed scope of work and each applicable standard.
    b. A SOIS Action Plan will be included as an attachment. The SOIS Action Plan will include the following in table format:
        i. Activities to be reviewed or monitored by the CRPM and Cultural Resource SME;
        ii. Timeline for when reviews/monitoring must take place;
        iii. List of all parties responsible for each review/monitoring activity;
        iv. Explanation of how the specified action will avoid adverse effects; and
        v. A "date completed" column to be filled in as each specified action is completed.
4. If the Cultural Resource SME determines that the undertaking does not comply with the SOIS as designed but can be adequately modified to do so, the Cultural Resource SME shall notify the CRPM and the CRPM shall direct the Responsible Manager to revise the project plans accordingly.
    a. If the project plans are satisfactorily revised, the process shall continue according to II.B.3, above. The CRPM shall keep records of undertaking revisions in the undertaking's administrative file.
    b. If the undertaking plans are not satisfactorily revised, then the CRPM shall proceed with the procedures in Stipulation VI of the PA.
5. The CRPM and Cultural Resource SME shall ensure that contractors comply with the SOIS Action Plan in the contract provisions during construction.
6. The CRPM and SME shall ensure that the undertaking is completed in compliance with the SOIS Action Plan and the undertaking plans.
7. The CRPM, following Cultural Resource SME review, must approve all changes to the undertaking plans after the completion of the FNAE-SC SOIS report to ensure that they comply with the SOIS.
8. If the CRPM, following Cultural Resource SME review, determines that the proposed changes to the undertaking do not comply with the SOIS, the changes must be redesigned to comply or the project review process will be reopened in accordance with Stipulation VI of the PA.
9. The CRPM shall keep records of all correspondence and documentation completed as part of the avoidance process in the administrative file.

E.4. STANDARD MITIGATION MEASURES

The DOE, in consultation with the SHPO and the ACHP, has determined that the following standard mitigation measures outlined here are appropriate for historic properties determined individually eligible to the NRHP under Criteria A, B, and/or C and/or as contributing element to a historic district associated with the development of nuclear testing during the Cold War for the period of national significance from 1951 to 1992.

Standard mitigation procedures are outlined for historic properties subject to adverse effects in three different situations:

(a) Contributing elements in recorded NRHP eligible historic districts;

(b) Elements in unrecorded and unevaluated historic districts; and

(c) Properties individually eligible for the NRHP that do not contribute to a recognized historic district.

Contributing Elements in Recorded NRHP-Eligible Historic Districts

Recorded NRHP-eligible historic districts contain substantial known information regarding the unique historic significance of buildings, structures, objects, and other accessories (contributing elements) making up the district; the spatial, functional, and contextual relationships of contributing elements to one another within the district; and the condition and integrity of these contributing elements. This existing information is a valuable baseline for resolving project-related adverse effects to specific contributing elements in recorded NRHP-eligible historic districts.

Adverse effects to buildings and structures that are contributing elements in a historic district will be mitigated in accordance with the following actions.

A. The DOE, with Cultural Resource SME support, will update the ARA form(s) to document current condition(s). If a contributing element has not been recorded on an ARA form, a form will be completed for that element, or it will be added to the appropriate ARA form as an accessory resource. Documentation will include:

   1. High-quality digital photographic images of the affected contributing element that conform to the best practices guidelines in the National Park Service National Register Photo Policy Fact Sheet with a photo log of the images describing each view with the file name, subject, and direction of view and a photographic plan map (https://www.nps.gov/subjects/nationalregister/upload/Photo_Policy_update_2013_05_15_508.pdf).

      a. The Cultural Resources SME will determine if the interior of a building or structure contains any character-defining spaces or features that contribute to the building's or structure's significance, either as an individual historic property or as a contributing element to the historic district, in accordance with *NPS Preservation Brief 17: Architectural Character: Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving Their Character*. Character-defining interior spaces and features will be photographed (depending on accessibility). Historically significant equipment and artifacts (including lab and field equipment, historic signage, and other historical records) will be identified and photographed before removal or demolition. The Atomic Museum in Las Vegas will be notified and given the opportunity to include items in their collection.

      b. If the element is an associated accessory or other object, images will be taken to illustrate multiple vantages of the element and its relationship to the primary element and to other nearby elements.

   2. Current annotated sketch plans (which indicate building room layout and use, if known) or historic facility plans and drawings.

B. The DOE, with Cultural Resource SME support, will prepare a Mitigation Report in accordance with the standards and guidelines for Mitigation Reports in NNSS PA Appendix F. The updated ARA form will be an appendix to the report.

Elements within Unrecorded and Unevaluated Districts

Adverse effects to the historic character of buildings, structures, objects, and accessory elements may occur in areas that appropriately may be considered historic districts but are presently unrecorded as such and where the NRHP eligibility of the district is unknown. Adverse effects will be resolved by the actions below before the initiation of the undertaking.

A. Boundary and Landscape Documentation. If a building, structure, or object subject to adverse effect is located within an unrecorded and unevaluated historic district, then the DOE, with cultural Resource SME support, will complete a reconnaissance architectural survey of the district and prepare a draft letter report (hereinafter the boundary report) with a map showing the unrecorded and unevaluated district boundary. In accordance with the standards and guidelines for Boundary Reports in NNSS PA Appendix F, this boundary report will include, but not be limited to:

1. A discussion of how the district boundary was defined based on archival research and the preliminary results of the archaeological and architectural fieldwork; and
2. Draft digital color photographs of the landscape surrounding and within the district; and
3. A photo log of the images describing each view with the file name, subject, and direction of view and a photographic plan map.
4. If the DOE plans to initiate the undertaking before completion of the district architectural survey report, the boundary report will include draft digital color photographs of contributing district resources subject to adverse effect showing context, setting, exterior elevations, interior views, and relationships to other contributing elements. These images will be sufficient for later use in ARA forms.
5. The intensive survey and written portions of the ARA forms will not be fully completed as part of the boundary report. These will be completed as part of Appendix D.II.B.

B. Historic District Architectural Survey

1. The DOE, with cultural Resource SME support, will complete an intensive architectural survey of the district and prepare a report in accordance with the standards and guidelines for Architectural Survey Reports in NNSS PA Appendix F. The report will include a historic context that describes the district's origin, history, and support functions as well as its significance to the development of the NNSS. The report will contain an NRHP evaluation for the district and will provide the results of the architectural survey with contributing and non-contributing elements identified and documented.
2. The DOE, with cultural Resource SME support, will record all architectural or archaeological resources discovered within the historic district boundary on ARA forms or NNSS site forms, as appropriate, and include them as an appendix to the Architectural Survey Report.

Eligible Properties Not Located in a Historic District

Certain historic properties may be individually eligible under the Secretary of Interior's Significance Criteria A through C. As part of the procedures outlined in the PA, such properties will already have been identified and documented using ARA or other standard forms, evaluated and determined to be eligible for the NRHP, and found to be subject to undertaking-related adverse effects. Adverse effects to these individual historic properties will be resolved in accordance with the following procedures:

A. The DOE, with cultural Resource SME support, will update the ARA form or NNSS site form, as necessary, with:

1. Additional detailed color images of the historic property and accessories that conform to the best practices guidelines in the National Park Service National Register Photo Policy Fact Sheet (see link above). The photograph submission will include a photo log of the images describing each view with the file name, subject, and direction of view and a photographic plan map; and
2. Historical photographs from archival sources, an annotated sketch plan, and engineering drawings or plans.

B. The DOE, with cultural Resource SME support, will prepare a brief Mitigation Report in accordance with the standards and guidelines for Mitigation Reports in NNSS PA Appendix F. The updated ARA form will be an appendix to the report.

Information Preservation, Publication, and Public Outreach

A. The DOE will archive copies of all ARA forms, photographs, image files, databases, and reports produced as part of the standard mitigation measures with the Nuclear Testing Archive in Las Vegas.

B. The DOE will publish documentation to the DOE Office of Scientific and Technical Information for access by the public at the following website: www.osti.gov. This will include:

1. Mitigation documentation for elements within a recorded historic district; and
2. Final historic district evaluation reports and related mitigation documentation for elements in an unrecorded historic district; and
3. Mitigation documentation for individually eligible properties not in a historic district.

Appendix F. Accomplishments of the NNSA/NFO CRM Program

Since the 1970s, the CRM program has worked to meet the DOE's and NNSA/NFO's responsibilities to manage and preserve the history of the NNSS. In that time, the program has made significant contributions to our knowledge of the past in Southern Nevada, from the earliest prehistoric occupations after the last Ice Age to the remarkable technological accomplishments of the Atomic Age. Select research results are presented herein to provide a comprehensive view of the historic legacy that the NNSS continues to convey.

Early Holocene Occupations. Extensive archaeological remains at sites from the region's earliest known Paleoamerican occupation period have been recorded along major drainages in the southern NNSS, including quarries used to obtain raw welded tuff stone to fashion large bifaces, projectile points, and other stone tools (Buck et al. 1998; Haynes 1996). Several sites in upper elevations of the northern NNSS also contain similar artifacts dating to this early occupation period (Pippin 1998).

Hunter-gatherer Adaptations and Environmental Change in the Southern Great Basin. This study reviews the fluctuation in past environments and examines how changes may have affected past hunter-gatherer strategies based on a sample of 1,311 archaeological sites recorded during preconstruction surveys on Pahute and Rainier Mesas at the NNSS. The study incorporates evidence from botanical remains, faunal remains, tree-ring indices, and sediments deposited in a variety of contexts (Pippin 1998a).

Wungiakuda. This American Indian site is located near Landmark Rock in the upper portion of Fortymile Wash at the southern edge of Pahute Mesa. It was an important village in the nineteenth and early twentieth centuries with a history of occupation stretching back thousands of years to the Paleoamerican period. Archaeological data recovery at the site (Johnson et al. 1999) demonstrated that several dozen people continued to live there from the 1880s well into the 1930s. They practiced traditional subsistence activities alongside new economic activities, such as ranching and mining, within a refuge distant from the extensive disruptions to traditional lifeways brought on elsewhere by Euro-American settlement of the region. *Wungiakuda* represents one of the better-studied ethnohistoric occupation sites known in the southern Great Basin (Figure F. 1).

Figure F. 1 Structure near the Wungiakuda site (DRI 2004).

Springs Survey at Tub Spring, Reitmann Seep, and Captain Jack Spring. Archaeological surveys were conducted at these spring locations on the NNSS to research the importance of water for people living in arid environments and the role the availability of water played in settlement patterns, subsistence strategies, and resource selection. Archaeologists documented approximately 8,000 years of cultural activity at the three springs (DuBarton and Drollinger 1996).

Petroglyphs of Upper Fortymile Canyon. This study resulted in the recording of five sites with rock writing, along with an ethnographic study of the sites (Figure F. 2). In all, archaeologists recorded 2,921 rock writing elements. Ninety percent of the elements were at one site alone (Drollinger et al. 2000).

Figure F. 2 Petroglyphs at Fortymile Canyon (DRI 2002).

Bower Cabin. A study documented the early twentieth century historic mining camp associated with the Oak Spring mining district of Nye County. B. M. Bower was the pseudonym of Bertha Muzzy Sinclair-Cowan, a writer of popular western stories who lived in a stone cabin here in the 1920s (Figure F. 3) (Drollinger 2003).

Figure F. 3 Bower cabin (DRI 2001).

Atmospheric Testing Historic Districts. Several atmospheric test locations have been recorded as historic districts, including Apple-2 (Figure F. 4) (Johnson and Edwards 2000), Frenchman Flat (Johnson et al. 2000), Yucca Lake (Jones et al. 2005), Smoky (Jones et al. 2014), and Shasta (King 2015).

Figure F. 4 Apple-2 house in background, instrument station in foreground (DRI 2010).

Atmospheric tests typically included permanent and temporary diagnostic stations built for a variety of purposes. These ranged from housing complex electronic systems and experimental equipment, to buildings and structures to study test effects, to support structures used for power, relaying electronic data, and timing and firing.

The Smoky Atmospheric Test. Located in northwest Yucca Flat, this test featured a steel tower measuring 700 feet high, on top of which a 44-kiloton device was detonated in August 1957. The area around the tower was extensively instrumented, and various tests of the effects of nuclear explosions on military personnel were conducted, including tests on troops stationed in underground bunkers. This event became one of the most important means for assessing health effects of radiation on personnel. The Smoky test site was recorded and described as a historic district in 2014. According to the author, Smoky "is the best-preserved post-shot atmospheric nuclear tower testing location on the NNSS" (Jones et al. 2014:4). It was determined eligible for the NRHP under all four evaluation criteria and is a strikingly complete and largely undisturbed example of the layout of tests completed during the atmospheric testing era at the NNSS.

Tunnels. Historical evaluations have been completed for the U12e, U12g, U12n (Figure F. 5), U12t, U15, and U16a tunnel complexes. In the mid-1950s, the Defense Threat Reduction Agency and the national research laboratories began studies on the development of underground complexes to meet testing needs, particularly for nuclear weapons effects on critical components of missiles and warheads, and sometimes entire systems. These tests usually were conducted in horizontal tunnels deep below the ground under Rainier and Aqueduct Mesas.

Figure F. 5 U12n Tunnel portal (DRI 2011).

The tunnels were also used for high explosive tests and other scientific experiments, including a nuclear fuel storage experiment, and for seismic studies in the Vela Uniform program. One nuclear test series executed at the north end of Yucca Flat studied how different types of underground structures could protect facilities such as command centers from nuclear attack. The first test in a tunnel having a nuclear yield was in 1957 and the last was in 1992. The various tunnel tests are considered significant scientific and engineering accomplishments in the history of the national defense of the United States during the Cold War.

BREN Tower. The Bare Reactor Experiment—Nevada (BREN) Tower complex was documented prior to its demolition to record its significant role in the history of nuclear testing, radiation dosimetry studies, and early field testing of the Strategic Missile Defense System designs (Edwards and Goldenberg 2013). The tower was designed to facilitate the experimental dosimetry studies necessary to understand the radiation doses for the survivors of Hiroshima and Nagasaki. At the time it was built in 1962, the 1,527-foot tower was the tallest structure west of the Mississippi River. Although moved from its original location in Area 4 to Area 25, the tower remained intact and continued to embody significant engineering features until it was removed in 2012.

Area 6 Control Point Historic District (CPHD). The Area 6 CPHD encompasses the complex of buildings and structures centered around Building 06-CP-1, otherwise known as CP1 (Figure F. 6). Both the district and CP-1 individually are eligible for listing in the NRHP for their critical association with nuclear testing during the Cold War. They are of nationwide significance (O'Neill et al. 2021).

Figure F. 6 CP-1 in the Area 6 CPHD (RSL 2016).

At CP-1, officials made decisions about NNSS testing activities, coordinated the movements of personnel throughout the areas forward (north) of the Mercury base camp, and communicated problems and emergencies in the forward areas to the appropriate agencies for solution. Some of the testing duties carried out at CP-1 and in the CPHD included the timing and firing of nuclear tests, air operations, security, communications, weather monitoring, and radiation safety. During tests, information and instructions were relayed between CP-1, the numerous testing operations locations, Washington, DC, the national laboratories, and overhead aircraft monitoring the tests. The Area 6 CPHD includes 27 primary contributing elements and only one non-contributing element.

Mercury Historic District. Mercury is the principal administrative and residential base of operations for activities at the NNSS. The base, first established in 1951, developed into a permanent townsite at the primary entrance to the NNSS. Mercury is a distinct town center that has always provided a wide range of support activities, including an extensive administrative center. The self-contained town was established to provide facilities, services, and amenities for personnel working at the site (Figure F. 7). After the end of nuclear testing, there was no longer a need for long-term housing, and many of the dormitories and other facilities went out of use. In response to a plan to reconfigure Mercury into a more compact, efficient, modern base that is better suited to perform the evolving missions of the NNSS, a programmatic agreement for the modernization and operation of Mercury was executed among NNSA/NFO, the Nevada SHPO, and the ACHP in 2018. As part of the PA, the Mercury Historic District was fully documented, evaluated, and determined eligible for the NRHP for its national significance and importance in supporting nuclear testing and scientific research from 1951-1992 (Reno et al. 2018).

Figure F. 7 Mercury overview (RSL 2013).

Sedan Crater. Sedan Crater was listed in the NRHP in March 1994. It was formed in 1962 as part of the Plowshare program and is the largest nuclear-generated subsidence crater in the United States. It is a main stop on the public tours of the NNSS sponsored by the NNSA/NFO.

Sitewide Programmatic Agreement. NNSA/NFO, the SHPO, and the ACHP spent four years negotiating the terms of the NNSS PA to streamline the Section 106 process for routine undertakings on the NNSS. In 2024, all parties executed the document, and it took effect. The main streamlining aspects of the NNSS PA are summarized in Chapter 4.3, and selected stipulations are presented in Appendix E. Since the PA took effect, it has been instrumental in eliminating the need for repetitive MOAs and simplifying the approval process for routine undertakings with no potential to affect historic properties. The NNSS PA has a ten-year term. In 2034, when it is due for revisions and/or renewal, this CRM plan will be updated to reflect any pertinent changes.