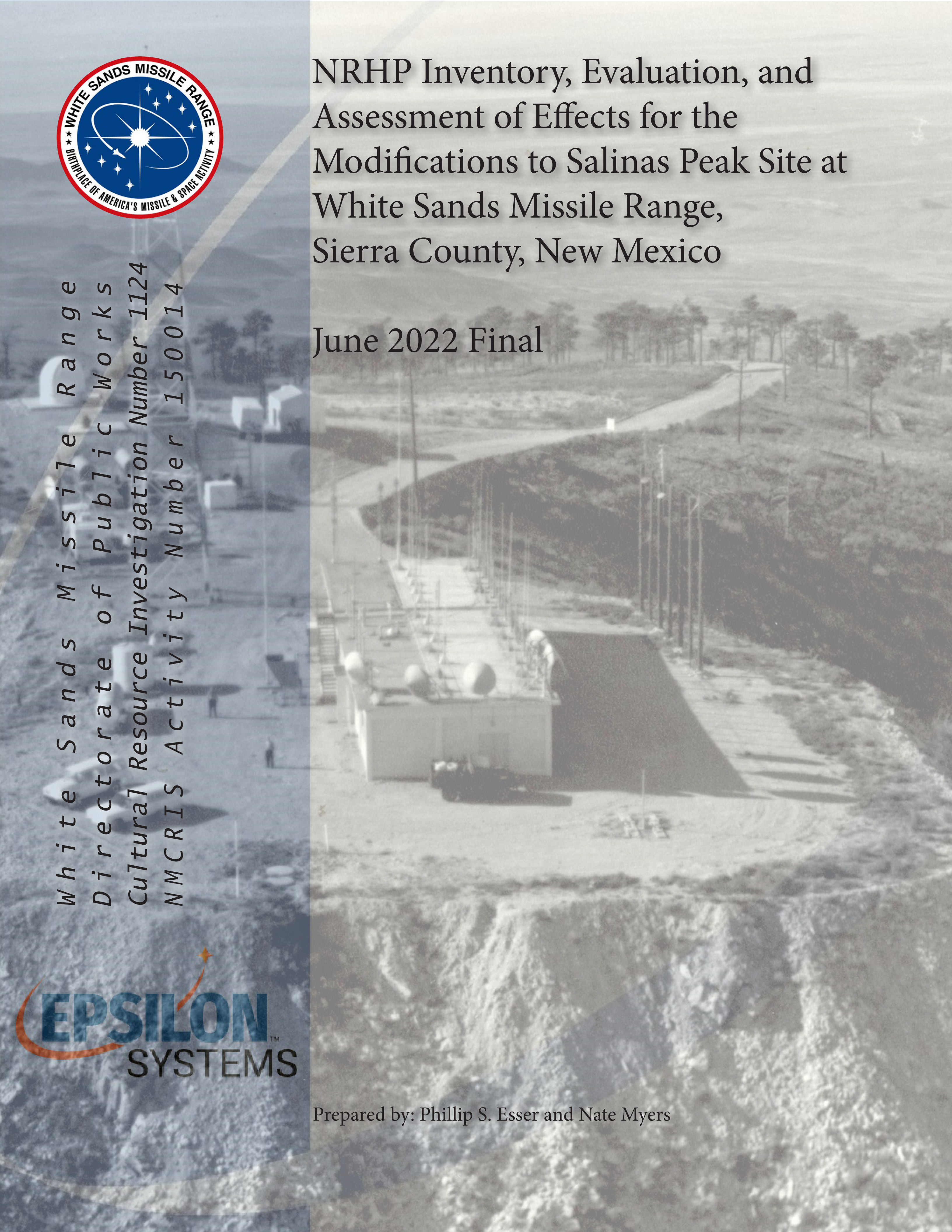

NRHP Inventory, Evaluation, and Assessment of Effects for the Modifications to Salinas Peak Site at White Sands Missile Range, Sierra County, New Mexico

June 2022 Final

White Sands Missile Range
Directorate of Public Works
Cultural Resource Investigation Number 1124
NMCRIS Activity Number 150014

Prepared by: Phillip S. Esser and Nate Myers

This Page Intentionally Left Blank

NRHP Inventory, Evaluation, and Assessment of Effects for the Modifications to Salinas Peak Site at White Sands Missile Range, Sierra County, New Mexico

Prepared for:
Leidos, in cooperation with White Sands Missile Range

Prepared by:
Phillip S. Esser, M.S. and Nate Myers, M.A.
Epsilon Systems Solutions, Inc.
205 W. Boutz Rd., Suite 4C
Las Cruces, NM 88005

WSMR Report Number 1124
ESS Report Number 2022-09

REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704-0188*

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Executive Service Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ORGANIZATION.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
	FINAL Report	2022

4. TITLE AND SUBTITLE	
A National Register Inventory and Evaluation of the Salinas Peak Site at White Sands Missile Range, Sierra County, New Mexico	5a. CONTRACT NUMBER
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) Phillip S. Esser, M.S. Nate Myers, M.A.	5d. PROJECT NUMBER 1124
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
Epsilon Systems Solutions, Inc. 205 W. Boutz Road Bldg. 4, Suite 3 Las Cruces, NM 88005	2022-09
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) US Army Garrison White Sands Missile Range Director of Public Works Environmental Division 163 Springfield Street White Sands, NM 88002	**10. SPONSOR/MONITOR'S ACRONYM(S)** DPW-ENV **11. SPONSOR/MONITOR'S REPORT NUMBER(S)** 1124

12. DISTRIBUTION/AVAILABILITY STATEMENT

13. SUPPLEMENTARY NOTES

This document has been OPSEC reviewed and approved by both WSMR Garrison and Public Affairs Office, June 2022. A copy of the approval is available from the Sponsoring Agency, Director of Public Works, Environmental Division.

14. ABSTRACT

The attached document is a National Register of Historic Places (NRHP) evaluation of the Cold War-era Salinas Peak Site. Communications are the backbone of managing the activities of a test range that encompasses over 4,000 square miles. WSMR's immense and varied land mass requires the ability to not only convey multiple types of electronic data, but to do so in an unobstructed manner. The Salinas Peak site was set up to facilitate improved flow of communications, both voice and instrumentation data links. Time-code generation would be added later. Optical instrumentation was set up concurrently but was not long-lived at the site. This review includes an evaluation of the structures for their eligibility to the National Register and Section 106 of the National Historic Preservation Act (NHPA). Documents such as this are also highly important in preserving the history of the range and its activities and will become part of the public record.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF: a. REPORT	b. ABSTRACT	c. THIS PAGE	17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
U	U	U	UU	152	William C. Godby
					19b. TELEPHONE NUMBER *(Include area code)* (575) 678-6003

Reset

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18
Adobe Professional 7.0

Michelle Lujan Grisham
Governor

STATE OF NEW MEXICO
DEPARTMENT OF CULTURAL AFFAIRS
HISTORIC PRESERVATION DIVISION

BATAAN MEMORIAL BUILDING
407 GALISTEO STREET, SUITE 236
SANTA FE, NEW MEXICO 87501
PHONE (505) 827-6320 FAX (505) 827-6338

August 30, 2022

James E. Bowman
Cultural Resource Manager
Conservation Branch
U.S. Army Garrison White Sands Missile Range
100 Headquarters Avenue
White Sands Missile Range, NM 88002-5000

Dear Mr. Bowman:

Thank you for your submission of "NRHP Inventory, Evaluation and Assessment of Effects to Salinas Peak Site at White Sands Missile Range, Sierra County, New Mexico," prepared by Epsilon Systems Solutions, June 2022. The New Mexico State Historic Preservation Office has completed its review of this submission and concurs with White Sands Missile Range that the Salinas Peak Site is eligible for listing in the National Register under National Register Criterion A in the areas of military and science during the Cold War because of its association with basic scientific research, materiel development, and the multi-part theme of command, control, communications, computers, intelligence. The site is eligible under Criterion C because its resources are excellent representative examples of buildings and structures built during the Cold War.

The New Mexico SHPO concurs that the proposed development of the Salinas Peak Site will have no adverse effect to the site. The proposed development of the site, as indicated, is consistent with guidance on "highly technical and scientific" facilities from the Advisory Council on Historic Preservation. The report accurately states that continuity of use can be expected on facilities, such as Salinas Peak Site, and may enhance their continued use and preservation.

The State Historic Preservation Office believes it's important to recognize the high quality of this report, well researched, well written, and well organized. It supports the Section 106 process, and it identifies another important facet of the White Sands Missile Range story and the story of New Mexico.

If you have any questions, please contact me at 505-476-0444 or steven.moffson@state.nm.us.

Best regards,
/Signed/

Steven Moffson
State and National Register Coordinator

Acknowledgments

Thanks are extended to James Bowman, White Sands Missile Range (WSMR) Cultural Resources Manager, and William Godby, Archaeologist for their support of this project. Gratitude is extended to Jenn Jett and Darren Court for providing access to the extensive materials in the WSMR Museum Archives. Thanks also to WSMR Directorate of Public Works (DPW) Facilities Director Michael Williams for providing access to the realty data on file with the WSMR Directorate of Public Works. Special thanks are extended to Adam Carruth, Telecommunications Specialist, John Medina, Chief, Transmission Services Division, Range Operations Directorate, and John Winstead with the US Navy Detachment at WSMR.

Phillip Esser served as the project manager and Nate Myers was report co-author. Essential reviews and commentary were provided Epsilon Systems Cultural Resources Program Manager Brad Beacham.

This report is dedicated to Jim Andress (1932-2021), longtime WSMR engineer and communications specialist. Jim served as Branch Chief, Transmission Engineering, for a number of years, and then became a technical advisor for the Directorate until he retired. Jim's concise and complete collection at the WSMR Museum Archives proved invaluable in preparing the historic context. Our thanks to his son Greg and the Andress family for providing additional materials.

Acronyms and Abbreviations

AADI	Advanced Air Defense Interceptor
ABL	Airborne Laser
AEC	Atomic Energy Commission
AFCRL	Air Force Cambridge Research Laboratory
AFRL	Air Force Research Laboratory
AIA	American Institute of Architects
ALA	Army Launch Area
ALRITE	Automatic Laser Radar Instrumentation Test Equipment
AMC	Army Materiel Command
AME	Angle Measurement Equipment
AMSL	Above Mean Sea Level
APL	Applied Physics Laboratory (Johns Hopkins University)
ASL	Atmospheric Sciences Laboratory
ASMSA	Army Signal Missile Support Agency
ARMS	Archaeological Records Management Section
ARMTE	Army Missile Test and Evaluation
ARTRAC	Advanced Range Testing Reporting and Control Plan
ASL	Atmospheric Sciences Laboratory
ATEC	Army Test and Evaluation Command
BC	Ballistic Camera
BMDO	Ballistic Missile Defense Organization
BRL	Ballistics Research Laboratory
C	Celsius
Caltech	California Institute of Technology
CFR	Code of Federal Regulations

CFS	Cambridge Field Station
CECOM	US Army Communications-Electronics Command
CMU	Concrete Masonry Unit
DFCS	Drone Formation Control System
DOD	Department of Defense
DPW	Directorate of Public Works
ECC	Ecological Communications Corporation
ECOM	US Army Electronics Command
EO	Executive Order
ERDA	US Army Electronics Research and Development Activity
F	Fahrenheit
FDL	Flight Determination Laboratory
FMG	Frequency Management Group
GALCIT	Guggenheim Aeronautical Laboratory at California Institute of Technology
GE	General Electric
GIS	Geographic Information System
GRLC	Green River Launch Complex
GTE	General Telephone Electronics
HABE	High-Altitude Balloon Experiment
HAFB	Holloman Air Force Base
HBIF	Historic Building Inventory Form
HCPI	Historic Cultural Properties Inventory (New Mexico)
HVAC	Heating, Ventilation, and Air-Conditioning
IDTS	Instrumentation Data Transmission System
IGOR	Intercept Ground Optical Recorder
IGY	International Geophysical Year
IRIG	Integrated Range Instrumentation Group

JATO	Jet-Assisted Take-Off
J-DETC	Joint Directed Energy Test Center
JPL	Jet Propulsion Laboratory
KTM	Kineto Tracking Mount
LADAR	Laser Detection and Ranging
LC	Launch Complex
LOS	Line-of-sight
LPG	Liquid Propane Gas
MARS	Military Amateur Radio System
MDA	Missile Defense Agency
MINSTREL	Missile Instrumentation by Electronic Means
MSFN	Manned Space Flight Network
NASA	National Aeronautics and Space Administration
NATIV	North American Test Instrument Vehicle
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMCRIS	New Mexico Cultural Resources Information System
NOTS	Naval Ordnance Test Station, Inyokern California
NPS	National Park Service
NRE	National Range Engineering
NRHP	National Register of Historic Places
NRO	National Range Operations
ORDCIT	Ordnance and California Institute of Technology
ORRAS	Optical Research Radiometrical Analysis Systems
PSL	Physical Sciences Laboratory, New Mexico State University
RDT&E	Research, Development, Test, and Evaluation
REL	Radio Engineering Laboratories

RF	Radio Frequency
ROTI	Recording Optical Tracking Instrument
RPI	Real Property Inventory
SBL	Space-Based Laser
SCEL	Signal Corps Engineering Laboratories
SCR	Signal Corps Radio
SM-6	Standard Missile 6
SMR	Small Missile Range
SMSA	Signal Missile Support Agency
SOTIM	Sonic Observation of the Trajectory and Impact of Missiles
SPAR	Synchronous Position Attitude Recorder
SRPA	US Army Signal Radio Propagation Agency
TISCOR	Time Signal Code Reader
TSU	Technical Service Unit
US	United States
USACC	US Army Communications Command
USAERDA	US Army Electronics Research and Development Activity
USAF	US Air Force
USAISC	US Army Information Systems Command
USASC	US Army Signal Corps
V-1	Vengeance 1
V-2	Vengeance 2
VHF	Very High Frequency
VODAT	Voice Operated Device for Automatic Transmission
WAC	Without Attitude Control
WRCC	Western Regional Climate Center
WPA	Works Progress Administration

WSMR	White Sands Missile Range
WSPG	White Sands Proving Ground
WSSA	White Sands Signal Agency
WSSCA	White Sands Signal Corps Agency
WWII	World War II

Table of Contents

Appendices

List of Figures

List of Tables

1. Management Summary

In January 2022, Epsilon Systems Solutions, Inc. (Epsilon Systems) was contracted by Leidos to conduct an inventory and evaluation of the Salinas Peak site and its facilities and evaluate them for their National Register of Historic Places (NRHP) eligibility. This project is being undertaken for the purpose of Section 106 of the National Historic Preservation Act (NHPA) for a proposed construction project at the Salinas Peak site as part of the Joint Directed Energy Test Center (JDETC) program.

Salinas Peak, located in the San Andres Mountain Range on the western side of WSMR, overlooks the Tularosa Basin to the southeast. Salinas Peak historically served as an optical instrumentation site, signal relay, and time signal transmission site. Today, the site consists of a mixture of Cold War and post-Cold War properties, as well as a handful of support facilities, all located on the highest peak in the mountain range. The primary Cold War properties constructed between 1959 and 1969 include the Communications Building (Property 32272), 120-foot tower (Property 32264), Instrumentation Building (Property 32270), and an antenna array support building (Property H5103). Additional properties were added to the complex after the Cold War-era.

The scope of the inventory area was determined in consultation with James Bowman, Cultural Resources Manager at WSMR. In order to adequately meet the requirements set forth in Section 106 of the NHPA and in NRHP guidelines, the inventory was inclusive of all the Cold War-era Salinas Peak properties taking into account the greater site context.

In February of 2022, Epsilon Systems architectural historian Phillip Esser conducted an on-site inventory and recorded ten buildings, structures, and objects at the Salinas Peak site. The recorded resources relate specifically to the Cold War military-industrial historic themes of Basic Scientific Research; Materiel Development; and the multi-part theme of Command, Control, Communications, Computers, and Intelligence (per Lavin 1998) that are significant to our national history. All of the documented resources date to the Cold War era (1946 to 1989); no prehistoric resources were recorded or evaluated. The current inventory was logged as New Mexico Cultural Resources Information System (NMCRIS) number 150014 with the Archaeological Records Management Section (ARMS).

While none of the recorded properties are recommended for individual eligibility under the NRHP Criteria, it was found that the Salinas Peak site represents a historic military landscape (per Loechl et al. 1994) that dates to an identified period of significance associated with the Cold War operation of WSMR (1959 to 1989). The Salinas Peak site has accrued some recent additions that post-date its Cold War-era period of significance; however, it is the recommendation of Epsilon Systems that Salinas Peak retains sufficient historic integrity of its physical features to convey its historic significance. As such, Epsilon Systems recommends that the Salinas Peak site is recognizable as a historic military landscape that is best managed as a historic district, per Department of the Army guidance (Loechl et al. 1994).

It is the recommendation of Epsilon Systems that the proposed improvements to the Salinas Peak site will not pose an adverse effect to historic properties. The proposed facility improve-ments will primarily be limited to facilities that were established in the post-Cold War period and do not contribute to the eligibility of the district.

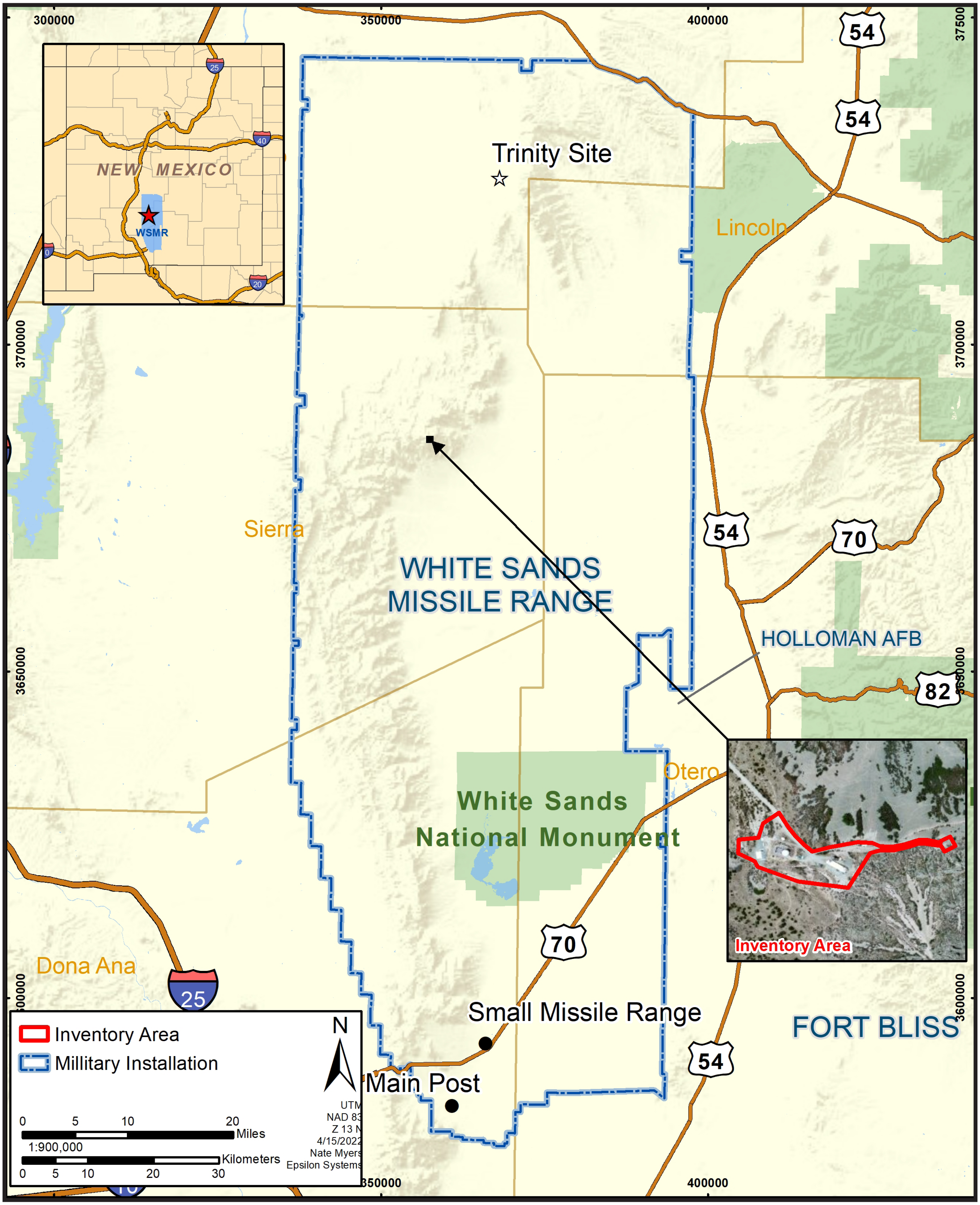

Figure 1. Map of the current inventory location within WSMR.

The project proposes to clear a location for a new helipad south of Property 32272. The proposed helipad location will not impact any eligible properties and is actually in the same approximate location as an earlier helicopter landing pad, so it is consistent with the historic site setting and aesthetic. As such, the proposed improvements do not pose an adverse effect to the historic properties at the Salinas Peak site. Therefore, Epsilon Systems recommends that the proposed undertaking will have no adverse effect on any historic properties listed, or eligible for listing, in the NRHP.

2. Introduction and Project Background

Communications are the backbone of managing the activities of a test range that encompasses over 4,000 square miles. WSMR's immense and varied land mass requires the ability to not only convey multiple types of electronic data, but to do so in an unobstructed manner. The Cold War-era site was set up to facilitate improved flow of communications, both voice and instrumentation data links. Time-code generation would be added later. Optical instrumentation was set up concurrently but was not long-lived at the site.

In January 2022, Epsilon Systems was retained by Leidos to conduct an inventory of the Salinas Peak site properties and evaluate them for their NRHP eligibility. The inventory limits were determined in consultation with James Bowman, Cultural Resources Manager at WSMR, as the immediate site containing buildings and structures. This boundary determined the spatial limits of the built environment inventory (Figure 2).

Ten Cold War-era properties were recorded at the Salinas Peak site as part of the current inventory. No prehistoric archaeological resources were identified as part of the inventory. In addition to the detailed recordation of the identified resources, each was evaluated for its eligibility to the NRHP, and the inventoried resources were evaluated as possible contributing elements to a larger military landscape or historic district.

The results of the inventory effort and NRHP evaluation are provided herein. Phillip Esser and Nate Myers were the report co-authors. Essential reviews and commentary were provided by Epsilon Systems Cultural Resources Program Manager Brad Beacham.

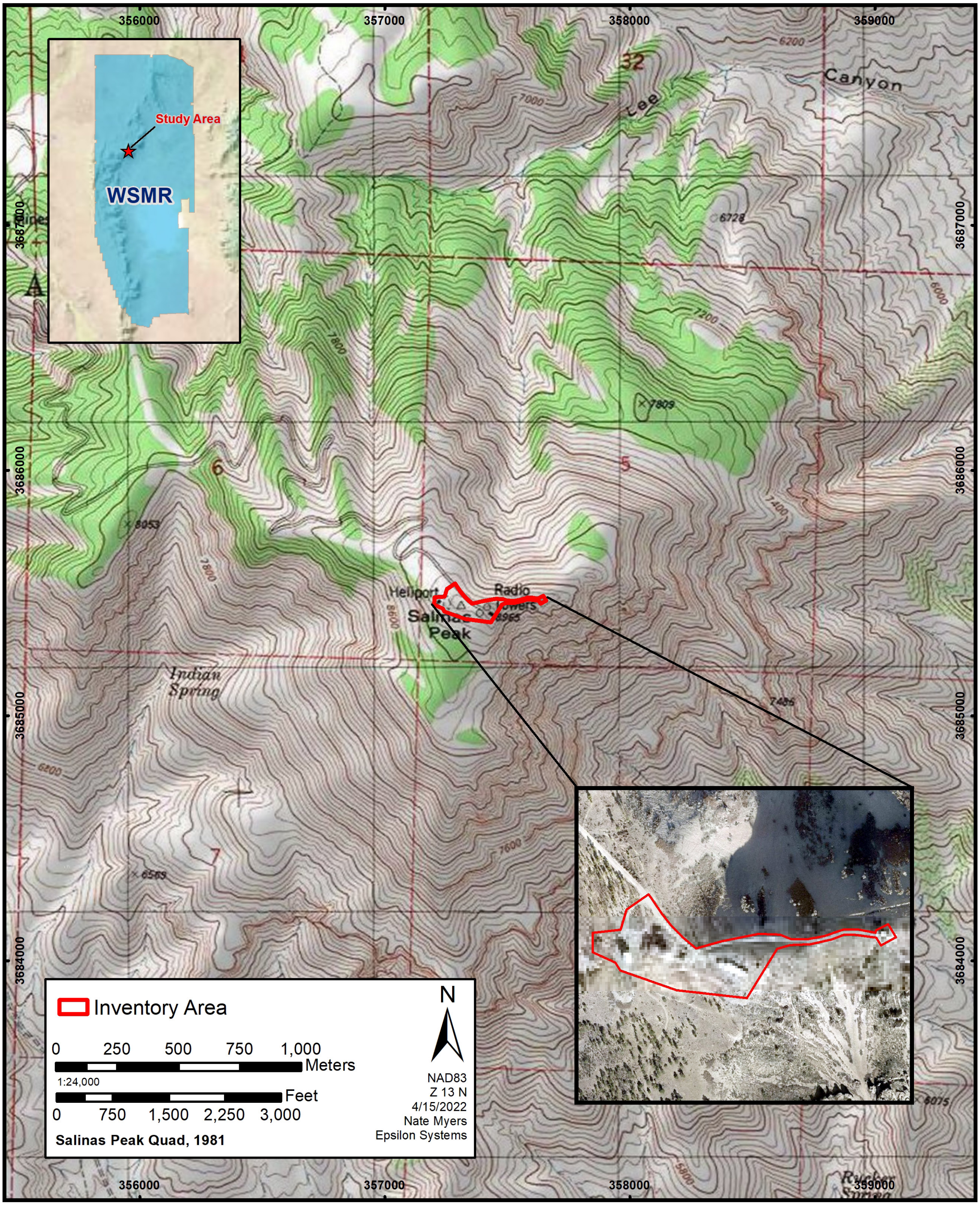

Figure 2. The limits of the current inventory at Salinas Peak.

3. Purpose of the Project

This project is being undertaken for the purposes of compliance with the requirements of Section 106 of the NHPA for a proposed construction project on the Salinas Peak site. The proposed project improvements would be limited to the existing developed portions of the Salinas Peak site and represent a federal undertaking as defined by Section 106 of the NHPA.

The purpose of this report is to inventory and evaluate the Salinas Peak properties for NRHP eligibility and assess the potential impacts of the proposed improvements to the inventoried properties. In accordance with Section 106 of the NHPA, Epsilon Systems is compiling existing historic documentation and evaluating all candidate buildings, structures, and objects at the Salinas Peak site for their NRHP eligibility.

Historic resource inventories and evaluations have been undertaken at military installations since the passage of the NHPA in 1966 and issuance of Executive Order (EO) 11593 in 1971. Section 106 of the NHPA requires federal agencies to "take into account" the impact of their undertakings on historic properties, whereas Section 110 directs federal agencies to inventory historic properties under their care and management, beyond considerations related to specific projects. Historic properties are buildings, structures, sites, districts, and objects that meet the criteria for listing in the NRHP (36 Code of Federal Regulations [CFR] 60). EO 11593 was a major milestone for historic preservation efforts conducted on federally administered lands for several reasons. EO 11593 established the requirement for federal agencies to locate, inventory, and nominate all eligible cultural resources to the National Register and to exercise caution until these inventories and evaluations were completed to ensure that no eligible federally-owned property was transferred, sold, demolished, or substantially altered (National Park Service [NPS] 2011). EO 11593 outlined procedures for meeting the inventory requirements of the NHPA and the National Environmental Policy Act (NEPA) and encouraged cooperation with state-level historic preservation agencies as part of the compliance process. Significantly, EO 11593 also established the principle of "interim protection," which means that until a resource has been evaluated, it must be treated as if it were eligible for listing in the National Register. EO 11593 was codified as Section 110 of the NHPA in 1980, making it a permanent addition to the NHPA compliance process (NPS 2011).

This report will assist WSMR in compliance with Section 106 of the NHPA. This document serves as a comprehensive inventory and NRHP evaluation of the Salinas Peak resources from the site's establishment in 1959 through the end of the Cold War. The report will also provide information on post-Cold War properties, which are not yet 50 years old, but are relevant to the consideration of the location's integrity and potential eligibility as a historic district.

4. Research and Field Methodology

The Salinas Peak facility was constructed in 1959 as a communications and instrumentation site on the highest peak in the San Andres Mountains. Salinas Peak historically served as an optical instrumentation site, signal relay, and time signal transmission site. The commanding position of Salinas Peak within the boundary of WSMR made it well-suited as a communications relay station. Changes to the site facilities have been a regular occurrence throughout the history of the installation, but the main communications building (Property 32272) and several other Cold War-era facilities remain in place at the location today.

Traditionally, built environment is conceived of as the net result of human activity resulting in the accumulation of physical modifications, materials, and facilities present within a defined area of the natural environment. Buildings, structures, and objects serve as the most prominent exemplars of the built environment and typically serve as the focal point of inventory efforts.

The methodology for recording Research, Development, Test, and Evaluation (RDT&E) facilities and related properties at WSMR was based on the four components of research and fieldwork: revisiting and updating previous evaluations; on-site recordation; contextual historic research; and research into the evolution of the construction and function of individual buildings, structures, and objects. Each of these components informs upon the other, and together can provide an in-depth understanding of the history and activities carried out at a given facility or complex. Each of these components is described in greater detail, beginning with the incorporation and enhancement of previous recording efforts.

4.1 Revisiting and Updating Previous Evaluations

Prior to the initiation of fieldwork, the listing of previous inventory and evaluation efforts housed at the WSMR Environmental Division, Conservation Branch were consulted in order to identify the previously documented properties located within a given project area. Additionally, WSMR DPW Real Property files were consulted and scanned, as needed, to facilitate future referral. These previous recordings were updated with current photography and any observed changes in the property's condition or physical characteristics were also noted. In many cases, the previous recordings were completed on the now obsolete New Mexico Historic Building Inventory Form (HBIF), and for these recordings a current WSMR-specific version of the New Mexico Historic Cultural Properties Inventory (HCPI) form was prepared. The previous recording was referenced in the property's descriptive narrative, recommendations, and HCPI form, as applicable.

4.2 On-Site Recordation

In order to achieve a comprehensive inventory of the Salinas Peak site, on-site fieldwork focused on the primary area of its built environment and the immediate surrounding area. Unlike some sub-installations at WSMR, Salinas Peak has a small developed footprint with only a small number of buildings, structures, and objects. The inventory area was determined in consultation with the WSMR Environmental Division, Conservation Branch and all the Cold War-era Salinas Peak buildings, structures, and objects within this area were recorded as part of this inventory.

The inventory referenced WSMR Geographic Information System (GIS) data and property records on file with the WSMR DPW to help identify properties and guide the on-site survey. The primary resources that compose the built environment of the Salinas Peak installation are buildings, structures, and objects. Accordingly, some additional discussion regarding the recordation of the prominent components of the Salinas Peak built environment is required.

4.2.1 Building, Structure, and Object Recordation

The NPS guidance for identifying NRHP-eligible properties recognizes buildings, structures, and objects, as well as two additional types of resources that may include multiple resources; sites and districts. The NRHP is by necessity oriented towards recognizing "physically concrete properties that are relatively fixed in location" (NPS 1995:4). The selection of categories should be dictated by "common sense and reason" (NPS 1995:4) and the *National Register Bulletin 15* provides definitions for building, structure, and object as follows:

> A building, such as a house, barn, church, hotel, or similar construction, is created principally to shelter any form of human activity. "Building" may also refer to a historically and functionally related unit, such as a courthouse and jail or a house and barn [NPS 1995:4].

In the case of Salinas Peak and many other WSMR facilities, buildings and structures are often specialized and serve specific functions related to range support and RDT&E. Examples of such buildings include blockhouses, launch pads, and assembly buildings.

> The term "structure" is used to distinguish from buildings those functional constructions made usually for purposes other than creating human shelter [NPS 1995:4].

A variety of specialized structures can be found at WSMR. Typical examples include magazines and blast barricades, which per the definition cited above, do not shelter a specific human activity, but serve some other purpose. The antenna tower (Property 32264) found at Salinas Peak is a good example of structure per this definition.

> The term "object" is used to distinguish from buildings and structures those constructions that are primarily artistic in nature or are relatively small in scale and simply constructed. Although it may be, by nature or design, movable, an object is associated with a specific setting or environment [NPS 1995:5].

Objects at WSMR are generally not artistic in nature, but can otherwise fit the definition by being of a portable nature, small in scale, and simply constructed. WSMR examples can include modular storage units and some launcher rails, as well as the occasional commemorative property.

Additionally, the NPS defines sites and districts as:

> A site is the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archaeological value regardless of the value of any existing structure [NPS 1995:5].

> A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development [NPS 1995:5].

The resources present at the Salinas Peak site consist of buildings, structures, and objects, which were distinguished using the stated NPS definitions. It is likely that these collective resources may also qualify as a historic district, as the guidance states that "properties with large acreage or a number of resources are usually considered districts" (NPS 1995:4). However, the recommendation of Salinas Peak as a district can only be made after a comprehensive recordation of its affiliated properties, followed by a careful consideration of these properties and their relative integrity within the framework of an appropriate historic context. The potential of the Salinas Peak site as a historic district is discussed in detail in Chapter 8.

The purpose of the on-site inventory was to document the extant properties at the Salinas Peak site in order to evaluate their NRHP eligibility. The recording process consisted of collecting field notes and representative photographs of each property, as well as relevant spatial data. In addition to inclusion within the body of the inventory report, the in-field recording data and information from archival research were incorporated into a WSMR-specific version of the HCPI form. The WSMR-specific version of the HCPI form eliminates many fields of the standard HCPI form that are not applicable to the properties encountered at the range, and substitutes these with fields and descriptive options that are more useful for describing WSMR properties. When accessible, building interiors were also photographed and alterations noted. In these cases, the condition of the building interior was considered when assessing the overall integrity of the property.

4.3 Contextual Historic Research

The purpose of a historic context is to allow the significance of a historic property to be judged and explained within the larger patterns of history. National Register Bulletin 15 provides the following definition:

> Historic contexts are those patterns or trends in history by which a specific occurrence, property, or site is understood and its meaning (and ultimately its significance) within history or prehistory is made clear. Historians, architectural historians, folklorists, archaeologists, and anthropologists use different words to describe this phenomena such as trend, pattern, theme, or cultural affiliation, but ultimately the concept is the same [NPS 1995:7].

Coincident with field recording of the relevant resources, a comprehensive historic context for the Salinas Peak site was prepared. In addition to general background on the region and the establishment of WSMR, the historic context includes discussion of the Army Signals Corps, the Army organization that was responsible for radio communications when the Salinas Peak site was established in 1959. The context also provides coverage on optical instrumentation at WSMR, as Salinas Peak hosted two optical instruments during the 1960s. Sources for this context included WSMR DPW files, architectural drawings, period newspaper publications, Department of Defense (DOD) sponsored guidance and contextual documents, web resources, and several Army Signals Corps historical summaries.

Other relevant databases and depositories were also consulted during the preparation of the historic context. The recent completion of a searchable electronic archive of the WSMR base newspaper, *Wind and Sand* and later *The Missile Ranger*, is also a publicly available resource for the local history of WSMR and its numerous Cold War programs and activities. Additionally, the WSMR Museum Archives contains a large number of historic photographs, documents, and videos that offer invaluable information into WSMR's history. WSMR inventories of real properties were also consulted to determine property identification and construction dates. These databases included historic WSMR property inventories and the current DPW Real Property Inventory (RPI) which was provided electronically by the WSMR Environmental Division, Conservation Branch.

4.4 Property Evolution and Function

Fieldwork was followed by research into the recorded buildings, structures, objects, and associated features. This research included review of original construction information and alterations, historic images, and a variety of other manuscript materials collected over the decades by the WSMR DPW, WSMR Museum Archives, and the WSMR Environmental Division, Conservation Branch.

Whenever possible, property evolution and function were established through individual property records including the disposition forms and real property forms available from the WSMR DPW. When possible, the changes at the individual property level were tied back to the overall historic context. Period photos and documentation are also often on file at the WSMR Museum Archives, which can be very helpful in identifying property modifications. Original architectural drawings and plans are also critical resources for interpreting changes in property design and use.

5. Environmental Setting

WSMR lies within the Mexican Highland Section of New Mexico's Basin and Range Province. This province is characterized by narrow mountain ranges that separate internally drained structural basins and valleys of major drainages (Hawley 1986). WSMR is primarily located within the Tularosa Basin, which is a graben basin bounded by the Organ, San Andres and Oscura Mountains to the west and the Sacramento Mountains to the east. The San Andres and Oscura Mountains form a natural boundary that divides the North Range of WSMR from its Middle and South Range areas. The Salinas Peak facility is located atop the summit of Salinas Peak, which is the highest peak in the San Andres Mountains at 8,965 feet Above Mean Sea Level (AMSL) (2,733 meters AMSL). Salinas Peak is also the highest point within the boundaries of WSMR, and rises approximately 4,600 feet from the floor of the Tularosa Basin to the east. The mountain is also very prominent from the malpais and Jornada Del Muerto plain to the west. The lofty location made Salinas Peak well-suited as a location for range communications and instrumentation, although it required construction of a dedicated access road to reach the site.

The San Andres Mountains are part of the eastern edge of the rift valley of the Rio Grande and are formed by west-dipping fault blocks composed mostly of San Andres Formation limestone, but also include exposures of Abo formation sandstone and quartz monzonite. The gypsum deposits that have gradually eroded from the San Andres Mountains down into the Tularosa Basin interior are the primary source of the white sands found in White Sands National Monument. Sweetwater Canyon, located to the south and east of Salinas Peak, is the main watershed along the east slopes of the mountain. Grapevine and Thurgood Canyons are the major watersheds on the west slopes below Salinas Peak. Range roads that provide access to Salinas Peak travel along the natural corridors formed by Grapevine and Sweetwater Canyons.

The Salinas Peak built environment consists of several historic properties along with several facilities that have been added to the site since the 1990s. The location is accessed via a winding and steep gravel access road (Range Road 327) that departs from Range Road 13. The hub of the installation is a large Communications Building (Property 32272) and associated antenna tower (Property 32264). The distinctive mountain peak location is not demarcated with a fence.

The climate of the area is cooler and wetter than that of the desert basins to the east and west; however, reliable climatic summaries specific to the San Andres Mountains are not readily available. The nearest source of climatic data that roughly approximates the conditions of the San Andres Mountains is a weather station at Carrizozo, New Mexico, where data was collected from May 1st, 1908 to October 31st, 2011 (Western Regional Climate Center [WRCC] 2022). During this period, mean annual precipitation was 32.68 centimeters (cm) (12.87 inches). Rainfall was heaviest from July through September. Average minimum temperature was 4.67 degrees Celsius (C) (40.4 degrees Fahrenheit [F]), while average maximum temperature was 22.11 degrees C (71.8 degrees F). Average annual snowfall totaled 24.13 cm (9.5 inches). Snowfall was heaviest in December through February (WRCC 2022). It should be noted that as a mountain summit, Salinas Peak experiences more extreme weather conditions than the surrounding lowlands.

The generally arid and rugged San Andres Mountains do not support extensive forests, with limited woodlands mostly found along sheltered eastern and northern slopes, which retain more moisture. Vegetation in the area consists of a mixture of Ponderosa Pine Forest and Pinyon Pine Woodland (Muldavin et al. 2000a; Muldavin et al. 2000b). The Ponderosa Pine Forest is mostly limited to the highest elevations of the San Andres Mountains and is indicated by a mixture of Ponderosa Pine (*Pinus ponderosa*) woodlands, deciduous oak (*Quercus gambelii*) woodlands, and montane grasslands. The Pinyon Pine Woodlands are more common and widespread across the San Andres and Oscura Mountains. Pinyon Pine Woodlands consist of a combination of pinyon (*Pinus edulis*), juniper (*Juniperus monosperma*), and evergreen oak (*Quercus grisea and Q. turbinella*) woodlands, along with mountain mahogany (*Cercocarpus montanus*) and wavy-leaf (*Quercus undulata*) montane scrub (Muldavin et al. 2000a; Muldavin et al. 2000b). Conditions on the top of Salinas Peak are not amenable to forest development, as the summit is exposed to high winds, mostly lacks developed soils, and is not well-watered. The natural vegetation that was found on Salinas Peak has mostly been cleared around the installation for both ease of access as well as to provide a defensible space in the event of brush fires. Areas of the site were also cleared and graded for the construction of buildings and structures.

6. Historic Context

A historic context is fundamental for understanding the significance of any given property, as physical resources do not occur in historical vacuum but are rather by-products of larger trends and patterns (NPS 1995). These patterns occur at the local, regional, and national levels, and even at the global scale. Often, these tiered patterns are intertwined, and the significance permeates from the local level to the national and beyond.

The built environment of WSMR is largely an outgrowth of the Cold War that is generally attributed to the period between 1946 and 1989. Most of the historic properties at the range were constructed during this period, and were the result of the competitive arms race between the US and the Soviet Union. However, many programs at WSMR that were initiated during the Cold War only reached maturation in the years following the end of that era, so the historic context is often required to reach into the post-1989 years to fully account for the operational life and use of many resources.

Per NPS guidance, only resources that are 50 years of age or older are to be considered "historic" as a half-century is generally considered the minimum amount of time required to assess whether events or trends are significant to the wider patterns of history. However, the NPS guidance also allows for the inclusion of recent properties if they are of "exceptional importance." As of this writing, properties that were constructed after 1972 would be considered for eligibility to the NRHP only if they meet the standards of exceptional importance as outlined in National Register Bulletin 22 (Sherfy and Luce 1998).

In order to provide a complete historical perspective for the Salinas Peak site, a brief summary of the region prior to the establishment of WSMR is presented. The following section provides an overview of the establishment of WSMR after the end of World War II (WWII). The thematic focus then shifts to the history of the US Army Signal Corps (USASC), and how this organization was a major contributor to the establishment of the communications network at WSMR. The context then discusses optical instrumentation and the instruments that were situated at Salinas Peak during the Cold War. The final portion of the historic context presents the site history of Salinas Peak.

6.1 The Tularosa Basin before WSMR

The American history of the Tularosa Basin begins with the incorporation of the region into the US by the Treaty of Guadalupe Hidalgo in 1848. Although known by the Spanish and Mexican colonial powers, the Tularosa Basin remained a remote and sparsely settled area that was considered largely uninhabitable due to the constant threat posed by the Apache. Fort Stanton was established along the Rio Bonito in 1855 in order to provide settlers with protection against the Mescalero Apache, but even so, settlement away from the fort in the Tularosa Basin remained a risky affair and the population in southern New Mexico remained focused in the Mesilla Valley of the Rio Grande.

By the 1860s however, several factors coincided to change the uninhabited nature of the Tularosa Basin. The onset of the Civil War made New Mexico a subject of military interest among both the Union and Confederate armies, and several engagements were fought for control of the Territory. These conflicts eventually saw the Union victorious, and the military presence

Figure 3. Colonel Albert Fountain, who disappeared in 1896 within what would later become WSMR (*public domain image)*.

across the area continued following the end of the war. The establishment of a series of military outposts across the region somewhat ameliorated the Apache threat, and the perceived security encouraged settlers to move into the area between the Sacramento and San Andres Mountains.

The earliest Territorial settlement in the Basin began even before the end of the Civil War. In the fall of 1862, Hispanic settlers fled the destruction wrought by the flooding of the Rio Grande in the Mesilla Valley and established a community at the mouth of Tularosa Creek at the western base of the Sacramento Mountains. This community, known as Tularosa, was carefully cultivated by its settlers and became a permanent oasis of civilization in the basin. By the early 1870s, the Apache were largely contained on reservations which mostly ended the threat of further raids from that quarter (Sonnichsen 1960:15). By the early 1880s, Anglo ranchers, mostly Texans, had discovered the Tularosa Basin, which at the time was especially verdant after several years of higher-than-average precipitation. The Texas cattle growers found in New Mexico a continuation of the open range grazing that was under assault by waves of post-war settlers and farmers in their native state, and these roving cattlemen rapidly established cattle ranching as an industry in the Tularosa Basin (Sonnichsen 1960).

The rise of cattle ranching in the late 19th century eventually led to "range-war" type conflicts that were experienced in New Mexico and elsewhere across the west. In the Tularosa Basin, this saga culminated in the disappearance of Albert Fountain and his son Henry on February 1, 1896. The site of the disappearance is located within WSMR, at a low ridge known as Chalk Hill that Highway 70 now bisects near the Doña Ana/Otero County line (Eckles 2013:57). Although political rival Albert Bacon Fall and his associates, including prominent area rancher Oliver Lee, were suspected in the case, no convincing evidence tying them to the crime was ever found (Sonnichsen 1960). The Fountain case was a polarizing incident that encapsulated much of life in and around the Tularosa Basin at the close of the 19th century, and endures as a compelling mystery today.

Figure 4. Albert Bacon Fall during his later years as a New Mexico senator (*public domain image)*.

The arrival of the railroad at the newly established railroad town of Alamogordo in 1898 brought the

Tularosa Basin into wider contact with the rest of the nation, but after the conclusion of the turbulent events of the 1890s, the area remained little changed during the early years of the 20th century. The main economic activity continued to be cattle ranching, with ranchers relying on a mixture of their own private property and large grazing leases of federal lands in order to make a living in the sparsely vegetated Chihuahuan Desert landscape. The carrying capacity for grazing was calculated at only five or six cattle per 640 acres in some areas of the Tularosa Basin (Eckles 2013:67). With the capacity for grazing so minimal, it took many thousands of acres to make cattle grazing a feasible endeavor for ranching families in the area.

New Mexico became the 47th state of the US on January 6, 1912. Thomas Catron of Mesilla, and Albert Fall, who resided in Las Cruces, were elected as the first US Senators of the state, ensuring that southern New Mexico was well-represented. As a state, New Mexico began to benefit from infrastructural improvements, and a state highway system was well underway by the 1920s. The old trail between Alamogordo and Las Cruces through San Augustine Pass was replaced with US Highway 70 during the 1930s (Wallace 2004:118). However, the lives of the people in the Tularosa Basin area were not much affected. The area remained much the same by the time White Sands National Monument was established in 1933 to preserve the unique white gypsum dunes that formed from the winds blowing off the Lake Lucero playa in the basin interior. However, the entry of the US into WWII would change the area forever.

With its open air space and reliably clear weather, the Tularosa Basin was an ideal place for training military pilots. The first flight training facility was under development for the training of British pilots when the attack on Pearl Harbor brought the US into the war in December 1941. The training school was subsequently re-directed into the Alamogordo Army Air Field and US bomber flight crews began training there in May 1942 (Kennedy 2009:19). The greatest conflict of the 20th century would bring many changes to the Tularosa Basin, and would also re-define concepts of offensive and defensive weapons for the remainder of the century.

6.2 The Establishment of White Sands Missile Range

Two independent developmental rocket programs required the Army to establish a sizeable overland test range in 1945. One program was domestic in origin and based in research conducted at the California Institute of Technology (Caltech). The other was captured technology from the German rocket and missile program that made its way to the US at the end of WWII.

The Caltech rocket program started in 1936, when J. Frank Malina, a graduate student from the Guggenheim Aeronautical Laboratory at California Institute of Technology (GALCIT), and a group of students under the guidance of Dr. Theodore von Karman initiated research into rocket propulsion. The GALCIT group made steady progress, and in 1939 the group began work on Jet-Assisted Take-Off (JATO) units for aircraft. This early JATO work was first supported by the National Academy of Sciences, but as the war in Europe began to loom larger the Army Air Corps offered support for the JATO development (Carroll 1974:3). The emphasis on developing a workable JATO unit shifted the GALCIT group's focus away from liquid-propellant and towards long-burning solid propellant, whose simplicity and economy was required for the expendable JATO unit.

GALCIT successfully developed solid propellant JATOs for delivery to both the Navy and Army Air Corps. The commercial production of JATO units was not practical under the auspices of GALCIT, so in 1942 GALCIT project personnel founded Aerojet Engineering Corporation. Meanwhile, the completion of the JATO solid propellant work left GALCIT available for new projects, and news of the German missile program from Europe inspired von Karman to further the liquid propellant research. Von Karman, J. Frank Malina, and Hsue-Shen Tsien prepared a memorandum outlining the proposed liquid-propellant work in 1944 (Carroll 1974:7). This memorandum was the first GALCIT document to use the title of Jet Propulsion Laboratory (JPL).

The JPL memo was a major turning point for US rocket and missile development. The German use of the Vengeance 1 (V-1) and Vengeance 2 (V-2) missiles in Europe was the major focus of the Army Ordnance Department Guided Missile Program and the JPL memo received a very positive reception by Army Colonel Gervais W. Trichel of the Rocket Development Branch of the Army Ordnance Department, who developed a contract to expand the JPL liquid propellant research effort (Kennedy 2009:14; Miles 1961). This contract was the Army Ordnance-California Institute of Technology (ORDCIT) contract with Caltech, which was instrumental in the development of the liquid propellant Private test vehicle series. The Private A launches were conducted at Leach Springs, a location within Camp Irwin, California in early 1944. The next ORDCIT rocket, the Private F, was launched at the Hueco Range at Fort Bliss, Texas.

The Corporal series was the next ORDCIT experimental prototype, which was a larger and more powerful rocket that required a larger range in order to test it safely (Kennedy 2009:16; Miles 1961). Early scale model tests of the rocket were conducted in California, but the projected range of the full-size rocket required a larger overland test range. Concurrently, intelligence gained through the course of WWII further emphasized the need for enhanced missile testing facilities comparable to those used by Germany.

As hostilities drew to a close in Europe, the US initiated efforts to capture parts, equipment, and research materials from the German V-2 rocket program at Mittelwerk prior to the Russian advance into eastern Germany. The recovery of the V-2 parts was led by Colonel Holger N. Toftoy in an operation dubbed Special Mission V-2. The parallel mission of locating and recruiting German scientists and engineers was dubbed Operation Overcast, later renamed Operation Paperclip. This mission was greatly facilitated when Wernher von Braun, chief scientist of the German missile program, and key members of his staff surrendered to Allied forces on May 2, 1945 (Eidenbach et al. 1996). With both the parts and the minds behind the V-2 program in hand, the US now possessed the means to accelerate the rocket research the ORDCIT program had begun.

In anticipation of the captured German rocket and missile technology, the Army Ordnance Department had issued a research and development contract to General Electric (GE) on November 20, 1944 (Bullard 1965:8). This contract, which became known as Project Hermes, was aimed at developing a new generation of long-range missiles and required GE to develop control, guidance, and ground equipment for new missile systems. The contract included three phases: a literature search; study of the German guided missile program; and the design and development of its own experimental systems (Bullard 1965:8). Project Hermes served as a parallel contract to the existing ORDCIT. As the prime contractor, GE was responsible for the processing of the V-2 materials that began to arrive in 1945. Both Project Hermes and ORDCIT required a suitable testing and proving ground; the Army began to search for an appropriate

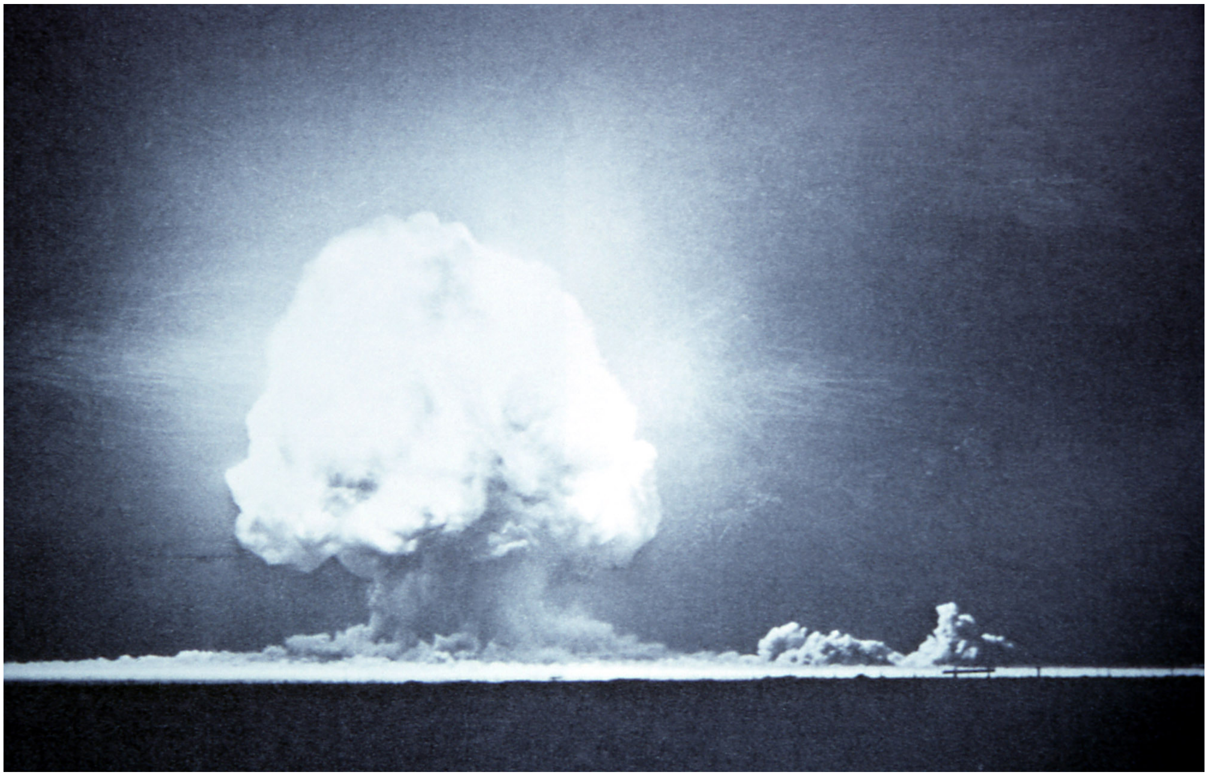

Figure 5. The flash and mushroom cloud of the world's first atomic bomb at the Trinity Site (*public domain image)*.

location for a new test range (Kennedy 2009).

The proposed proving ground required flat and open ground, a sparse population, and predominantly clear weather. Other preferred characteristics included surrounding hills or mountains for observation sites and natural barriers, access to railroad lines and utilities, and proximity to an established military post for support. The Tularosa Basin was identified as the best choice, possessing nearly all of the desired characteristics. The location was selected in February 1945 and named White Sands Proving Ground (WSPG) after the adjacent National Monument. Some of the land in the proposed proving ground was already under federal lease, and additional property was acquired from private landowners in the area via annual lease payments. The lease payments for the use of the ranchers' properties were used in lieu of outright purchase of their lands, as the range was conceived as being a temporary extension of the existing bombing ranges, and it was believed that the new missile mission would eventually be completed (Eckles 2013:87). This, of course, was not the case and the formation of the new proving ground effectively ended the ranching lifestyle in the Tularosa Basin which dated back to the 1870s.

WSPG was formally established on July 9, 1945. The following week, on July 16, 1945, the top secret Manhattan Project detonated the world's first atomic bomb at the Trinity Site in the northern portion of the new range. The atomic explosion was the result of four years of focused development, and J. Robert Oppenheimer named the test site "Trinity" as an homage to a favored poem by John Donne.[1] The flash and rumble of the Trinity explosion was reported as far

1 John Donne was a 16th century poet and sermon-writer, and Oppenheimer based the Trinity name on Donne's Holy Sonnet XIV, which started with "Batter my heart, three-person'd god..."

away as Silver City, New Mexico and El Paso, Texas (Sonnichsen 1960).

On September 26, 1945 the ORDCIT project launched a Tiny Tim rocket modified as a booster for the Without Attitude Control (WAC) Corporal at the newly established WSPG, the first rocket launched at the new range (Kennedy 2009:29). On October 11, 1945, the first fully fueled WAC Corporal launch reached an altitude of 235,000 feet, the altitude record for an American rocket at the time (Kennedy 2009:29). Meanwhile, the first of the captured V-2 materials were transported to the range and GE personnel working under Project Hermes began to sort, catalogue, clean, and assemble the various German missile components. Parts that were missing or damaged were fabricated as needed. The program progressed quickly, and the first American launch of a V-2 missile took place at WSPG on April 16, 1946 (Kennedy 2009:29).

Figure 6. J. Frank Malina stands by the WAC Corporal launch tower at LC-33, 1945 (*US Army photo)*.

The arrival of the V-2 suddenly provided a vehicle that could collect data on upper atmospheric conditions and phenomena, data on which were critical to the continuation of the fledgling American missile program. However, as the V-2 was a military program, it was not necessarily the leading academics in upper atmospheric studies that used the missile as a research vehicle, but rather a new class of pragmatically-oriented scientists from the military contract community (DeVorkin 1992). Army Ordnance saw the potential of the V-2 in conducting upper atmospheric research, but was primarily interested in the application of this research to military technology through the materiel development process.

Per the interservice agreements in place at the end of the war, Colonel Toftoy tasked a member of his staff, Colonel James B. Bain, to identify possible partnerships with user groups within the Army and Navy, along with various contracting agencies within the military research sphere (DeVorkin 1992:59). Colonel Toftoy tasked Bain with organizing all the interested parties into a single manageable body that was independent of, but subject to review by, Army Ordnance (DeVorkin 1992:59). Chief among the interested parties was Dr. Ernst H. Krause, head of the newly formed Rocket Sonde Research Section at the Na-

Figure 7. Little Bright Eyes, the first tracking telescope at WSMR circa 1947, with Organ Mountains in background (*photo courtesy WSMR Museum Archives)*.

val Research Laboratory (NRL). Bain's efforts resulted in a series of meetings that ultimately culminated in the formation of the V-2 Upper Atmosphere Panel, whose first official meeting was on February 27, 1946 at Princeton University. Often referred to as the "V-2 Panel," the group was an informal self-constituted body that had no official status or authority, but was the primary advisory body to Army Ordnance on experimental programs and priorities as they related to the V-2 launch program.

The primary members of the V-2 Panel consisted of organizations within the sphere of military research and development: the NRL, the Army Ballistic Research Laboratory (BRL), the Army Signals Corps Engineering Laboratory (SCEL), and the Cambridge Field Station (CFS), later known as the Air Force Cambridge Research Laboratory (AFCRL). Three additional members were engineers from GE, the primary V-2 contractor under Project Hermes. Associated with the military research agencies were civilian contract laboratories such as the Applied Physics

Laboratory (APL) of Johns Hopkins University, and university departments with military contracts, which included Harvard University, University of Michigan, University of Colorado, University of Utah, Boston University, University of Chicago, Princeton University, University of Rhode Island, and Rhode Island State College (DeVorkin 1992:73; Naugle 1991:1; Smith 1954). Dr. Ernst Krause of the NRL was nominated as the first chairman of the panel. The NRL made significant contributions to the V-2 launch program by providing telemetry systems, telemetry analysis, and ground support (DeVorkin 1987). The NRL telemetry systems formed the foundation for WSPG's range-wide telemetry network that was critical for future test programs. The NRL also provided special replacement nose cone assemblies for the V-2 that were needed to house instrumentation for a variety of scientific research programs that were conducted during the V-2 flight series, the last of which took place in 1952.

As the range continued to develop, the late 1940s and early 1950s proved to be a significant period of advancement for the range instrumentation and communications systems. The installation of range-wide instrumentation, communications, and timing networks was a significant, but often overlooked, part of the effort required to turn the desert landscape of the Tularosa Basin into a world-class missile test range. In many ways, the capability to precisely track, measure, record, and generate data from tests, while synchronizing these activities across long distances, is what truly defined the facility as a proving ground. Pioneering work on range instrumentation systems was undertaken by a group led by Ernst Steinhoff and a select group of optical, electronics, and geodesy experts at Holloman Air Force Base (HAFB). Steinhoff originally was brought to the US as part of Operation Paperclip and came to HAFB in 1949 after working at Fort Bliss. There he selected additional German experts that were brought into the country in 1951 as part of Project 63, which was an Air Force program to place knowledgeable German scientists and engineers into private sector positions within the aerospace industry (HAFB 1949; Mangum 1951). In addition to selecting the instrumentation locations at HAFB, Steinhoff and his instrumentation group published early guidelines and plans for range instrumentation systems and infrastructure at HAFB that were soon incorporated at WSPG as well.

Early instruments that met the requirements for range instrumentation were limited, and existing equipment had to be adapted to fit the role. Some of the best early optical instruments were Askania cinetheodolites recovered from the German rocket program and re-used at WSPG. Fastax and Mitchell high speed cameras and surplus WWII SCR-584 radars were also staples of the early range instrumentation, while more specialized instruments had to be custom fabricated. For example, the first tracking telescope was hand-assembled by planetary astronomer Dr. James B. Edson and assistant Ralph Konegan (Mabe 1958:2; Wind and Sand 1956). This early precision instrument was known as "Little Bright Eyes" and was built on a surplus M45 gun mount and relied on telescopes pieced together with spare refractors, a 35 mm motion picture camera, and a pair of high power Japanese Navy binoculars Edson acquired via barter during WWII (Delgado 1981). Edson was unable to remain at WSMR, but recruited fellow astronomer Clyde Tombaugh to continue the tracking telescope effort. Edson and Tombaugh had worked together at Lowell Observatory and Tombaugh was actually Edson's brother-in-law. Tombaugh is mostly remembered today as the discoverer of Pluto, but made major contributions to the optical tracking of missiles and satellites. In December 1946, Tombaugh captured a V-2 tumbling near the apex of its flight, a previously unknown flight characteristic (Mabe 1958:2). This landmark film heralded the tracking telescope as a revolutionary new kind of instrumentation that was critical to further missile development and remains a key data collec-

Figure 8. Land-Air staff manning a Modified Intercept Ground Optical Recorder (*MIGOR)* circa 1960 (*courtesy WSMR Museum Archives)*.

Figure 9. Land-Air staff working on equipment at WSMR, circa 1960 (*courtesy WSMR Museum Archives)*.

tion component in contemporary missile testing.

By the late 1950s, technology had caught up to the need for range instruments, and the instrumentation became increasingly specialized and sophisticated. New instruments included the AN/FPS-16 radar, the first tracking radar built expressly for use at test ranges. New optical instruments included two new tracking telescopes; the advanced Intercept Ground Optical Recorder (IGOR), developed by Clyde Tombaugh and the BRL, and the Perkin-Elmer Recording Optical Tracking Instrument (ROTI). Both of these devices possessed far greater ranges than the original Bright Eyes and were significant, state of the art advances at the time of their introduction.

During the 1950s, the Army contracted with Land-Air Corporation for the operation and maintenance of most of the range instrumentation. This greatly streamlined the compatibility and standardization of the range instrumentation, the repair and operation of which was formerly handled by a mixture of various contractors and military personnel. The company had received its first contract at the adjoining HAFB in 1948, as a subcontractor with the North American Test Instrument Vehicle (NATIV) long-range missile program. For more than 20 years Land-Air Corporation played a significant role in range support, particularly with optical instrumentation. A succession of contractors would replace Land-Air, though many were in the form of name changes and many experienced staff would be hired on with little interruption in their employment.

WSPG underwent a period of rapid expansion in the wake of the Korean War due to the significant increase in defense spending that accompanied the end of the conflict. The facilities expansion accelerated the growth and complexity of the instrumentation and communications networks which had already been a priority of the WSPG mission since 1945. The growth continued unabated for at least two more decades requiring every aspect of instrumentation and communications infrastructure to be expanded. This included constantly incorporating new technology while doing away with outdated systems. It also required running thousands of miles of cables of all types, both above and below ground.

6.3 Historic Context for Salinas Peak Site

When establishing this remote site on the highest elevation within WSMR, Salinas Peak was conceived as both an optical instrumentation site as well as a communications relay station. The historic context for the Cold War-era therefore depends on a discussion of communications as well as optical instrumentation. Timing, which falls under the rubric of "communications," is the establishment of a universal time code for all instrumentation, which provides for the split-second alignment of information being captured from multiple sources, which aids in analyzing flight data. Ultimately, the most significant and long-lived activities at Salinas Peak have been those of communications.

Salinas Peak was, and continues to be, a site whose primary benefit is its elevation. At almost 9,000 feet, the ability to send and receive signals without obstruction, as well as an unusual point of view for optical instruments, made the site desirable to develop despite the difficult terrain that had to be conquered. This historic context covers the primary functions of the site, beginning with its establishment in 1958 as a simple radio tower site, its expansion into a significant WSMR communications and instrumentation site, and its ongoing use through the end of the Cold War.

6.3.1 Cold War Communications Development at WSMR

In the historical focus on the rocket and missile programs that define WSMR through the Cold War, electronic and optical instrumentation have been well-documented in historical studies in the last decade. However, the establishment, expansion, and exponential technological innovation that accompanied the vast array of communications networks is often taken for granted. Communications are the backbone of test range activities, especially considering the significant distances and varied terrain at WSMR. In the early history of WSMR, it is no surprise that communications were among the first infrastructure called out as a basic need, to be completed by September 1, 1945 (Simmons 1952:27).

Communications can be defined in both a narrow and broad sense in the realm of a missile test range and are not limited to telephones and simple data transmission. WSMR's own Cold War-era technical capabilities description provides a concise definition:

> The communications system consists of radio, hard wire, microwave and cable networks; fixed and mobile transmitters and receivers; base stations and repeaters; recorders; data modems and tone transmitter equipment. These facilities and equipment interconnect the range control centers with the launch complexes and other range instrumentation and test facilities.These networks allow

> the National Range flexibility in selecting the control center to best serve the customer and to control the test. Additionally, with this arrangement it is possible to operate the various WSMR subranges as stand-alone test areas which make it possible to conduct simultaneous operations at several locations. The communications trunking and transmission system can accommodate various bandwidths, data bit rates and signaling options. For reliability, each communications station has automatically-switched, backup equipment and battery power available [WSMR 1986:86].

A 1968 version of this descriptor, which included telephone, ground-to-air communication, and closed-loop television illustrates how the digital age and redundancy built into the systems greatly increased the sophistication of the communication realm from generation to generation. This section will explore communication developments during the Cold War that began with the embedded USASC who, from the beginning, had a complete hand in the creation and expansion of the communications network at WSMR, which included the interconnectivity of all range instrumentation. While not up and running until 1959, Salinas Peak is partially a product of the Signal Corps at WSMR, though the follow-on WSMR communications agencies continued to develop the communications capacities at Salinas Peak through the second half of the Cold War. Understanding the history of the USASC at WSMR provides a backdrop placing Salinas Peak within the context of the history of WSMR and for discussing its primary functions.

6.3.1.1 USASC History at WSMR

At the end of WWII, the USASC was reorganized. The War Department decentralized, and the USASC returned to a prewar independent agency status, shrinking from a high of 350,000 enlisted members to just over 50,000 (Coker and Rios 1988:24). As the USASC reduced capacity it brought all of its training activities to its headquarters at Fort Monmouth, New Jersey and lost personnel and functions to both the newly-formed Air Force and Army Security Agency. Despite the post-war blow to the agency’s capacity, it continued its technological development efforts within the USASC Laboratories (Coker and Rios 1988:25; Raines 1996:318).

The multiple USASC laboratories had undergone regular reorganizations and transitions over the years. The Radio Position Finding Section had become the Evans Signal Laboratory and, in 1945, reorganization formed the Signal Corps Engineering Laboratory (SCEL) (Joint Board on Scientific Information Policy 1945:10). The Evans Signal Laboratory remained intact and would be involved in electronics work with SCEL at WSPG.

It was under SCEL that the USASC began its association with rocket and missile testing. With the capture of the German missile technology at the end of WWII, the military agencies lost no time in experimenting with this advanced technology. The USASC was tasked with providing electronic support for the emerging rocket and guided missile programs.

In her 1954 historic compilation of the formative years of WSPG, Eve Simmons, an early range historian, captured key aspects of the formation of the multiple groups that contributed to bringing the test area up to speed – SCEL played a major role right from the beginning. In 1945, the Chief of Army Ordnance established a policy that instrumentation for the new test range would be the responsibility of the BRL, Aberdeen Proving Grounds, Maryland, for which BRL would create their White Sands Annex. Under an agreement between the BRL and

Figure 10. SCEL-modified SCR-584 radar units at C-Station in 1947 (*image courtesy David K. Barton)*.

SCEL, SCEL staff would be "stationed here chiefly to handle problems incident to radar used for tracking purposes" (Simmons 1952:35). Ultimately, the scope of SCEL's involvement at WSMR would end up being far broader, first under the local White Sands Signal Corps Agency (WSSCA), and follow-on USASC agencies at WSMR.

A historical summary published by the WSSCA in the early 1950s provides an excellent record of the USASC role during the formative period of WSPG (WSSCA 1953). Capturing events up until June 1953, the historical summary is appended with copies of numerous period documents. According to the summary, immediately upon the activation of WSPG in 1945, the Ordnance Corps requested support from SCEL with instrumentation and communication facilities (WSSCA 1953:1).

In January 1946, SCEL's Electronic Control Section, Radar Branch, began work on modifying the USASC SCR-584 (gun-laying) tracking radar, the most sophisticated tracking radar system available, renowned for its excellent performance and reliability. Two modified versions were sent to WSPG in March 1946, both capable of skin tracking and beacon control of guided missiles.[2] A USASC transponder beacon (AN/APN-56) was installed in the early V-2 rockets launched at WSPG. Accompanying this equipment were two USASC lieutenants to be provided to WSPG for no more than 30 days. Five days later 10 additional enlisted personnel would be assigned to WSPG for no more than six months (WSSCA 1953:2). Known as the "SCEL Development Detachment," they would be the first of what would, in a few short years, be well over a thousand USASC enlisted personnel from four detachments, as well as civilian employees and contractors who would support the Ordnance Corps in a wide variety of activities managing and constructing many range capabilities. SCEL would also concurrently assist the Air Force at adjoining HAFB in providing similar support for that agency's missile testing programs. Ultimately, WSPG and HAFB would share the test range in the 1952 Integrated Range

2 "Skin" refers to the test vehicle surface where a signal is reflected back to the radar receiver; a "beacon control" refers to a radar signal the missile follows versus having an internal guidance system.

agreement. SCEL and its follow-on agencies made major contributions to the development of WSMR throughout the Cold War.

Originally placed at "A" Station, a mile south of the new Army Launch Area 1 (ALA-1), the Army relocated the mobile SCR-584 radars and other equipment two miles further south to the new C-Station in 1947, as this position provided a more accurate measurement of the initial launch angles (Barton 2014:1-2). C-Station was the hub of instrumentation and testing activity at WSPG from 1947 through the mid-1960s. The C-Station Control Building was built in 1950 and soon after modified with several additions. During this period, C-Station shared data collection with adjacent HAFB and Stallion Range Control on the north end of the 100-mile range, until the sheer number of tests conducted at WSPG required a central processing and control center. A new state-of-the-art Range Control facility, generally referred to as Building 300, was constructed in 1966 to meet this need (WSMR 2012).

In addition to missile tracking with radar at WSPG and pioneering work at HAFB in developing a plotting board system of missile control, some of the other early USASC activities that would presage later development included the Upper Atmosphere Research Branch and the Frequency Coordination Branch. SCEL's Upper Atmosphere Research Branch installed various instruments in rockets and missiles as well as operated and maintained ground-based equipment at the direction of the Chief of the Meteorological Branch at SCEL's Evans Signal Laboratory. In addition to supplying data from those tests to the Evans Laboratory, they also tested lab-produced and modified equipment. SCEL was also one of the six agencies involved in the use of the V-2 for upper atmosphere research. The primary mission of the Frequency Coordination Branch was to monitor radio signals within a range of 150 miles of the US border; this mission remains in effect today and has been significantly expanded through time (WSSCA 1955:4, 5; Simmons 1952:39).

In 1947, one of the first "permanent" facilities established by SCEL was a radio control station known as "Alamo Lookout" at Alamo Peak in the Lincoln National Forest. A precursor to Salinas Peak, by 1954 it would also serve as a microwave relay station. Microwave communications fall within the broader spectrum of radio frequency (RF) communications. Microwave frequencies between 1 gigahertz (GHz) and 100 GHz, are delivered in what is known as "point-to-point communications" or line-of-sight (LOS) pathways, referred to as "links" (Commscope 2017:6). With point-to-point communication at WSMR, elevation is key for unobstructed signals over the 100-mile-long range.

Installing the infrastructure for communications and signaling circuits was the responsibility of the Post Signal Officer, who was in charge of both administrative communications and Range instrumentation and communication systems. In early 1946, construction of communications and signaling circuits was awarded under a contract with Callaghan Electric of El Paso. Within four months, 1,467 poles and 6,084,152 feet of overhead wire were installed at WSPG. A BRL report dated July 8, 1946 describes the limits of the communication systems to date, which included two trunk lines and one pay station to El Paso, Texas; one dedicated trunk line to the Fort Bliss switchboard for toll free calls to the city, and; a local switchboard that could handle up to 80 calls, though only 40 were then in use. For radio communications, only 20 radios of various kinds were in use; no outside radio sets were yet in operation (Arnold 1946:10-12). Additional contracts were let to cover more area but the work was relegated to the 129th Signal

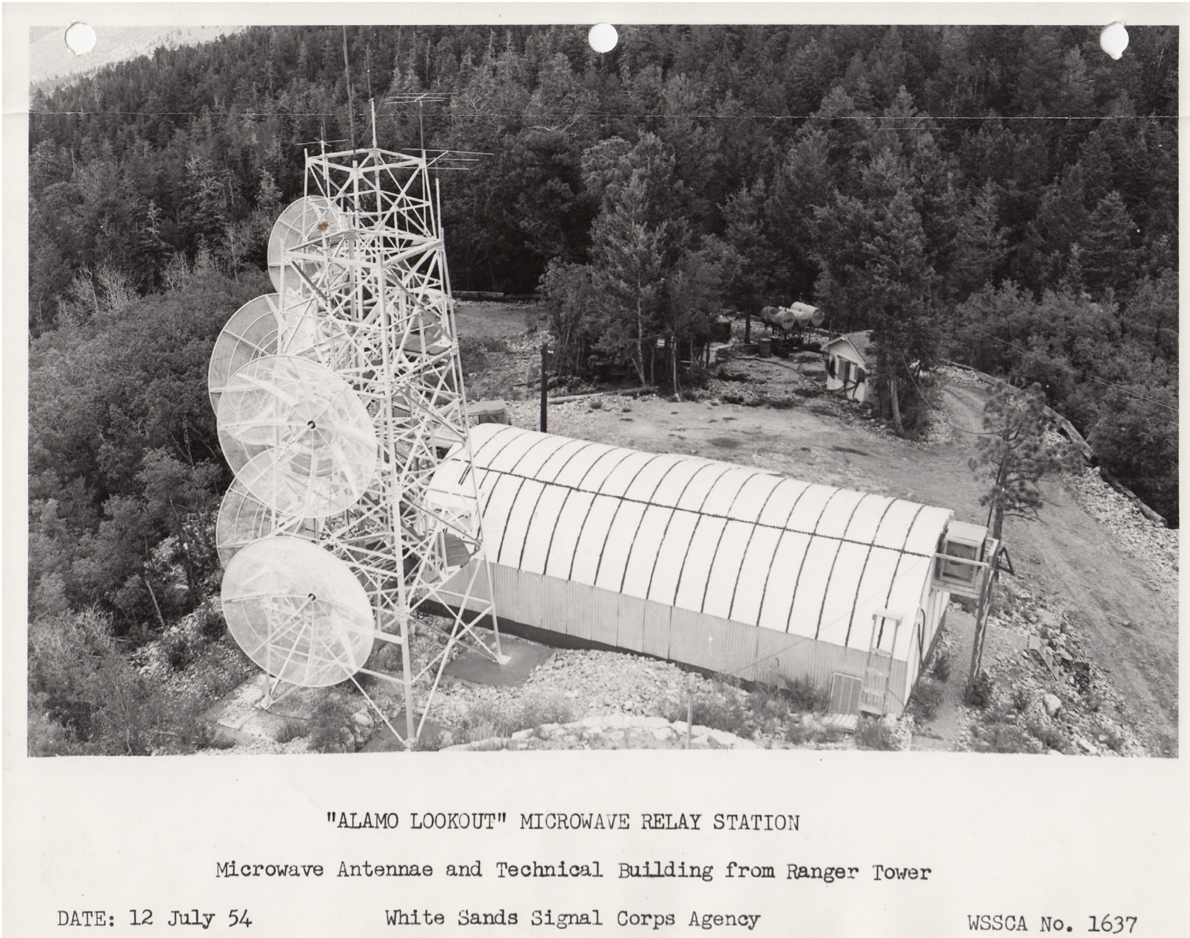

Figure 11. SCEL "Alamo Lookout" radio control station atop Alamo Peak, July 12, 1954 (*WSMR Museum Archives)*.

Battalion stationed at adjoining Fort Bliss by May 1947 (WSSCA 1953:14; WSSCA 1955:11).

Since 1947, the National Bureau of Standards' Radio Propagation Field Station had been tasked with study and reporting on the ionosphere.[3] Located north of the main post, the equipment and personnel were placed in a mobile van. SCEL took over this role in 1951 with the 9480th Technical Service Unit (TSU), whose mission was to measure and record frequencies of the ionized regions of the atmosphere to predict usable frequencies. This information was provided in support of WSPG activities as well as all military, shipping, and commercial airline use. Directly related to upper atmospheric testing, SCEL was involved with the Navy's Aerobee sounding rocket for upper atmospheric research by providing instrumentation and conducting some of their own experiments (WSSCA 1955:8-14).

Plans for creating and operating a Chain Radar System were the impetus for pursuing a dedicated USASC organization at WSPG. On January 1st 1949, the "9577th Technical Service Unit, Signal Corps Engineering Laboratory, Field Station No. 1" was activated at Fort Bliss to support a range of activities including ballistic radar instrumentation, project engineering,

3 Located at altitudes from about 37 to 620 miles, the ionosphere affects the way radio waves behave as they travel.

and frequency coordination. Operational control was delegated to the director of the Evans Signal Laboratory (WSSCA 1953:5; Simmons 1952:19). The pioneer 9577th TSU members were later referred to as "soldier-technicians" (Wind and Sand 1953a:3).

Figure 12. Patch for the 169th Signal Construction Company (*courtesy WSMR Museum Archives)*.

Late in 1949, the second permanent USASC detachment was assigned to WSPG. Consisting of six officers and 210 enlisted men, the recently re-activated 169th Signal Construction Company, stationed at Camp Gordon, Georgia departed for New Mexico on November 1, 1949 (WSSCA 1953:15; Wind and Sand 1953b:2). This group would take over the work of communications and signaling circuits construction assigned to the 129th Signal Battalion stationed at Fort Bliss (WSSCA 1953:15). Like the 9577th, the 169th would have a long history at WSPG.

Figure 13. Column header from WSPG newspaper (*adapted from Wind and Sand 1953)*.

The base newspaper, *Wind and Sand*, sheds light on the active involvement of the USASC detachments in the life of WSPG. The very first issue, from March 16, 1950, had two column headers dedicated to the USASC. The first, "Signal News," provided recent activities of the different units, the highlight being the delivery of the new telephone directory (Wind and Sand 1950:2). The second, "S.C.E.L.'s Bells," was a social column dedicated to the more personal and social side of SCEL personnel. The units created their own sports teams and were active in all aspects of the social life of WSPG. Integral to the functioning and development of the expanding test station, dedicated columns could be found in the newspaper for another ten years under multiple headers, including "Post Signal Scoop;" "Signal Side Lines;" "WSSCA Fricassee;" "WSSC-Ads;" "The FREQ's;" "The SCAnner;" and "TWX from WSSA."

In the realm of Morale, Welfare, and Recreation, the USASC set up a Military Affiliate Radio System (MARS) at WSPG in March of 1950 (WSSCA 1955:16). MARS served as a supplemental means of communication for military personnel abroad, as well as providing communications support in case of emergency or disaster. Local MARS operators were able to patch radio communications through as collect phone calls or pass on messages to family members (Rocketeer 1980:5). The MARS network helped service members communicate during the Korean, Vietnam, and Gulf War conflicts, and has assisted numerous disaster relief efforts domestically and internationally (MARS n.d.). In 1954, the WSSCA set up a television relay station that re-broadcasted local network affiliate television shows to WSPG (WSSCA 1955:44).

By 1951, SCEL Field Station Number 1 had been consolidated from Fort Bliss to WSPG. The Integrated Range agreement between WSPG and HAFB for the co-use of the ranges under the control of the Army made consolidation at WSPG logical. The last to make the move was the Service and Supply Section which had been at HAFB (Wind and Sand 1951:4). By August 1952, the increase in USASC activity at WSPG resulted in the re-designation of the sub-agency as the WSSCA. As a Class II activity, the USASC activities based at WSPG were under the control of the Chief Signal Officer who was reported to by the WSSCA Commanding Officer through the WSPG Commanding General (WSSCA 1953:31). The WSSCA sub-agency was considered a major operational unit of the USASC and consisted of four main branches: radar instrumentation, upper atmospheric research, frequency coordination, and administration and service. WSSCA missions included installing and operation of radars, communications, training, research, frequency coordination and monitoring, high altitude (ionosphere) testing, still and motion picture photography, film processing, and electronic countermeasures. The agency was so active that it possessed its own transportation system, shops, and supply depots (Simmons 1952:19; WSSCA 1953:5-8; WSSCA 1955:18-20). In 1953, a brief vignette in Wind and Sand newspaper summed up the rapid growth of the WSSCA over a less than five-year period:

> The progressive growth of the 9577th TSU is reflected in the administrative changes from SCEL Field Station No. 1 to WSSCA, and now to several detachments. Without intending to disparage the present outfit, the old one was in many ways better simply because it was so much smaller and everybody knew everybody else by first name. It's like the difference between New York City and Pine Tree Corners [Wind and Sand 1953c:5].

In a Progress Report prepared by WSPG for calendar year 1951, it was obvious the communications systems had expanded significantly over five years. The telephone switchboard was now automatic with direct-dialing capability, with a carrying capacity of 1,400 calls. Close to 900 phones had been installed and the installation of underground and above-ground trunks and cabling for phone service was growing almost every year (WSPG 1952). Range communications were expanding as well. In 1947, anticipating growth, the Army constructed a sizeable "Communications Room" addition to the Army Blockhouse, nearly doubling the existing floorspace. In 1951, the central wire testing capabilities within the facility were expanded and rearranged. The facility is described as consisting of "switchboards, toll-test boards and a distributing frame for the interconnection of the complex networks used in the wire instrumentation necessary to support the guided missile program" (WSPG 1952:24-26). The immense workload was shared by both the USASC and contractors. Radio and wireless networks increased in scope as well. The report indicated that 120 special "intercommunication sets" were in use at the time, and also boasted that an additional 8,000 or so poles had been erected since 1946 in the open wire network (WSPG 1952:24-26).

The increased workload prompted a civilian personnel recruiting trip to California in November 1952 (WSSCA 1953:37-46). A new USASC detachment, the 14th Signal Operations Company, was created out of a small force assigned to support HAFB with their operational

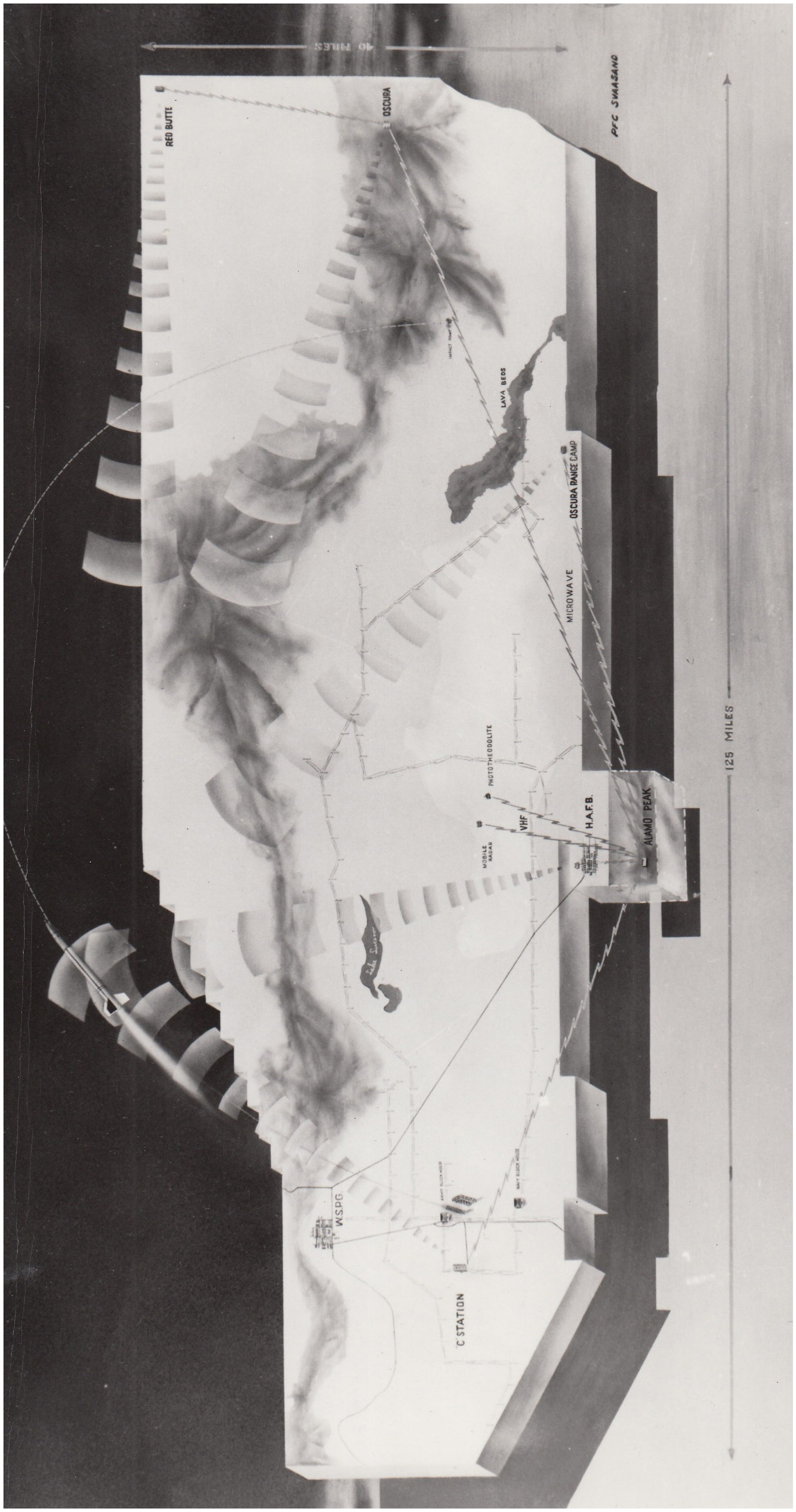

Figure 14. Schematic drawing of the Signal Corps Chain Radar System, 1953 (*couretsy WSMR Museum Archives*).

needs as part of the Integrated Range with WSPG (Wind and Sand 1953b:2).

Figure 15. Ozro "Ozzie" Covington, circa 1960 (*image from WSMR Hall of Fame)*.

The activities of the WSSCA are well-documented through 1954 thanks to efforts by the agency; the remaining history is culled from a variety of technical documents, base newspapers, and USASC reports. Highlights from the early 1950s include, among many others, the activation and staffing of the Electronic Warfare Division, Aerobee instrumentation and telemetry, tracking radar installation at HAFB's King 1 Station, installation of a range-wide microwave communication and data transmission system, the construction of communications and data systems for Army Launch Area 3 (ALA 3, which was later divided into Launch Complexes 36 and 37) and the impact areas, as well as setting up the communication, data, and radar systems for the new highly-instrumented Small Missile Range (SMR).

As mentioned earlier, one of the chief accomplishments of the SCEL and WSSCA was the installation of the Chain Radar System. The name of the Chain Radar System refers to the way in which the radars were linked together so that any radar in the network could position other radars onto the target. In this manner, a target could be continuously tracked and acquired by individual radar stations with no interruption in tracking coverage as it traveled uprange (Eckles 2013:155; White 1955). The Chain Radar System could also be used to direct optical instruments such as the IGOR tracking telescope and Askania cinetheodolites, which was a major advantage in the acquisition of fast-moving targets (White 1955). The chain could be directed by any single radar in the system, and the radar with the strongest signal was given "command" of the system. In the early version of the system, the radar with the strongest signal was determined by a human operator at C-Station, but automated systems were soon developed to perform this function (White 1955).

Central to the development of rocket and missile tracking was Ozro "Ozzie" Covington, who worked for SCEL as the senior civilian employee from 1946 to 1961 and was the principal organizer in establishing the WSPG Chain Radar network and the centralized range control at C-Station. Under Covington's leadership, the Missile Instrumentation by Electronic Means (MINSTREL) concept was developed, which was "…a centralized real-time control center into which funneled all tracking and telemetry data in digital form" (Corliss 1974:74). Covington also helped establish the range telemetry, communications, and central timing networks, and played an important role in creating ground control systems for guided missiles (WSMR Museum 2014). His titles included Supervisory Engineer, Chief Engineer and Technical Director of the US Army Missile Support Agency. Covington joined the National Aeronautics and Space Administration (NASA) in 1961 and became instrumental in developing and deploying the NASA Manned Space Flight Network (MSFN) for the Gemini and Apollo flights (Corliss 1974:73).

Figure 16. WSSCA administration and laboratory facilities, circa 1953 (*courtesy WSMR Museum Archives)*.

According to the WSSCA history, "permanence was a keynote in thinking and planning" in the 1954 and 1955 fiscal years (WSSCA 1955:43). The WSSCA continued to expand its role through the mid-1950s; the 1954 organizational manual now designated six staff administrative divisions: Administration, Comptroller, Supply, Maintenance, Engineering, and Troop Command. Two operational missions, the Signal Operations and Range Signal Services Missions, were newly designated. The Signal Operations Mission consisted of the Electronic Warfare and Special Projects Divisions, while the Signal Services Mission consisted of the Range Instrumentation, Range Communications, and Frequency Coordination Divisions; this mission was in direct support of the Integrated Range (WSSCA 1955:43). While ultimately answering to the Chief of the USASC, WSSCA had established itself as a strong and integral part of the Army Ordnance-run WSPG.

Throughout the years, the WSSCA Pictorial Division was instrumental in recording every conceivable aspect of WSMR. Still photography was captured in abundance and helps tell the story of WSMR, with a whole host of subject matter that included testing and facilities, rocket and missile shots, social events, equipment, people, nature, and historical sites. Motion picture photography was also created to document numerous activities, but mostly focused on testing. However, the Pictorial Division documented many accomplishments and provided footage and personnel in collaboration with outside film and television professionals in producing documentary films for public relations purposes. Most memorable are "The Big Picture" series, an Army production that ran from 1951 to the early 1970s, highlighting the activities and accomplishments of the Army. One example is "The Tularosa Frontier" from 1960, a 30-minute documentary on the origins and development of WSMR (SMSA 1960:69).

Remaining under the auspices of the USASC, the WSSCA received a name change in 1957 dropping "Corps" from the name to simply, White Sands Signal Agency (WSSA). Described as one of the "principal organizations" of WSPG, the WSSA military and civilian population had grown to over 1,400 by July 1957. Communications and radar remained "big projects" while new ones were identified, including missile geophysics and pictorial and television programs. Geophysics projects highlighted during this period were "micrometeorology," or missile meteorology, the study of atmospheric conditions for all aspects of missile flight. Details on wind measurements at multiple altitudes, humidity levels, air temperature and density were all factored into missile tests. Related to sound-ranging was the development of the Sonic Observation of the Trajectory and Impact of Missiles (SOTIM) system. Using strategically placed underground microphone arrays, the remote stations measured the shock wave of an incoming missile to calculate its impact point. Pictorial programs included the use of talented in-house artists and illustrators, or "Imagineers" to produce a wide variety of graphics for WSPG. Television technology began with closed-circuit monitoring but would later expand to a suite of fully portable recording capabilities with videotape and included other uses such as boresight cameras for radar system calibration. By 1957, the communications and data network consisted of 20,000 circuit miles of wire and cable, 23 microwave channels, and 197 radio channels over which were transmitted timing, telemetry, control signals, and voice communications (Wind and Sand 1957a:1, 8; 1957b:1-2).

In 1958, a *Wind and Sand* newspaper article noted that the WSSA had once again been renamed. Now designated the Signal Missile Support Agency (SMSA), the article indicates the name change is associated with SMSA's close identification with missile work (Wind and Sand 1958a:1). The name change was probably related to the fact that WSPG was renamed WSMR the same year. A USASC report speaks to the continued growth of the agency – by 1959, it had doubled in size and scope within four years. In the first 10 months of 1958, the SMSA provided support for a record setting 2,000-plus "live" firings at WSMR and the SMSA also participated in the International Geophysical Year (IGY) by establishing a detachment at Fort Churchill, Canada in support of rocket activities (USASC 1959:60-61).

The construction of facilities for administration and laboratories during the 1950s represents the physical manifestation of the USASC's growth at WSMR. In addition to the multitude of electronic instrumentation, communication, radar, and timing sites spread throughout WSMR, a number of substantial permanent USASC buildings were constructed in the Cantonment. Taking up the southeastern corner of the Technical Area, these include the SMSA Pictorial Building (Property 1621; constructed in 1954); the Frequency Coordination Laboratory and Missile Electronic Warfare Building (Property 1624; constructed in 1955); the Missile Geophysics Building (Property 1623; constructed in 1958) and; the 32,785 square-foot Communi-

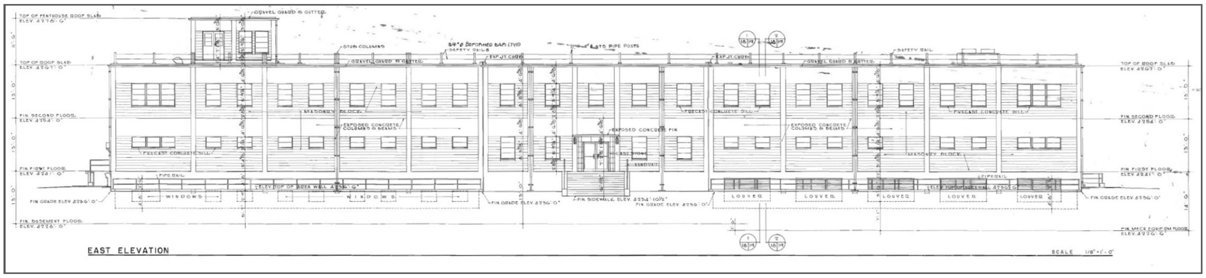

Figure 17. Elevation of the Communications Laboratory (*Property 1622)* from 1958 WS-HL plans.

cations Laboratory (Property 1622; constructed in 1958).

In addition to the new laboratory, three major telephone communications buildings were constructed in this period. With a now range-wide dialing capacity, “connections for missile firings are made quickly and surely” (Laidlaw 1959:8-9). Much of the improvement to the WSPG telecommunications network was ascribed to a new telephone trunking system that carried multiple conversations on one pair of wires. In 1957, the installation of a 200-line automatic direct dial system was completed in the Launch Complex 38 (LC-38) area, further expanding the range-wide communications network (WSMR Diary 1960: 47). The wire line and cable data transmission and range communications system now consisted of 50,000 circuit miles and the microwave system was doubled to 46 channels. A system for two-way radio-telephone conversations on a single frequency, called Voice Operated Device for Automatic Transmission (VODAT), was installed. The VODAT systems also allowed radio operators to tie into the WSMR telephone system (Laidlaw 1959:8-9). It was in this period that Salinas Peak was established as a new data transmission relay and instrumentation site.

In the late 1950s, the SMSA also worked to install and operate the newly developed AN/FPS-16 tracking radars at WSPG and HAFB. By 1963, the WSMR Chain Radar network had been modified to include nine AN/FPS-16 radar units, two MSQ-1 radars, two MSQ-1A radars, six MPQ-12 radar units, and five MPQ-18 radars (Aerospace Corporation 1963:4-6). The AN/FPS-16 radars steadily replaced the older SCR-584 based radars at the range through the 1960s, although the older SCR-584 based systems were still in use for range safety purposes due to their wide availability and lower cost (National Range Operations 1971; Scavullo and Paul 1965).

Revolutionary in that they were designed specifically for missile tracking, the AN/FPS-16 could achieve levels of accuracy that approached those of optical instruments (USASC 1959:61). The AN/FPS-16 radars would remain critical components of WSMR range instrumentation well into the 1990s, and remain in use today at WSMR and throughout the world. The AN/FPS-16 radar at WSMR participated in the NASA MSFN that tracked flights of the Mercury, Gemini, and Apollo programs during the 1960s (Corliss 1974).

In 1958, plans were made to develop the Salinas Peak site which would be initially set up as a communications relay station and instrumentation site. On the communications front, the 8,965-foot elevation site was large enough to house a substantial permanent building and other semi-permanent buildings and structures. Whether driven by the need for improved com-

Figure 18. Salinas Peak from Tularosa Basin, circa 1970 (*courtesy WSMR Museum Archives)*.

munications or seeking a unique position for optical instruments, historical records do not definitively point to the impetus for developing the site. In both cases, the unobstructed view was clearly beneficial. WSMR engineer Jim Andress authored a 1963 article in *Telephony* magazine that described how an increase in trunking traffic “overcrowded” the WSPG open wire and cable network during the late 1950s, which prompted significant upgrades (Andress 1963:18-19). Among these was the development of the transistorized multiplex providing 60-channel capacity with modular expansion capability on seven range links. Six of the links all terminated at the seventh link, which was Salinas Peak. Centrally located and with its unobstructed line-of-site to virtually all of WSPG, Salinas Peak provided an ideal hub to tackle some of the overcrowded networks (Andress 1963:18-19). More specific information on the development of Salinas Peak is found in Section 6.4.

In 1962, a job request for an antenna to be installed at Salinas Peak was submitted in support of the Advanced Range Testing Reporting and Control Plan (ARTRAC), though the specific location was not identified (McClain 1962). By the late 1950s, the range instrumentation system had reached a point where the volume of missile firings and complexity of instrumentation systems necessitated the development of a more sophisticated and fully integrated instrumentation communications system. Range firings had tripled since 1954 and increased workload was anticipated for the coming years. Increasingly faster missile systems as well as the ballistic missile program with off-range firings into WSMR would further tax the outdated system. Collecting, interpreting, and coordinating data from multiple instruments, known as "data reduction," and providing the information to evaluators quickly, had always been a challenge at WSMR. The increased workload and complexity of the instrumentation itself called for an advanced network that could efficiently handle the new workload. The ARTRAC system was designed to create an improved and unified network for facilities and processes for firing and controlling missiles in flight, launching and directing targets, and safety surveillance. Not intended to completely revamp the system, ARTRAC incorporated existing instrumentation while accommodating improved and new systems (Range Instrumentation Development Division 1959:1-2). One critical component was that the system provided real-time data for missions whose control component was dependent on that information. At the time, the system represented a major overhaul of the WSMR control network: "ARTRAC may be considered an overall regrouping and modernization of the total Range mechanism" (Range Instrumentation Directorate 1962 K-6).

No follow-on documents could be located to assess the success of the ARTRAC system, but console images at HAFB, the SMR, and the new Range Control Center (former Building 300) illustrate that the system had been fully implemented. Images of consoles at Stallion Site and Green River Launch Complex (GRLC) in Utah are also in the same collection.

In 1960, SMSA produced a catalog of capabilities which included an updated list of duties and responsibilities. It is interesting to note that, with extraordinary advances in technology and major growth of the sub-agency since the SCEL Detachment arrived in 1946, the specific du-

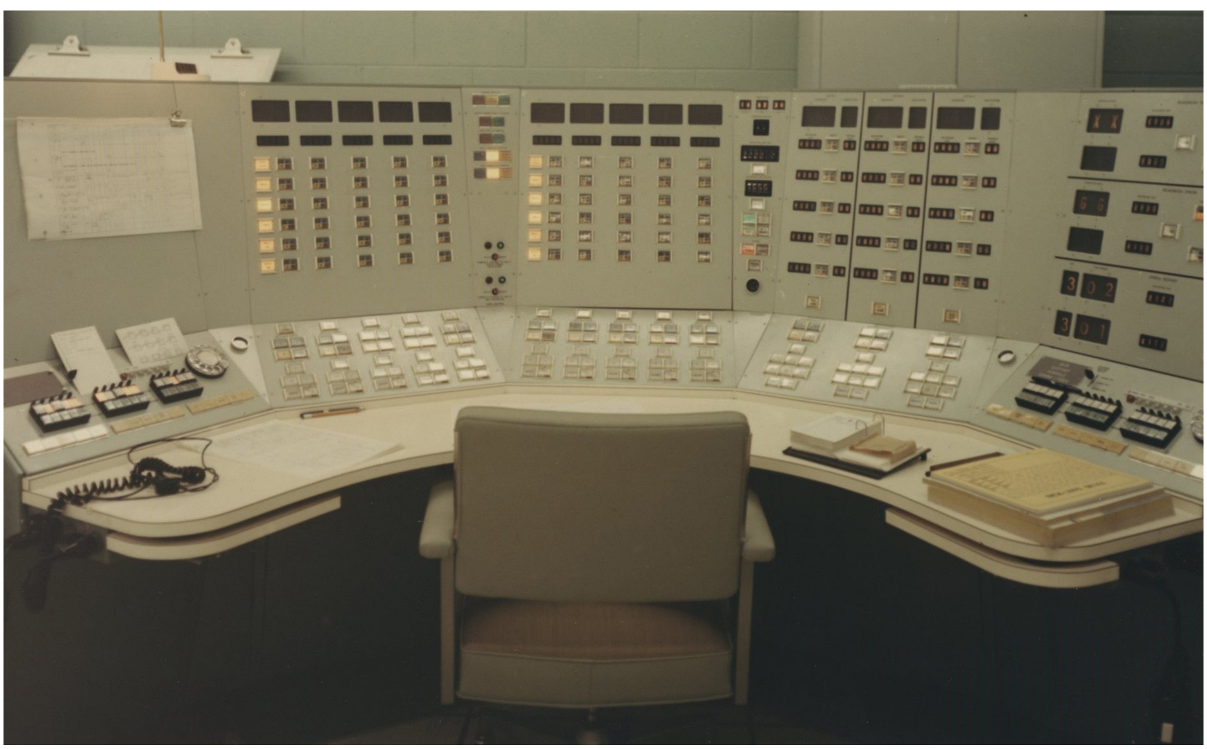

Figure 19. ARTRAC console at WSMR Range Control Center, 1971 (*courtesy WSMR Museum Archives*).

ties and responsibilities had changed little. As of 1960, the SMSA had achieved an impressive presence at WSMR, with more than 2,000 civilian and military personnel operating over $100 million in facilities (SMSA 1960:1).

At the operational peak of the SMSA, WSMR boasted of 80,000 circuit miles of wire and cable for its communications and data transmission network, which also included 197 radio channels, 48 microwave channels, and over 900 inter-communications stations. All of these activities covered over 5,600 square miles of WSMR and surrounding areas. In an attempt to illustrate the complexity of the system in the simplest of terms, an article in *Wind and Sand* stated: “The communications plant connects the range control centers, centers, launching, sites, instrumentation stations and other technical facilities. The system collects and distributes data and timing and control information for missile firings” (Wind and Sand 1962d:19). The *Wind and Sand* article provides additional details on communications activities, which included: base radios at six locations for ground-to-air ultra-high frequency radio transmission; a dedicated voice channel for engineering and maintenance, including a data channel, and; extensive radio networks for all range activities. Users of the WSMR radio networks included military police and security personnel, firefighters, ambulances and survey crews, and public works personnel (Wind and Sand 1962d). All of these were supported by the aforementioned inter-communications stations to provide links and relay capacity for coverage over the long distances. The network of open wire lines and trunking provided distribution for voice communications and instrumentation services to range centers, electronic and optical instrumentation. The article also mentions Salinas Peak with its ability “to make possible communications and data transmission throughout the mountainous terrain of the range” (Wind and Sand 1962d:19).

In 1962, more than just a name change came to SMSA – a major Army reorganization took place in which the USASC received command changes. On May 8, the Army Materiel Command (AMC) was established assuming operational control of Army-wide installations and all weapon development, production, and fielding. The USASC, being one of the Army’s seven technical services, was placed under the new US Army Electronics Command (ECOM), taking control of the USASC laboratories and therefore assuming the responsibility of SMSA activities. At WSMR, the agency was renamed the US Army Electronics Research and Development Activity (USAERDA, or ERDA) (Wind and Sand 1962a:1, 7; Wind and Sand 1962b:1). In June of 1962, all activities related to frequency management and upper atmospheric research at WSMR were placed under the umbrella of a new USASC agency, Detachment 1 of the Signal Radio Propagation Agency (SRPA) (Wind and Sand 1962c:1). Bigger changes were on the horizon.

6.3.1.2 Post-USASC Cold War-era Communications Development at WSMR

Beginning in the mid-1960s, major Army organizational changes finally ended the operation of the USASC as an independent support agency at WSMR. Under the new National Range Operations (NRO) and National Range Engineering (NRE) commands, WSMR became one of six national test ranges whose reorganization was intended to streamline operations and avoid duplication of efforts. Test ranges under Army control were now under the auspices of the Army Missile Test and Evaluation (ARMTE) Command (Wind and Sand 1966a:1; 1966b:1). Under WSMR General Order 73, duties traditionally assigned to USASC groups were mostly placed under the authority of the WSMR Deputy, NRO (WSMR 1966). ECOM and ERDA re-

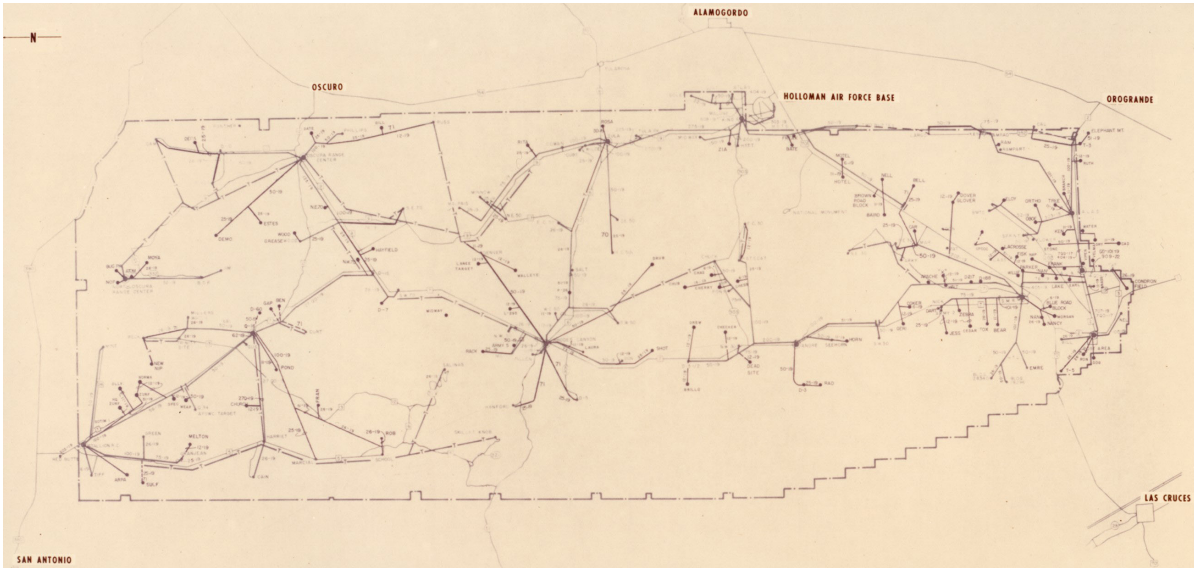

Figure 20. WSMR cable trunking, distribution, and open wire network, 1967 (*courtesy WSMR Museum Archives)*.

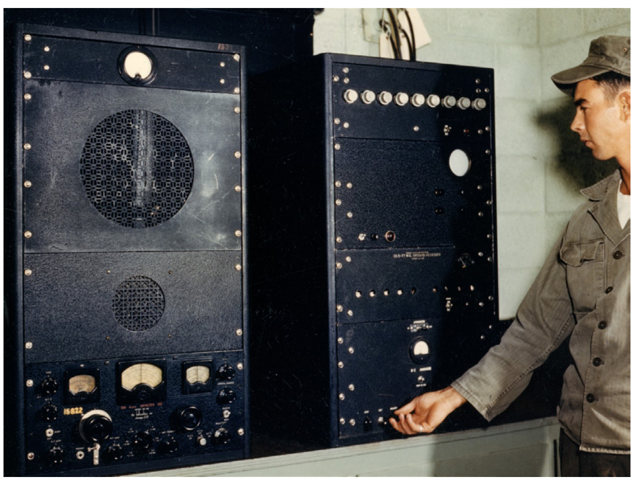

Figure 21. Typical voice communications set, 1950-1970 (*courtesy WSMR Museum Archives)*.

Figure 22. WSMR voice communications console, 1964 (*courtesy WSMR Museum Archives)*.

mained intact as agencies and, while roles such as communications and radar were relegated to directorates at WSMR under the NRO. ERDA continued to play a role in the WSMR Communications Directorate until late 1970, when it was re-designated as the Atmospheric Sciences Laboratory (ASL) under ECOM (Missile Ranger 1975:2).

In 1967, as part of WSMR's modernization program, the communications network was upgraded to include an Instrumentation Data Transmission System (IDTS), a microwave/multiplex and high-speed data communications system. The improvements were not revolutionary but served to provide point-to-point trunk service throughout the range. Chief of the Plant Branch, Communications Directorate, John Owens is quoted as saying: "Exotic missile systems and sophisticated instrumentation need comparable communications facilities" (Mabe 1967:1). Constant improvements and upgrades were critical in keeping pace with the increasingly sophisticated missile systems being tested, particularly those like the lightning-fast, lower atmosphere Sprint ballistic missile defense system.

A reference is found in the 1967 Instrumentation Facilities Maps to the presence of a calibration unit at Salinas Peak for a system which began development in the early 1960s, called Angle Measurement Equipment (AME). As the name implies, the system is designed to locate an item in space using a radio interferometer system with pairs of precisely spaced antennas. Each site was made up of a crossed antenna field with amplifiers, mixers, a tuneable oscillator, phasemeters, data processor, and data handling unit. Used to collect mid-course trajectory data on missiles, two AME systems were developed at WSMR, AME East and West on the south end of the Range, and Cube and Laura Sites at mid-range. The system was limited by the signal source and required a line-of-sight (WSMR 1986:28; NRO 1976:A-3).

By the early 1970s, WSMR's communications network now included off-range launch sites such as Fort Wingate, Blanding Launch Site in Utah, and the missile flight corridor that extended from the GRLC in southeastern Utah to WSMR. In addition to the extensive telephone network, the communications system included the continued installation and maintenance of communications-electronics data transmission and control systems, as well as adding over 100 microwave and radio channels within the decade (Missile Ranger 1972:4). In 1973, the Communications Directorate fell under the auspices of the US Army Communications Command

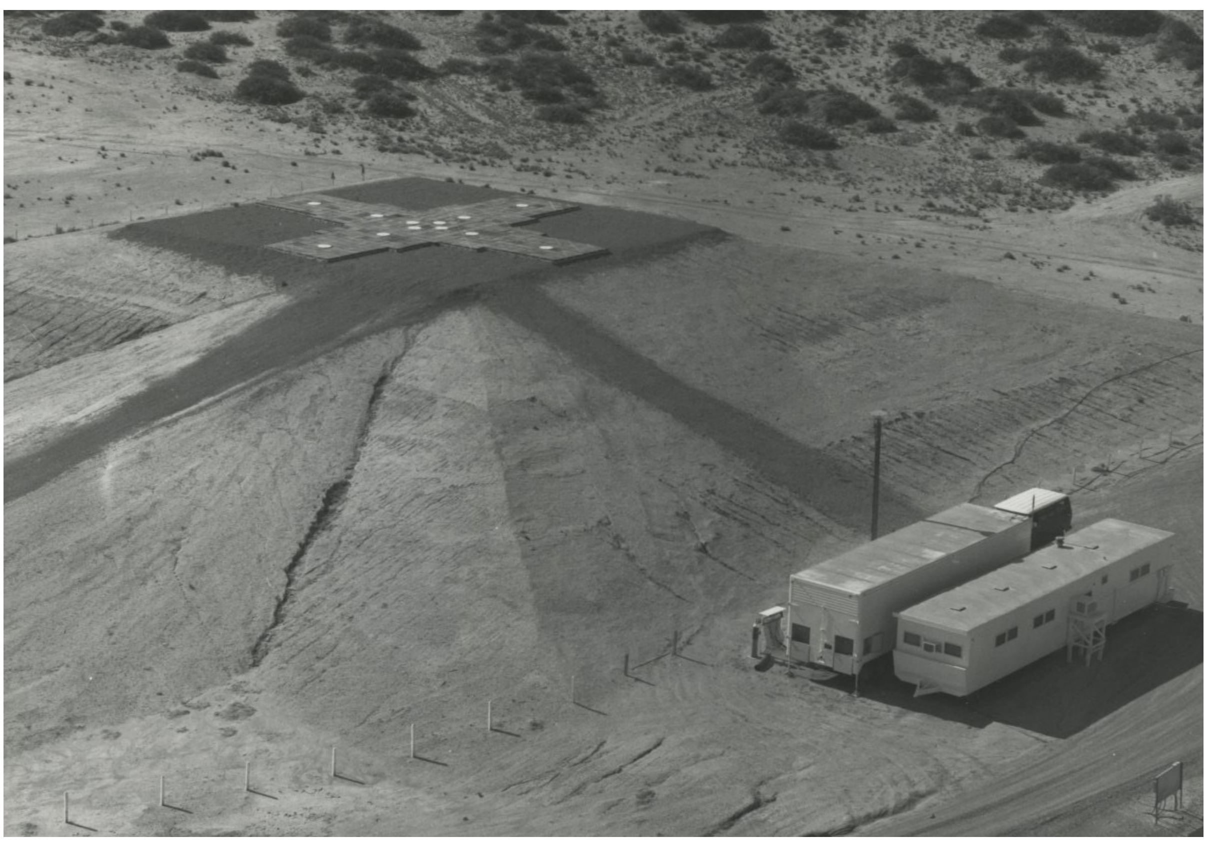

Figure 23. Angle Measurement Equipment site (*from Jim Andress Collection, WSMR Museum Archives)*.

Figure 24. Cable trenching equipment laying new cable, circa 1970 (*courtesy WSMR Museum Archives)*.

(USACC) (Andress n.d.)

The last big Cold War-era technological advance that increased communications speed and capacity began in 1983 with the range-wide installation of a fiber optic cable network. In the early 1970s Corning Glass Works managed to overcome attenuation issues (the reduction of the amplitude of a signal) in the manufacture of fiber optic cable, making it available as an alternative over copper wire with a significant increase in signal carrying capacity. The Transmission Branch of the Communications Directorate undertook the installation project, laying

Figure 25. Sample of Corning fiber optic cable at WSMR (*Jim Andress Collection, WSMR Museum Archives)*.

over 200 miles of cable by June of 1987. By undertaking the cable-laying project in-house, the Transmission Branch saved over two million dollars, completing the work two weeks ahead of schedule (Andress 1987:3). The new Lightwave/Fiber Optic Transport System was made up of two prime components, the fiber optic cable, and transmitting and receiving equipment with digital multiplexers. The increased signal carrying capacity allowed for the transmission of several individual circuits over long distances from a central switching or processing point, minimizing or even eliminating remote site switching or distribution processing equipment (Andress 1988:1-2).

The last command restructuring of the Communications Directorate during the Cold War took place in the mid-1980s. The Directorate now fell under the authority of the US Army Information Systems Command (USAISC) (Andress n.d.). Structurally, the roles and responsibilities for range communications continued to belong to the Communications Directorate through the end of the Cold War and up to today. The USASC played a formative and substantial role in the evolution of infrastructural communications systems at WSMR, so its organizational history is worthy of singling out. The impetus for this historical overview of the USASC and follow-on agencies and the role they played in developing communications networks at WSMR provides a context for understanding the establishment and evolution of the Salinas Peak site.

6.3.2 Optical Instrumentation

Coexistent and dependent upon communications networks, flight testing instrumentation on a missile range consists of two major types: optical and electronic. Optical instrumentation includes tracking telescopes, fixed and tracking motion picture cameras, ballistic cameras, and cinetheodolites.[4] Electronic instrumentation primarily consists of radar, but also includes various types of radio interferometry equipment and other means of tracking via electronic signals. All of these efforts are coordinated through communication channels which, including synchronized time signals, are a critical component of instrumentation. Instrumentation also is part of the unified system for which infrastructure is required (Missile Range Instrumentation 1960:22). Salinas Peak saw the installation of a tracking telescope (T-130), cinetheodolite (G-129), and ballistic camera (B-168). A brief overview of these instruments provides context for discussing what was installed at Salinas Peak.

As mentioned earlier, the history of optical instrumentation at WSMR has been the subject of detailed historical analysis and technical overview studies (Korfmacher 2015). For the purposes of this narrative the discussion on optical instrumentation is limited to cinetheodolites, ballistic cameras, and the ROTI.

Cinetheodolites essentially combine a motion picture camera with a theodolite, recording azimuth and elevation data on film. The optical instruments were used in combinations of two or more to collect data from which the position of a test vehicle in space can be determined through calculating where the two or more lines cross. Additionally, the devices collect data on trajectories, accelerations, velocities, and attitudes. As an optical device, the cinetheodolite could also collect visual information on film not captured through electronic instrumentation (Test Department 1953:1).

4 Optical instrumentation stations at WSMR are assigned designation letter: “G” for cinetheodolites, “T” for telescopes, and “B” for ballistic cameras

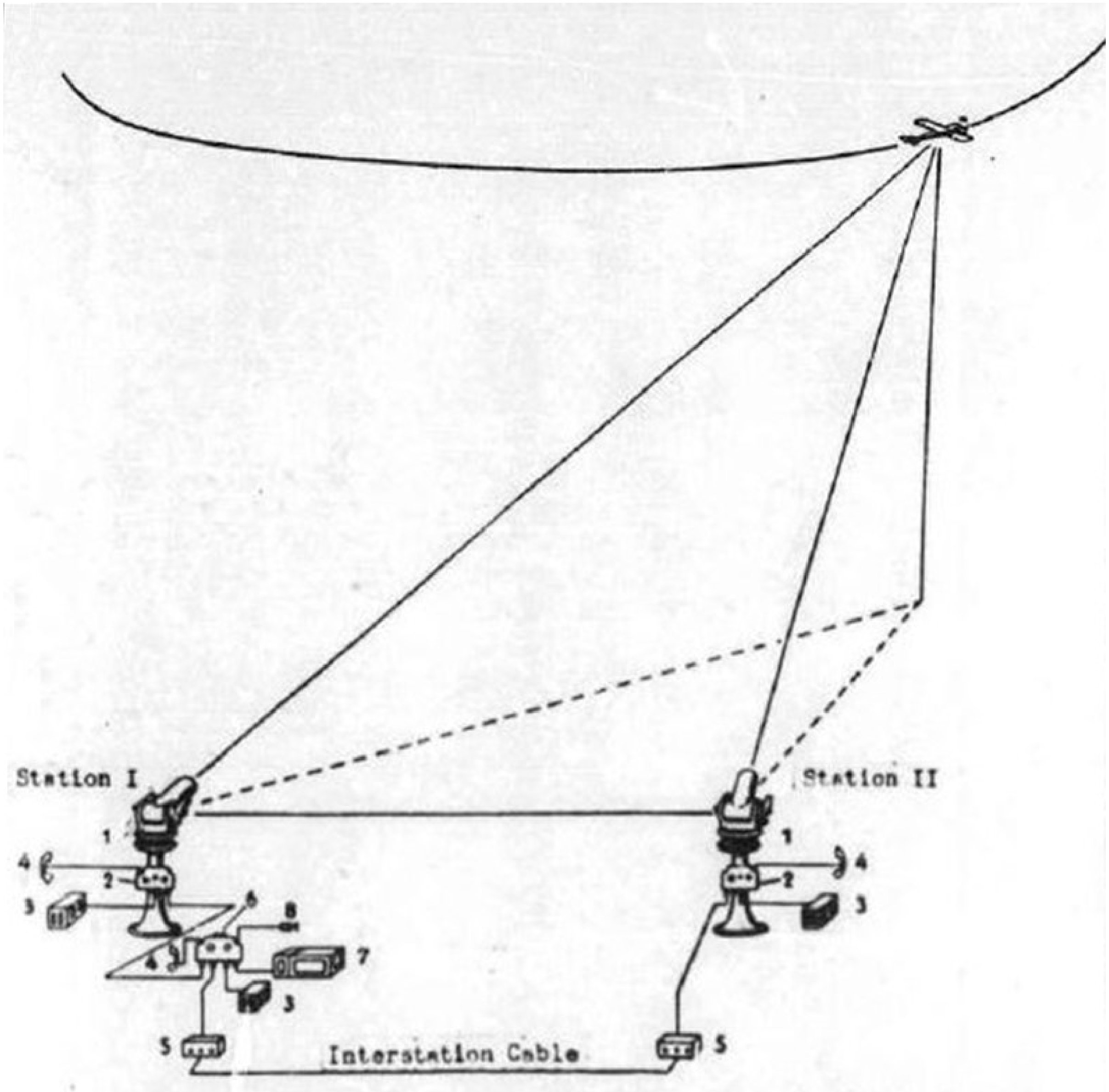

Figure 26. Schematic of how theodolites track azimuth and elevation and position (*adapted from DTIC AD221126)*.

Rocket and missile testing by the Germans during WWII called for more of this specialized data collection. Designed and manufactured in 1940 and 1941 respectively, the GTK 40 and Kth-41 were the first metric instrumentation devices ever designed (Delgado 1981:706). Built by Askania Werke A.G. in Berlin, these first generation cinetheodolite units were used at the German Peenemünde missile development center along the German Baltic coast. The revolutionary aspect of these first generation cinetheodolites was capturing the position data onto film as it happened in real time.

These highly prized instruments were salvaged from Germany and brought to the US for the exclusive use at military test ranges. The US had attempted to replicate the instrument based on

Figure 27. Early use of Askania Cinetheodolite at WSPG, circa 1945 (*Bellinger Collection, WSMR Museum Archives)*.

a unit acquired before the war but could not duplicate the precision attained by the Germans. Technicians at WSPG restored and modified captured Askania cinetheodolites for use on their ranges as early as 1946; some of the recovered Askania cinetheodolites had been dumped into the Baltic Sea to prevent their capture as Allied forces closed in on Peenemünde (Kammer 1997). The Navy also modified captured Askania cinetheodolites and put them to immediate use on their ranges. Test ranges also used the American-made Mitchell and Akeley types. Known to be less accurate than the German-made Askania's, they were designed primarily for measuring the performance of aircraft, training antiaircraft gunnery crews, and recording positions of antiaircraft bursts (Test Department 1953). The cinetheodolite served as a critical tool on American missile test ranges and was continually improved through the second half of the twentieth century.

Subsequent generations of modified Askania cinetheodolites would be introduced into the ranges, most being modified versions of the captured GTK-40 and Kth-41 units. Even with constant maintenance and modifications, the Askania's would only have a limited lifespan, particularly with constant use. The next generation of cinetheodolite were vastly improved Kth-51 and Kth-52 models in the 1950s. The follow-on Kth-53 was the most prolific and be-

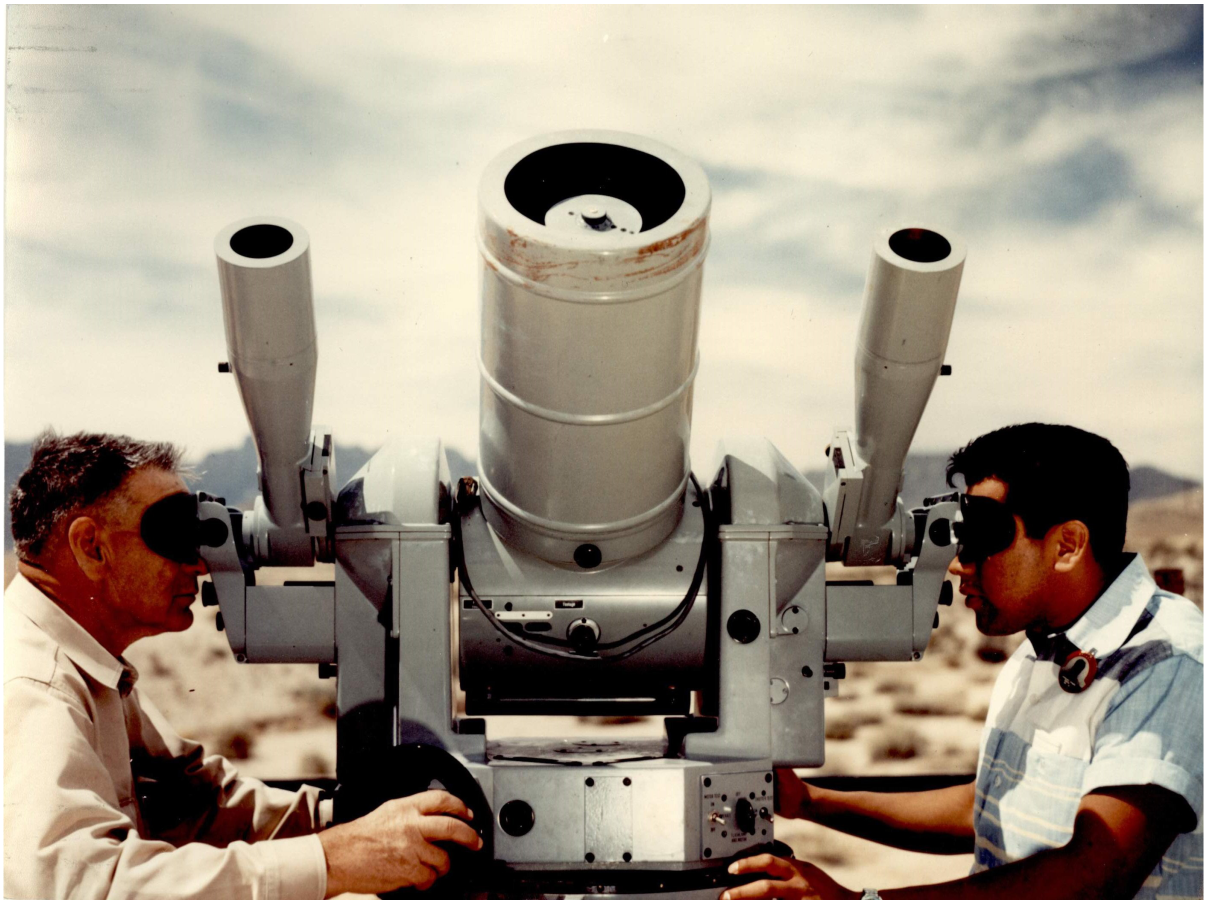

Figure 28. Kth-53 Cinetheodolite, circa 1955 (*Bellinger Collection, WSMR Museum Archives)*.

came a mainstay of the range, consisting of over a third of the cinetheodolites used at WSPG. Based on a map reproduced from a 1963 report, the cinetheodolite installed at Salinas Peak in 1959 was a Kth-53 model (Korfmacher 2015:27).

Although cinetheodolites were used until the 1990s at many US missile test ranges, new technologies began to supersede them in the 1970s. The Kineto Tracking Mount (KTM) system made its way into the DOD range system in the mid-1970s, and the Automatic Laser Radar Instrumentation Test Equipment (ALRITE) and Laser Detection and Ranging (LADAR) systems was developed by General Telephone Electronics (GTE) in the 1970s.

Specific to desert environments is an optical effect dubbed “atmospheric boil,” first described in a post-WWII article (Riggs et al. 1947:15-20). The results of the study revealed that between the hours of 6 a.m. and 4 p.m. the heat buildup at ground level creates a shimmering effect that distorts images. Based on a number of reports that emerged in the early 1950s, desert ranges worked to resolve the issue, the solution of which was to elevate the instruments well above grade.

In addition to the atmospheric boil issues, climatic effects on the instruments had also become enough of an issue at WSPG for the instrumentation department to seek solutions. From 1950 to 1955 WSPG expanded the range, constructing multiple permanent instrumentation shelters for cinetheodolites. These early instrumentation buildings were concrete frame buildings with concrete block walls set on thick concrete foundations. These simple, robust buildings were mainstays for a whole generation of cinetheodolite tracking activities. Rectangular or square in plan (generally 12-foot by 14-foot and 18-foot by 28-foot) and one story in height, these buildings featured a flat roof with a tubular steel safety railing around the perimeter. In an early attempt to protect the equipment while not in use, the Army installed hydraulic lifts that allowed the pedestal and Askania cinetheodolite to be raised through the roof level for use, and brought back down inside for storage and servicing.

Figure 29. Single cinetheodolite building, circa 1951 (*courtesy WSMR Museum Archives)*.

Figure 30. Interior of single cinetheodolite building, circa 1951 (*courtesy WSMR Museum Archives)*.

Another factor was the effects on the film used to record test events. Besides the issue of temperature fluctuations causing shrinkage problems and therefore interpretive inaccuracies, low humidity caused the film to be brittle; dimensional stability is a critical factor in reading and interpreting the data on the film. To make matters worse, engineers at WSPG were reporting dust infiltration that was leaving spots on the electrostatically charged film (Pike 1954). Other subtleties affecting performance and accuracy arising from temperature and humidity variations include refraction in the lenses, dimensional instability of plastic components, effects on viscosity of internal lubricants, and longevity of supporting electronic equipment. The critical factor in working towards controlling the environment would be easing the equipment into the extant outside conditions when preparing for use—if not, many of the issues could quickly arise again, particularly condensation and dimensional stability of plastics and film.

In an attempt to mitigate some of the aforementioned issues plaguing the cinetheodolites and

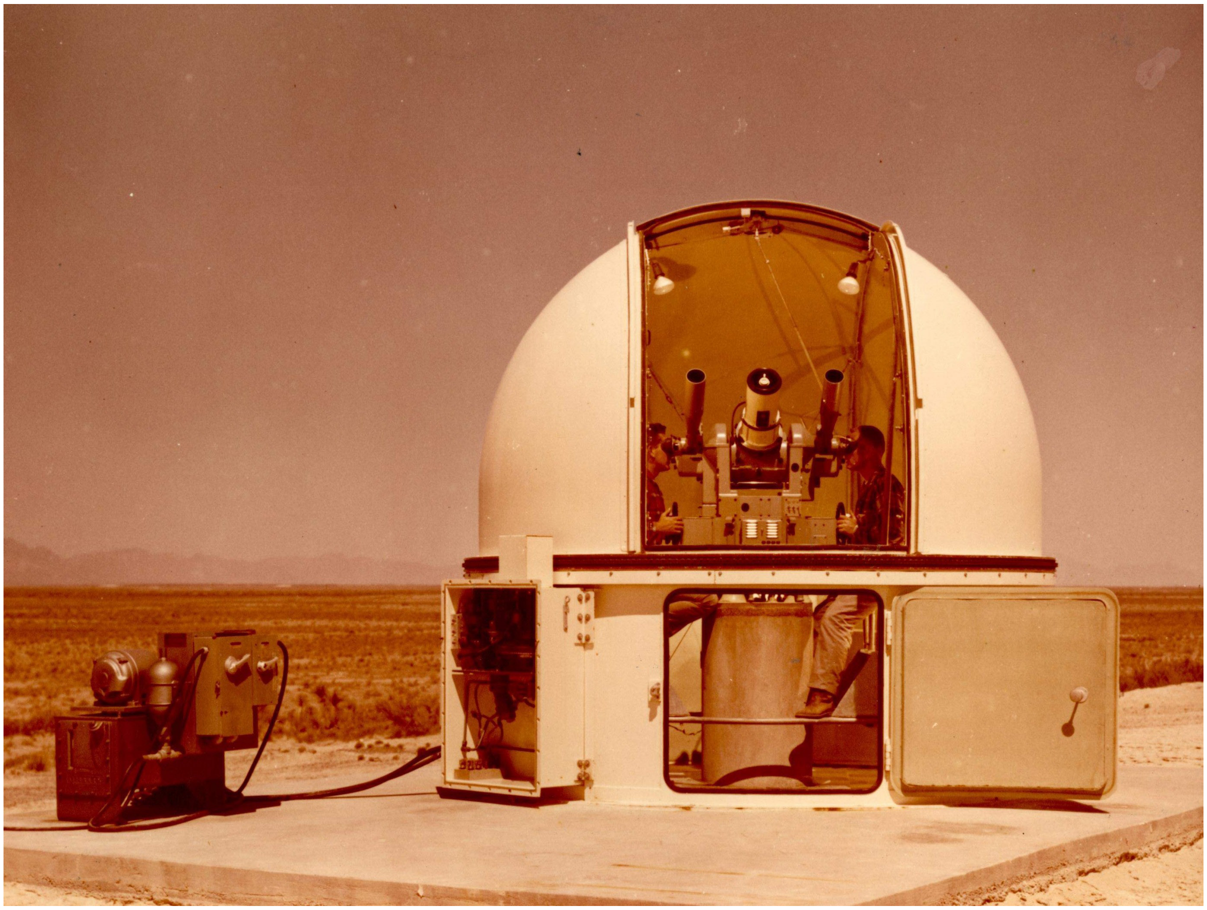

Figure 31. 10-foot Parabam astrodome with hydraulic drive unit (*Bellinger Collection WSMR Museum Archives)*.

reduce costs, the next generation of cinetheodolite shelters began by employing concrete slabs on raised earthen berms on which a shelter, dubbed an "astrodome," was placed (Esser 2017). The slab provided rigid stability for the cinetheodolite and, like the hydraulic lift, the 8 to 10 foot elevation of the cinetheodolite above grade helped reduce atmospheric boil. Initially developed by the Navy at the Naval Ordnance Test Station (NOTS) in California's Mojave Desert, the 10-foot diameter astrodome created a new standard for housing a cinetheodolite controlled by a single operator; the sun, wind, dust, heat, and fluctuating humidity levels would be minimized, all the while significantly expanding daytime usability. The design was turned over to Parabam, a newly-formed California-based company who would sell hundreds of these particular units in various sizes to WSMR for over a decade.

The nature of the innovative design allowed for rotation of the upper portion which provided much needed protection from direct sunlight, and the use of window-type air-conditioning units allowed for a degree of climatic stability. The astrodome would be widely used at WSMR, though few if any, remain in use today. Currently, most optical instrumentation is carried on mobile units.

More versions of optical instrumentation structures utilizing astrodomes would be developed in the late 1950s, mostly elevated steel frames with cylindrical concrete cores to stabilize the sensitive optical instruments. One specialized version was designed to house the ROTI. Designed by Perkin-Elmer Corporation, a specialist in optical instruments, the ROTI was a tracking telescope that had been in development for six years under an Air Force contract. Mounted on a naval gun mount, two huge telescopes were mounted in an over-and-under configuration, each having different focal lengths to cover a range from 50 to 500 inches. The bottom telescope covered 50 to 100 inches in 25-inch increments, while the upper took the 100 to 500 range in 100-inch increments. A specialized camera system had been contracted known as the Synchronous Position Attitude Recorder (SPAR) camera system, but did not meet expectations and was replaced by 70mm Mitchell cameras, one for each telescope. These were designed to have frame rates up to 80 frames per second (Bateman 1962: i,1,3). The cameras provided a permanent photographic record of missile performance such as position, velocity, acceleration, flight time, event and intercept miss-distance data. This brought the instrument closer to being somewhat of a hybrid of a tracking telescope and cinetheodolite (Bellinger 2000).

The ROTI Mk I was a significant advance over its predecessor, the IGOR Mk I, an early 1950s tracking and recording, manually operated tracking telescope, 13 of which had performed with great success (Wosika 1959:8). The ROTI could be operated with one person, whereas the first-generation IGOR was a two-person instrument – one for azimuth and one for elevation.

Figure 32. The ROTI Mk I optical instrument, circa 1959 (*courtesy WSMR Museum Archives)*.

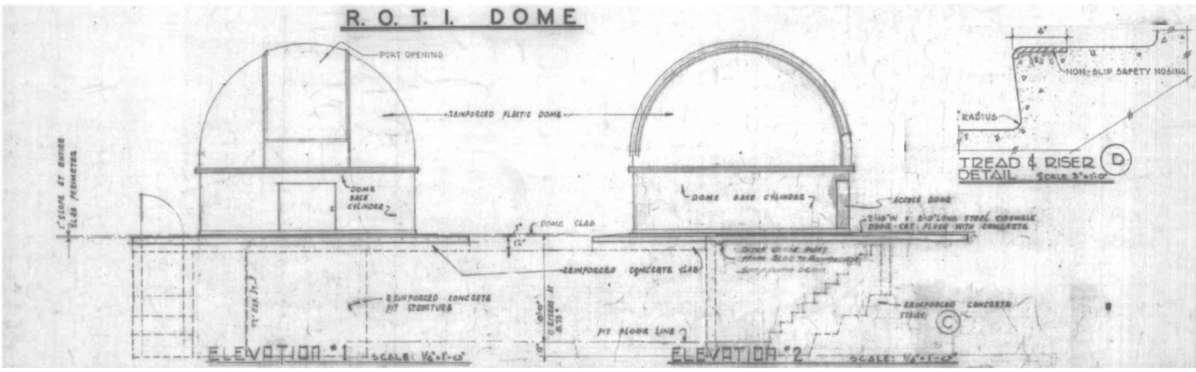

Figure 33. Two elevations of the ROTI reinforced concrete structure with 16-foot diameter astrodome from 1958 WS-HJ plans.

Unfortunately, the ROTI Mk I system did not perform to specifications and ultimately the contract was cancelled. However, the Air Force took delivery of the two completed units “as-is” from Perkin-Elmer in October of 1960. The first was installed at Bate Site just west of the HAFB boundary with WSMR (Bateman 1962:3-4, 35). In 1961, the second was installed at Salinas Peak. It is interesting to note that, while the two units were installed and put to use, the 1962 report only concluded that both units had not been fully evaluated and therefore no determination had then been made to determine the “feasibility and desirability of having both instruments brought up to present WSMR theodolite-type telescope capabilities” (Bateman 1962:41). However, a 1981 history on optical instrumentation states: “From all reports, it was a superb instrument that met or exceeded all expectations” (Delgado 1981: 705).

For the ROTI instruments, a special below-grade, reinforced concrete “pit” was developed. The sheer size of the unit and its attendant Navy Mk-30, 5-inch, 38-caliber gun mount likely needed access below for the hydraulic lines to drive the mount as well as the 16-foot astrodome – no above-grade hydraulic lines or electrical/communications cables are evident in historic images. Only two structures were constructed since only two ROTIs were ever installed at WSMR. More detailed information on the ROTI installation at Salinas Peak is found in Section 6.4.

Lastly, a reference to the presence of a ballistic camera at Salinas Peak was found in the 1967 Instrumentation Facilities Maps, identified as B-168, a semi-permanent facility. While it could not be verified and no known structure was ever constructed for the camera, its specific, assigned number is strong evidence of its existence. The following brief overview provides context should evidence be discovered of its presence on the site during the Cold War-era.

Used only at night, the ballistic camera utilizes a sequential shutter to record missile trajectories against a star background. A ballistic camera is unusual because it only works at night and records everything on a single photographic plate. It operates by exposing the film plate just before a missile test to the field of stars and records their streaks across the sky. Then the shutter is opened a second time to record light from the streaking missile as it travels across the field of stars. The stars then become the reference points for precisely measuring the position and speed of the missile. According to Bill Bellinger, range optics expert, ballistic cameras have relatively large random errors, but small systematic errors, where by comparison, radars

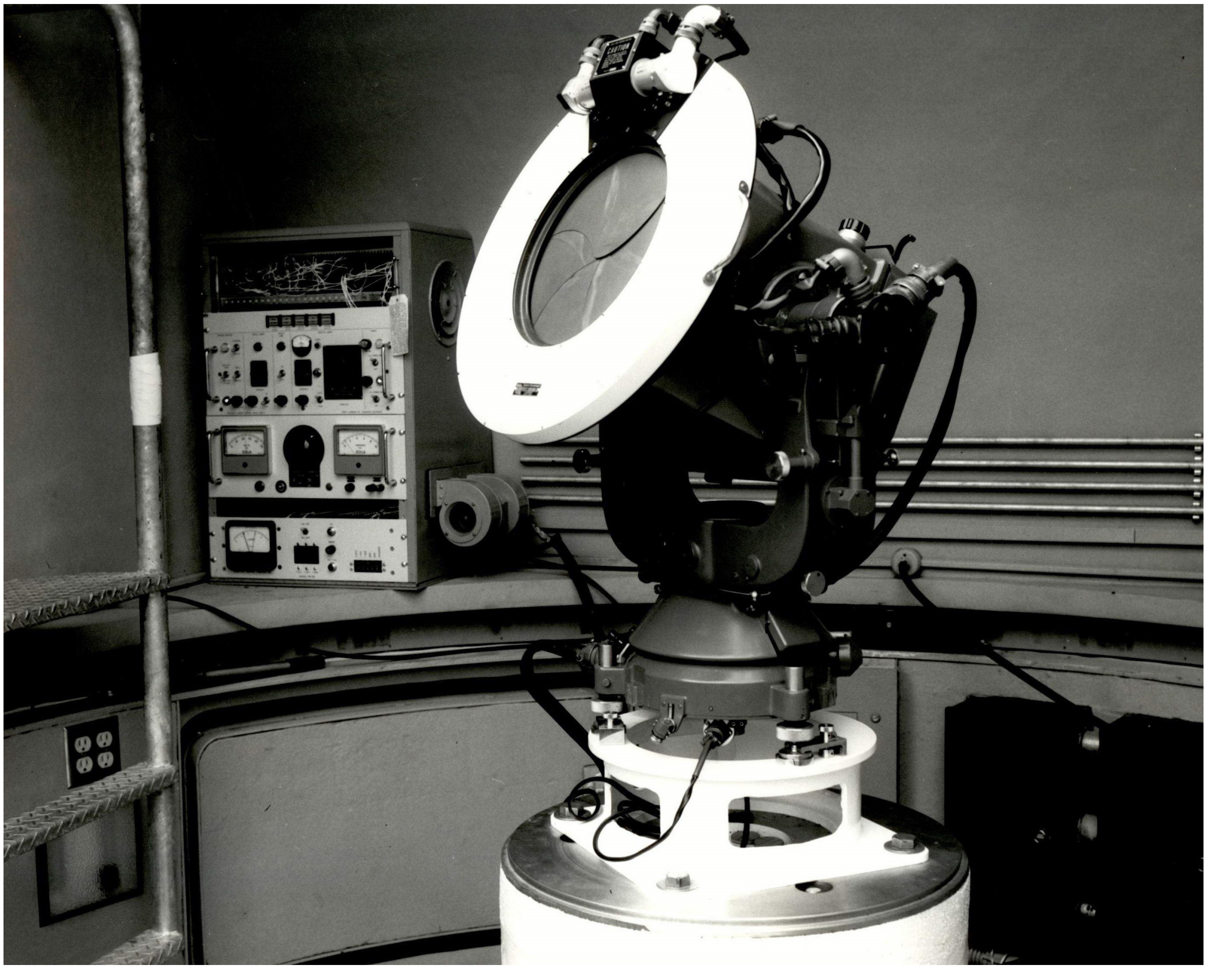

Figure 34. BC-4 “Star” ballistic camera, circa 1965 in 10-foot astrodome. Note large aperture and camera shutter (*Bellinger Collection, WSMR Museum Archives)*.

have large systematic errors, but small random errors (Bellinger 2000). The WSMR Ballistic Camera System (BC-4) was designed to record missile trajectory with enough accuracy to serve as a standard for measurement of the accuracy of other trajectory instrumentation systems (Bellinger 2000).

6.3.3 Range Time-Code Systems

In 1962, Salinas Peak was chosen to be a relay station for a new time-code system based on the Integrated Range Instrumentation Group (IRIG) standard. The system was designed to provide an upgraded universal time-code system for WSMR (Reynolds 1962).

WSMR relies on an array of optical and electronic instrumentation, much of which is used simultaneously for test events. Each of these instrumentation devices is carefully synchronized to a central timing station to assure the varied types of data are precisely aligned in time. Similarly, all range instrumentation is integrated into a precisely surveyed spatial grid that covers the range horizontally and vertically. This allows all instrumentation measurements of a test article’s flight path to be translated into highly accurate spatial coordinates. This synchronized timing process saved countless man hours in the data reduction process (Poisall 1956:1). As the Cold War progressed, the technology for timing was continually improved.

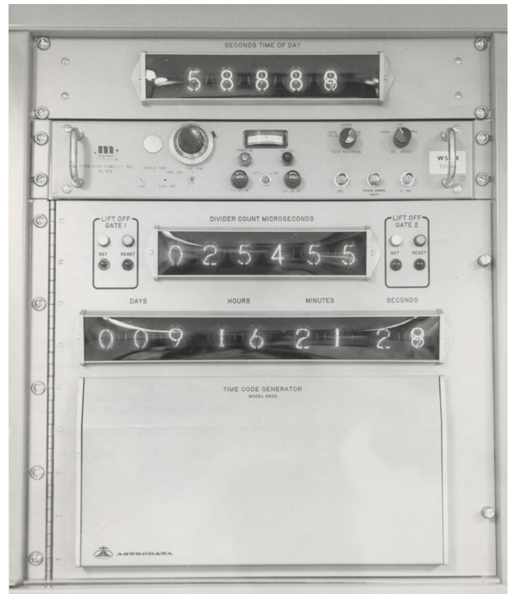

Figure 35. Astrodata Master Time code generator, 1967 (*WSMR Museum Archives)*.

Joe Gold, a range pioneer, mentioned one of the first instances of time-code generation in a historical summary of the Physical Sciences Laboratory (PSL). Gold recalled that during one of the early V-2 launches at WSPG in 1946, "pointing angles being recorded on film at the rate of four data points per second. Timing signals [were also recorded] so that all the data collected at other such sites around the range could be reconciled" (quoted in Bumgarner 2011:17).

This early method of time correlation was limited to encoding data with a time stamp within the instrument data itself, as opposed to the institution of a master clock that provided a universal time signal to the instruments. The ultimate goal was to align the time code in ever-narrower increments to fully extract the most precise information from multiple data sources. Equally important was to significantly reduce the amount of time it took to reduce data for flight analysis by hundreds of hours.

In 1951, a radio link carrying an 8,000 cycles per second, carrier timing system was set up between the Main Post and Army Blockhouse at LC-33, then ALA-1. This was the first step in anticipation of a planned link between the time standard at the WSPG Main Post and U-Station, just west of ALA-1 (Simmons 1952:112). U-Station would become the main time-code generation source for the range instrumentation system. In 1946, the BRL had named instrumentation stations on the south end of the range using letters as identifiers. U-station was originally set up as one of three Bowen-Knapp camera stations. The letter" U" would ultimately become the letter identifier for any timing facility, such as U-52 at Salinas Peak.

In 1956, a new, ultra-high frequency "multiplexing" system was installed by the Flight Determination Laboratory (FDL) to provide timing signals for "all instrumentation agencies" at WSPG. Designed and installed by the Radio Distribution Section of Timing & Control Unit, Field Measurements Branch in collaboration with the Radio Engineering Laboratories (REL), time generation signals were fed into multi-pair cables from the Time Generation Unit at Main Post. The system was capable of remotely starting instrumentation recording for a test event, and hard wire lines were planned for all new instrumentation installations. Concurrently with the new multiplexing system, the Commanding General included in the list of significant achievements of 1956-1959, the development of the Time Signal Code Reader (TISCOR). TISCOR made it possible to "program timing in automatic data processing systems and to convert standard timing at WSMR into other signal configurations required to meet the needs of some missile contractors to analyze their data" (Laidlaw 1959:1).

In 1962, the aforementioned ARTRAC system posed challenges for the timing systems implemented in 1956. An ARTRAC timing study, of which Salinas Peak was part, revealed that an incompatibility of the two systems by one millisecond required completely new generation, distribution, and terminal equipment. Once synchronized, time signals would now be transmitted via microwave. The master time signal generator would allow transmission of ten separate channels of timing information over the RF distribution system with the use of time division multiplexing equipment (Range Instrumentation Directorate 1962: L-4-5). Little in the way of substantial changes to the system could be found after the implementation of ARTRAC. Amazingly, almost 30 years later, the timing distribution system at C-Station was still in use.

Towards the end of the Cold War, a description of the then current timing system was provided in the WSMR Range Capabilities booklet:

> The instrumentation timing system consists of central time-code generation, wire and radio distribution and timing terminal equipment. The time-code generation equipment consists of three IRIG time-code generators with automatic comparison and switchover should the on-line generator fail. The time-code generators are synchronized to Universal time coordinated by loran-C radio transmissions provided by the U.S. Coast Guard. The time- code accuracy is ±25 microseconds with correlation between on-range instrumentation sites ranging from ±10 microseconds to ±1 millisecond… WSMR has six stationary timing stations in the southern range area and five mobile and eight stationary timing stations in the central and northern areas. The timing system also consists of airborne time-code generation services, satellite timing receivers, ground-to-air timing and a mobile clock facility. A small van is used to provide the airborne time-code generation services which include installation of range-furnished time-code generators or radio receivers in aircraft and the synchronization of range- and customer-supplied airborne time-code generators to range time. The mobile clock facility performs direct time transfer and time delay and correlation at remote instrumentation and distribution stations [WSMR 1986:87].

The WSMR timing system consists of a master clock and timing generation system and a network of distribution stations. The area timing distribution stations serve radar, optics, and telemetry, as well as provide support to major test facilities, laboratories, launch complexes, NASA, and commercial users.

As discussed earlier, plans were made in 1958 to develop the Salinas Peak site which initially was planned as a communications relay station and instrumentation site. The 8,965-foot elevation site was large enough to house multiple buildings and structures, and must have been seen as an ideal location for optical instrumentation, most of which was placed in the Tularosa Basin and the somewhat elevated alluvial fans of the mountain ranges that flanked the basin on the west and northeast sides. The development of the Salinas Peak site is discussed in the following section.

Figure 36. Portable clock van for mobile cinetheodolite, circa 1965 (*Jim Andress Collection, WSMR Museum Archives)*.

Figure 37. Astrodata timing distribution system at C-Station, 1992 (*courtesy WSMR Museum Archives)*.

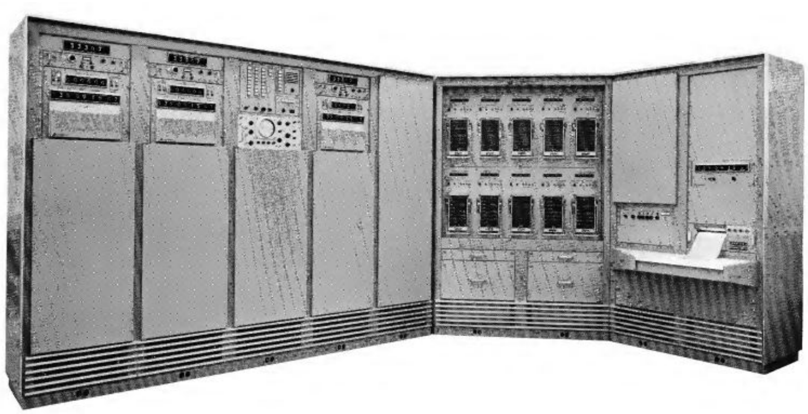

Figure 38. Photo of Astrodata timing distribution system from 1963 brochure.

6.4 Cold War Evolution of Salinas Peak Site

Salinas Peak was established slightly later than most of the WSMR communications and instrumentation facilities. Its elevation and treacherous access likely made it less than desirable to pursue in the early days. The Alamo Peak site, at an elevation of 9,270 feet in the Lincoln National Forest, had served as the range-wide microwave relay link since 1947. It was supplanted as the primary hub in the early 1960s by Salinas Peak. North Oscura Peak, at 7,976 feet, is located within the boundaries of WSMR, and historically served as a Chain Radar link and communications relay. A lesser-known site, San Andres Peak, at the southern end of the range, was set up in the early 1950s as an instrumentation site. Accessed by a tramway system constructed in 1947 (WSMR 1959:1), a cinetheodolite was installed with a shelter and accompanying service building. Used for only about five years, it was ultimately abandoned because of the difficulty in accessing the site and discontinuation of high-altitude missile projects requiring this type of facility (Billups 1959:6).

According to Tom Starkweather, a WSMR employee who wrote many historical articles for the *Missile Ranger*, the name Salinas Peak was coined for the location of a large salt deposit (Starkweather 1990:12). The earliest known reference to Salinas Peak at WSMR is found in *Wind and Sand*, where a 1957 article stated that personnel performed an air reconnaissance trip scouting for new uprange sites on April 10, 1957 (Caldwell 1957:2). Jim Andress, former communications engineer and Branch Chief, recounted his experiences in conquering the peak a year before the road to the site was cut into the mountain (Andress 2007). Beginning in the early days of WSPG, the 4,000 square mile range was made available semi-annually for the public to hunt deer. Apparently, the impetus for accessing the mountaintop site was to provide the military police with enough radio coverage to keep track of all the hunters, particularly in the mountainous areas where it can be difficult to send or receive signals. The solution was to provide a radio repeater with an antenna at Salinas Peak, which provided the highest elevation at WSMR. Andress details how, at the time, the only way to access Salinas Peak was by foot

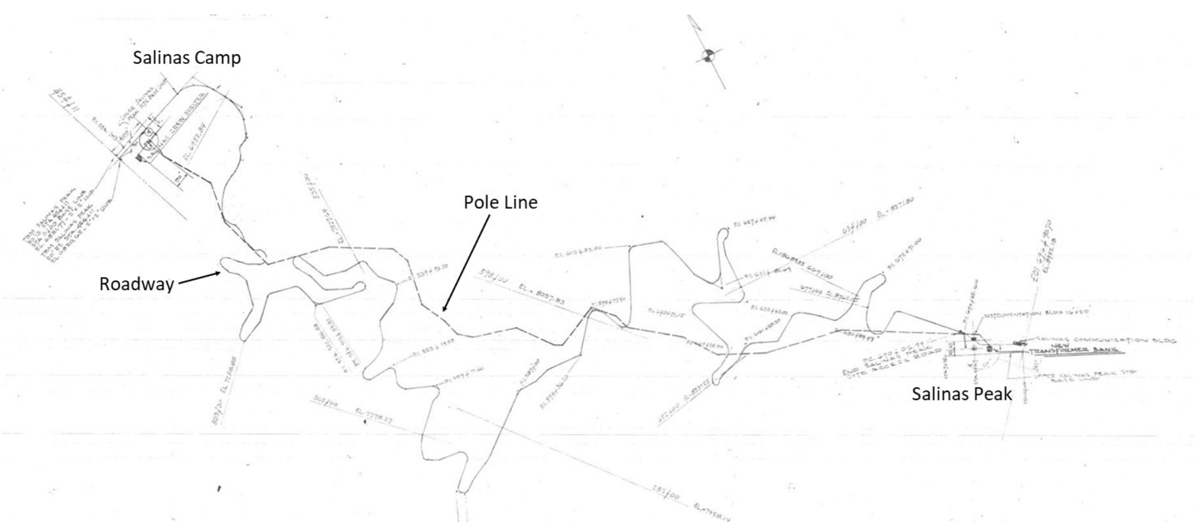

Figure 39. Roadway and electrical pole line layout from 1959 59083774-4 drawing.

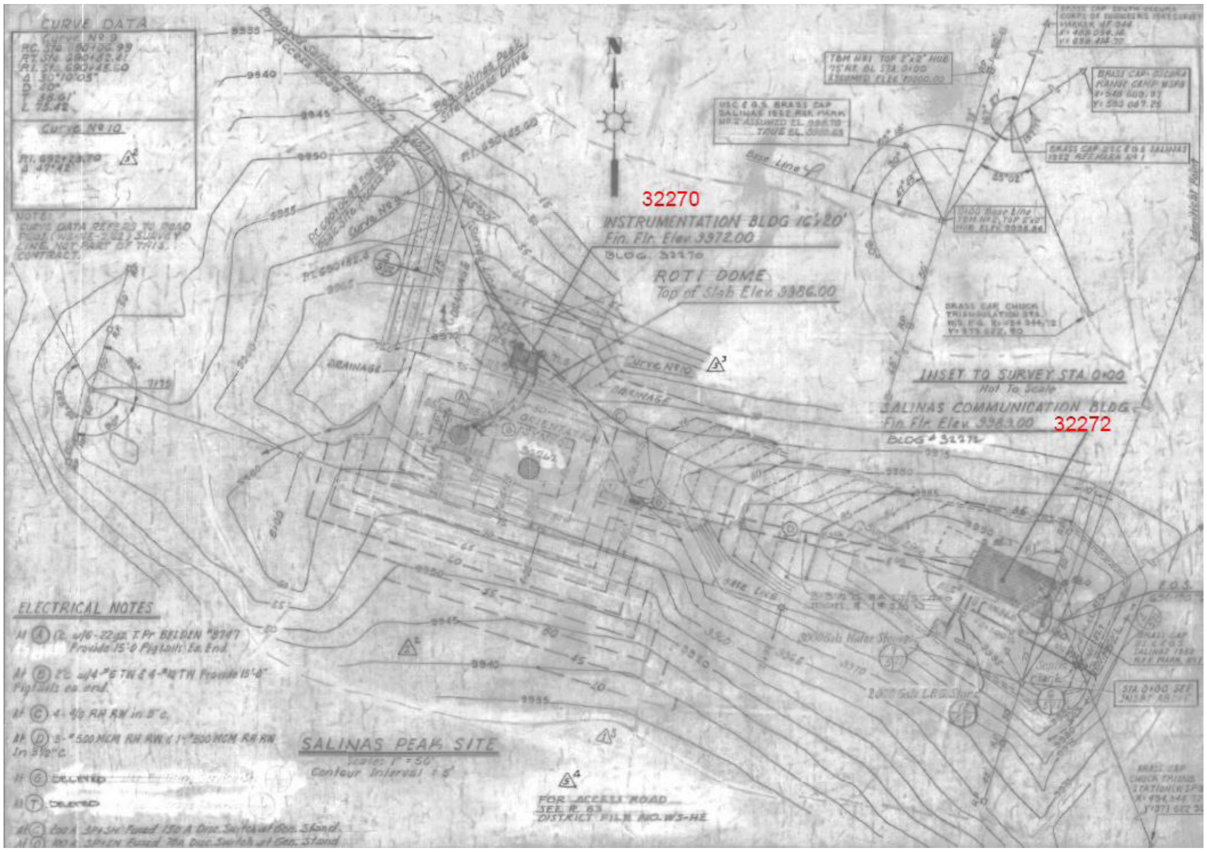

Figure 40. Salinas Peak site layout from May 1958 WS-HK plan set.

or helicopter, though few helicopter pilots dared maneuver the thin air and winds at almost 9,000 feet; a trail had been established a few years earlier and site cleared (Andress 2007). Even after managing to establish a base camp, the remainder of the trek was uphill, at times on a 45-degree angle using a Caterpillar tractor to blaze a new trail. Andress indicates that it was this and prior excursions that pushed station officials to establish a communications relay and instrumentation site. Wilson and Company, an A&E firm out of Albuquerque, was retained to design an access road in 1958 (Drawing WS-HE). The graded, unpaved road was cut on the west side of the mountain in 1959 which provided the first vehicular traffic access (Andress 2007:3, 6).

The original layout called for one permanent building, one semi-permanent support building, one ROTI facility, one cinetheodolite pad, and support infrastructure such as generators, water, propane, and septic. Plans for the site were developed in May 1958 (WS-HK) by the A&E firm of Kenneth S. Clark and Phillipe Register of Santa Fe, New Mexico along with numerous other instrumentation sites. The plans, entitled "Range Instrumentation Buildings, White Sands Missile Range," included the Communications Building (Property 32272) and two optical instrumentation sites (Properties 32262 and 32271), the first development phase of Salinas Peak. While a partner in the firm, Kenneth Clark is identified as the architect-engineer on the plans.

Kenneth S. Clark (1909-1990) is one of numerous architect-engineers recognized in a

Figure 41. Kenneth S. Clark, circa 1959 (*adapted from digitalrepository.unm.edu)*.

DOD-published guide to Cold War architectural firms (Moore et al. 2010). A 1932 graduate of Oklahoma A&M, he graduated with degrees in both architecture and structural engineering. From 1935 to 1938, Clark was the assistant state architect for the Works Progress Administration (WPA); he would briefly partner with another notable Santa Fe architect, Willard C. Kruger, from 1938-1942. Clark served in the US Army Air Force for the remainder of the war years—as an Air Force Captain he was also a reservist from 1936 to 1955 (Bowker 1956:97). He struck out on his own in 1950 and in 1956 partnered with Phillipe Register until 1960, whereupon he resumed private practice. That same year he was awarded the Department of the Army Certificate of Civilian Service (Moore et al. 2010:85). Clark also received an Atomic Energy Commission (AEC) Los Alamos Achievement Award (Bowker 1962:120). Clark would design many buildings for WSMR including specialized instrumentation buildings. Clark's specialty was combining his architectural skills with engineering expertise—much of his work was for military applications as evidenced by numerous commissions for the AEC at Sandia and Los Alamos National Laboratories, as well as over $23 million in technical support buildings at WSMR and adjoining HAFB from 1951 through 1965 (NMA 1966:20). In 1966, Clark, along with only 60 others in the US that year, was named a Fellow in The American Institute of Architects (AIA) (New

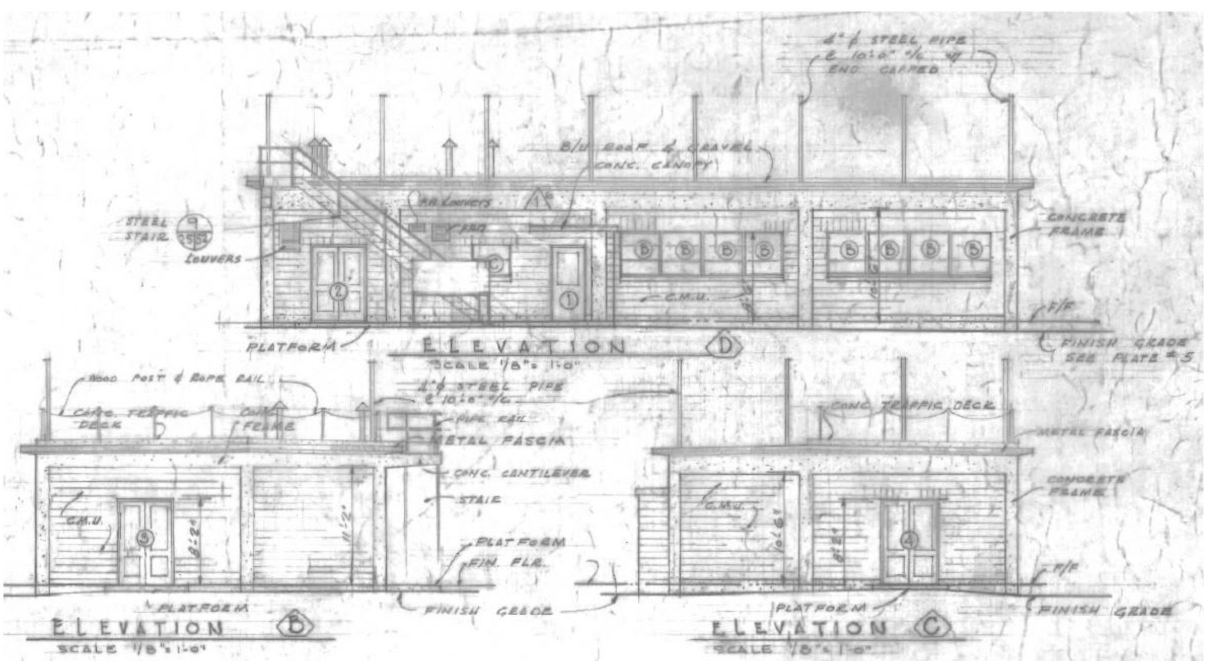

Figure 42. Property 32272 Communications Building - south, east, and west elevations from 1958 WS-HK plans.

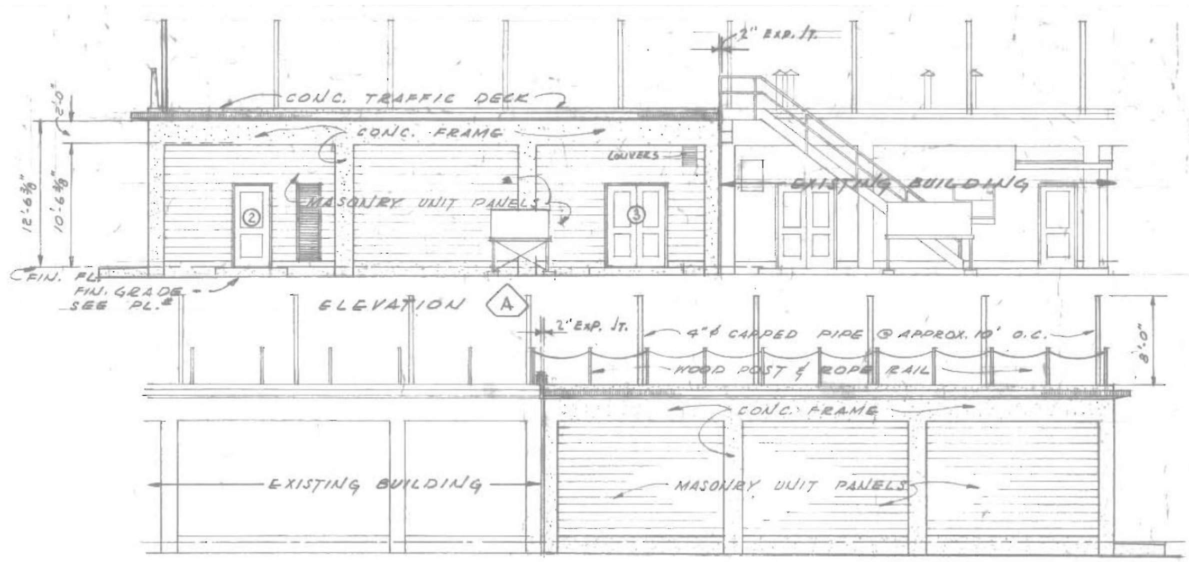

Figure 43. Property 32272 Communications Building with west addition, from 1959 WS-IN plans.

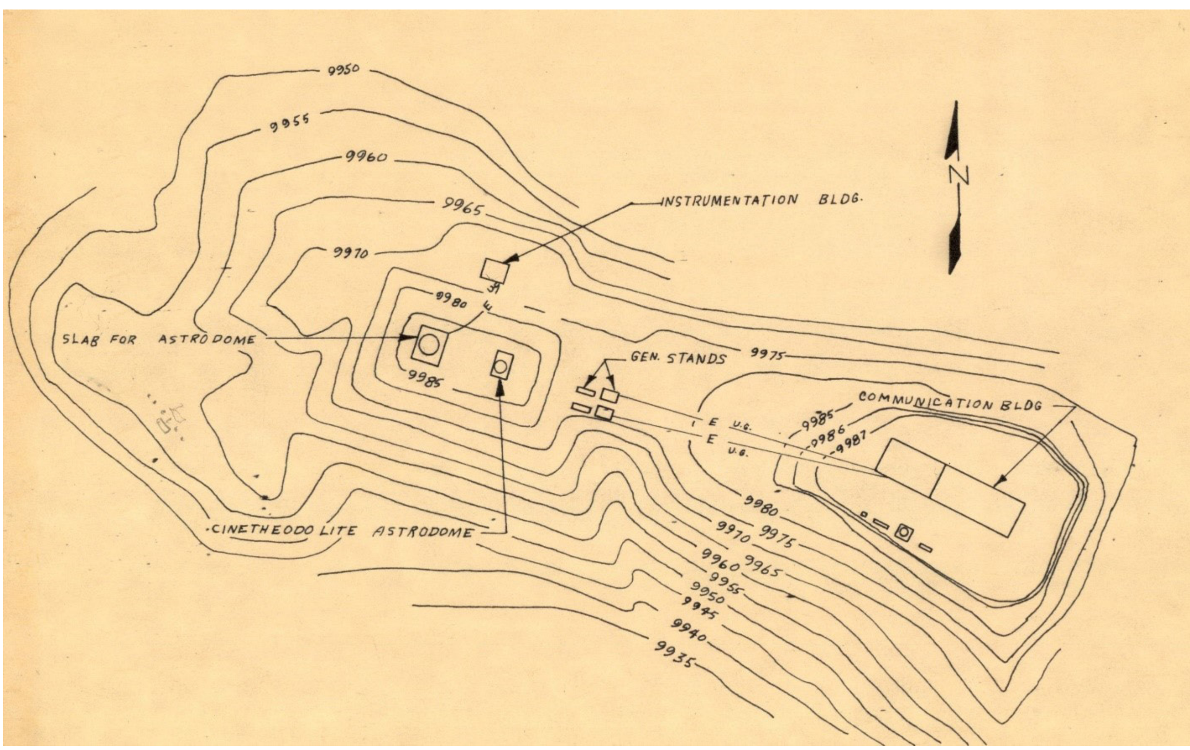

Figure 44. Site Plan for Salinas Peak, August 15, 1960 (*courtesy WSMR Museum Archives)*.

Figure 45. Site under construction, late 1960. Note 16-foot astrodome for ROTI has not yet been installed (*courtesy WSMR Museum Archives)*.

Mexico Architecture 1966:20).

The Communications Building (Property 32272), also referenced in official records as the Telephone Exchange Building, was completed by October 1959. The building is constructed with concrete post-and-lintel structural elements with concrete masonry unit (CMU) infill walls, and lacks fenestration on the north elevation. An addition to the west was planned within a year and was completed exactly a year later in October 1960; the addition extended the original footprint and was of essentially identical design and materials to the 1959 portion of the building. No photographs of the building prior to the 1960 addition could be located in archival records.

Salinas Peak was mentioned in *Wind and Sand* in April 1959, where an article on the ROTI indicated that the site would be home to one of the new tracking telescopes (Wosika 1959:1). Since delivery of the two units to WSMR was not until October 1960, it was not actually installed until at least the Spring of 1961.

The earliest source of electrical power came from a diesel-powered generator. From the beginning, two generator stands were placed to the west of Property 32272, but early photos indicate that only one generator was installed. A powerline was designed in 1959 that took a far more direct route than the serpentine roadway. Photographs suggest that the electrical power line was completed by early 1961. A small substation had been installed directly to the north of the

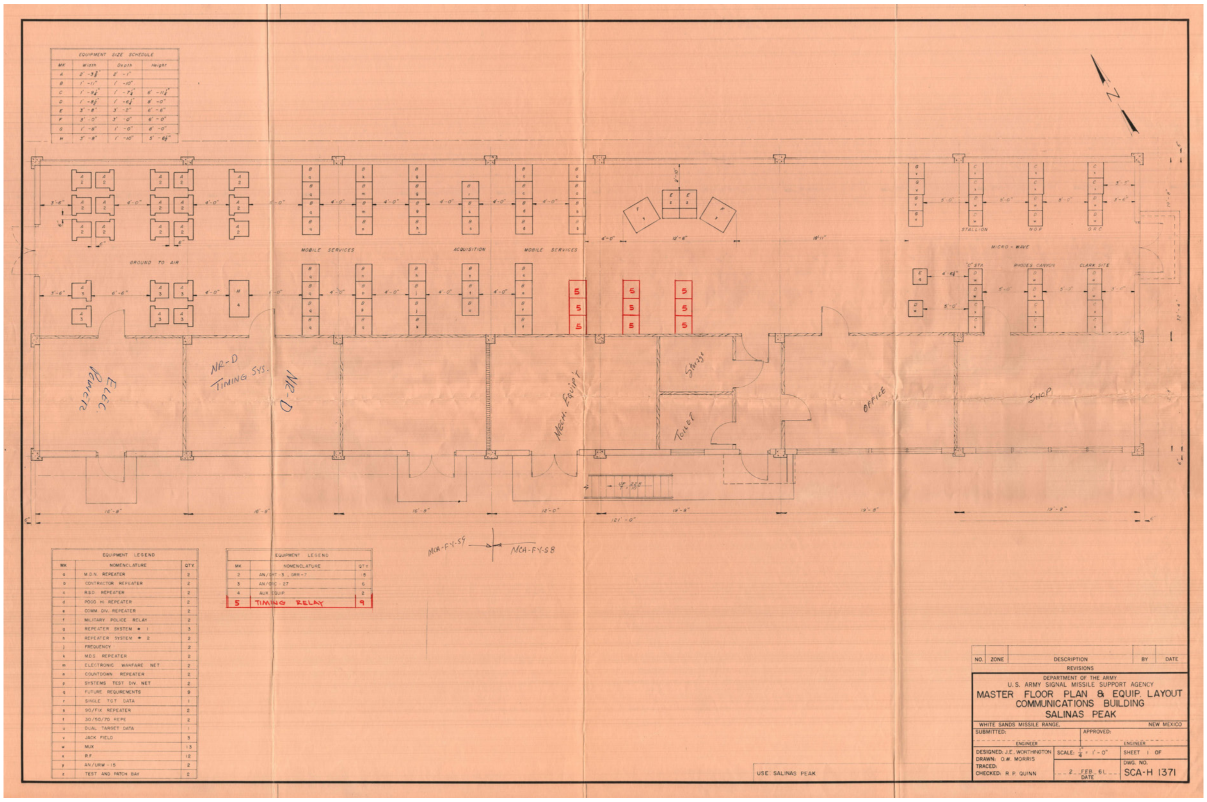

Figure 46. Floor plan of Property 32272 Communications Building, from drawing SCA-H1374 drawing dated February 2, 1961.

generator stands (Figure 45).

Water for the site was provided by a stand-alone 3,000-gallon tank (Property 32273; demolished). However, water had to be trucked in from a water source at Stallion Range Camp and brought up the treacherous incline which required the use of two trucks. The road grade near the base of the peak was too steep for a loaded 5-ton truck to climb, so another 2.5-ton truck was always used to help push the 5-ton truck and its tanker trailer to the top (Wind and Sand 1961).

By 1961, Property 32272 appears to have been fully fitted out with equipment and was up and running. A 1961 floorplan illustrates the different services installed in the building, including ground-to-air relays, mobile services, acquisition, and the six microwave relays as described by Jim Andress in 1963.

By 1963, the two optical instruments and their facilities had been fully installed (Properties 32262 and 32271). As described earlier, the ROTI was a specialized facility type with a concrete pit incorporated into its foundation. The ROTI foundation at Salinas Peak is no longer extant but the concrete portion of the facility is still intact at Bate Site. Images of the abandoned structure help illustrate what was once installed at Salinas Peak (Figures 48 and 49).

The cinetheodolite pad with 10-foot astrodome was placed just east of the ROTI and was designated a type "A" which was simply a concrete pad with a 10-foot astrodome. However,

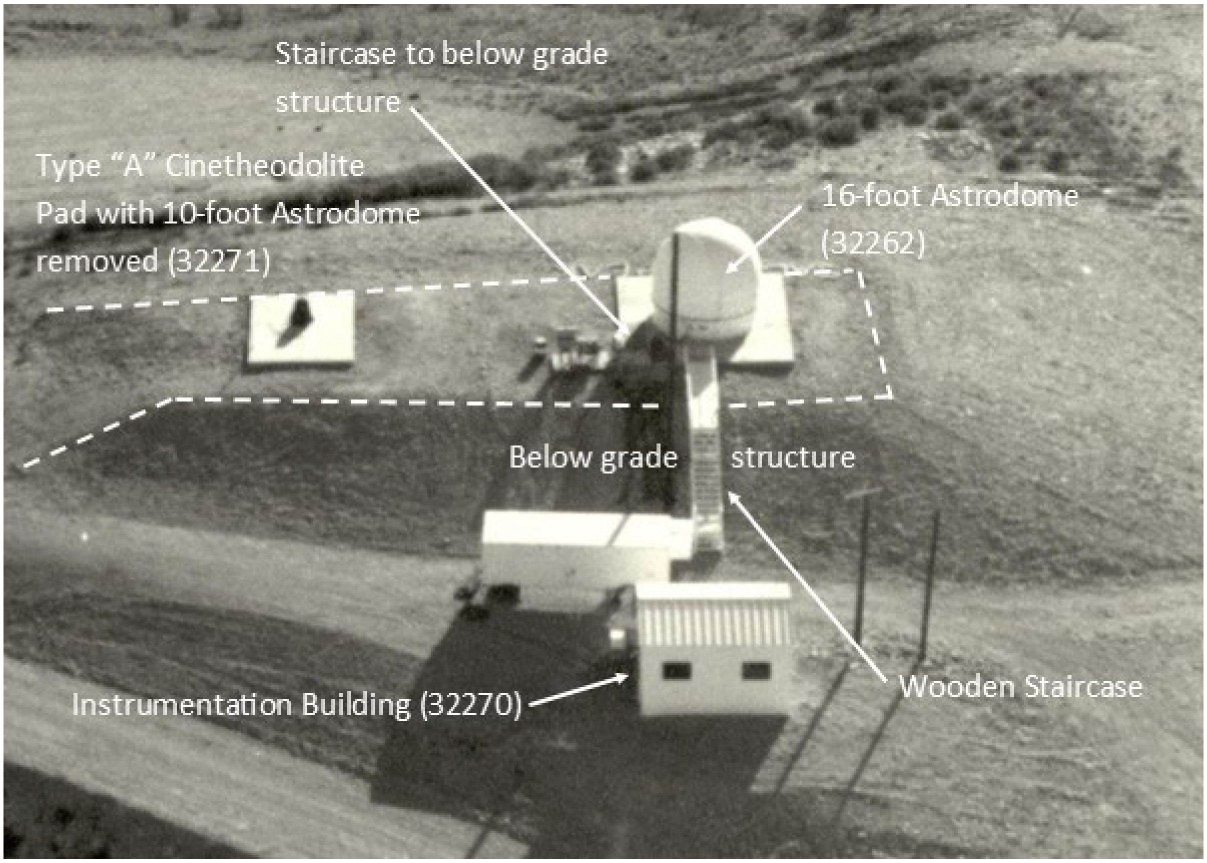

Figure 47. ROTI at Salinas Peak, November 26,1963 (*courtesy WSMR Museum Archives)*.

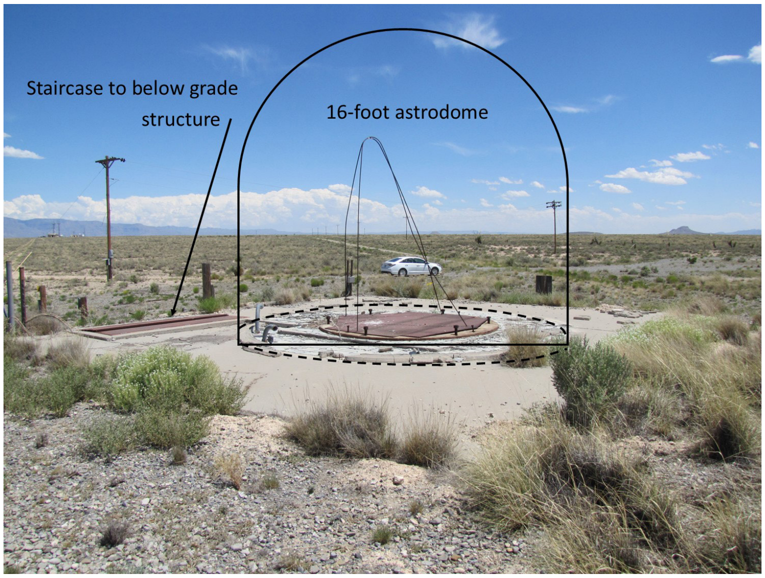

Figure 48. ROTI Structure at Bate Site, 2018.

Figure 49. ROTI Structure at Bate Site, 2018.

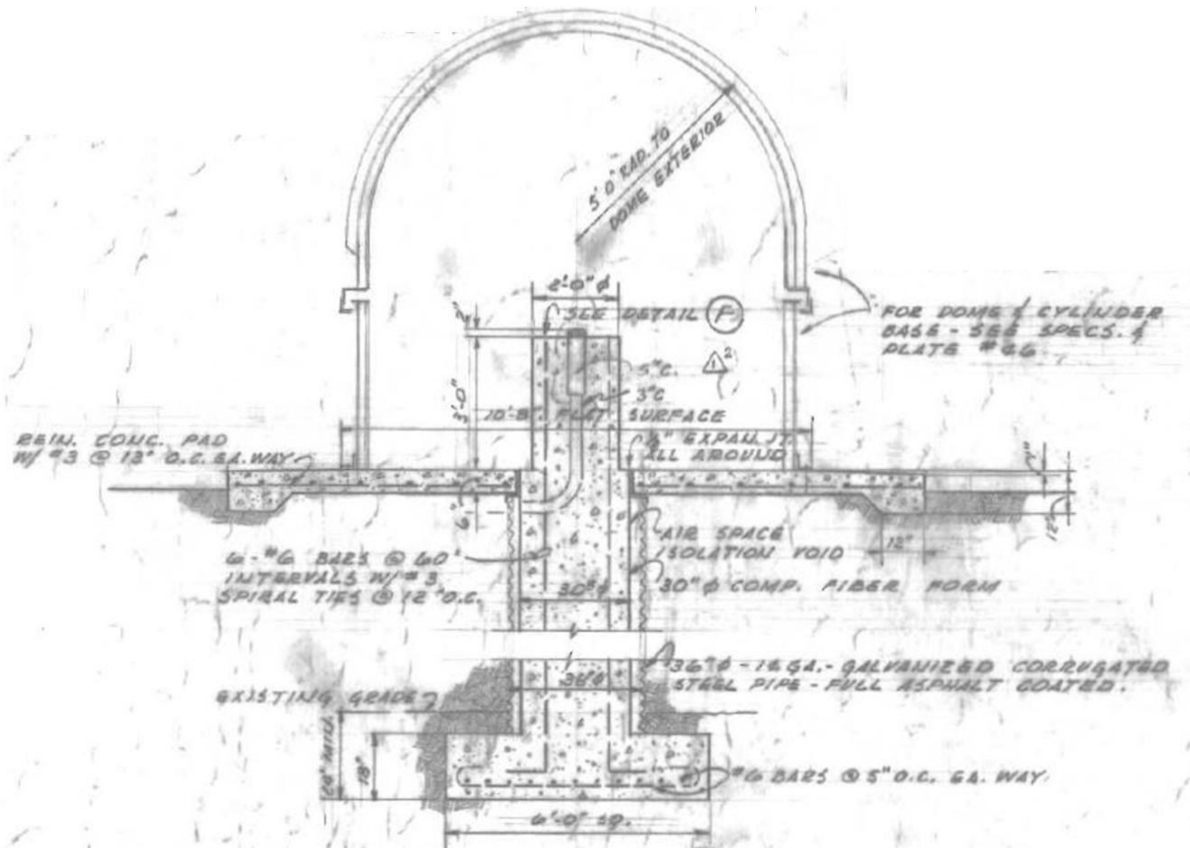

Figure 50. Cinetheodolite pad with 10-foot Type "A" astrodome, from 1958 WS-HK plans.

one additional component was the installation of a stabilizing concrete pedestal, standard on all that generation cinetheodolites, even those placed at grade (Esser 2017:30). It is interesting to note that the 10-foot astrodome and cinetheodolite were removed by 1963 as shown in Figure 47. However, target poles were installed for a cinetheodolite in 1964 and the dome reappears in the 1965 aerial image (WSMR 1964).

In January of 1962, a job order request was put out for the installation of a 3-foot square concrete pad with a 3-inch diameter by 9-foot tall steel post and tie-down anchors for an AN/TRC-29 antenna for the ARTRAC timing distribution tests (McClain 1962). No such structure could be located in the current site survey.

By 1963, a series of antenna poles had been installed on the north side of Property 32272, and soon after that, a steel-frame, 120-foot tower (Property 32264) was erected on the southwest side of the building. In November, a design was made for a second tower, a 60-foot tall, 18-foot square wood-frame antenna tower (Figure 59). Placed at the northwest side of the building, it was the second structure of any considerable height to be erected at Salinas Peak. This type of antenna tower was built in at least two other sites in the mid-1960s at WSMR. In both cases they were constructed for frequency monitoring stations, one south of the launch complexes, the other at Sacramento Peak in the Lincoln National Forest.

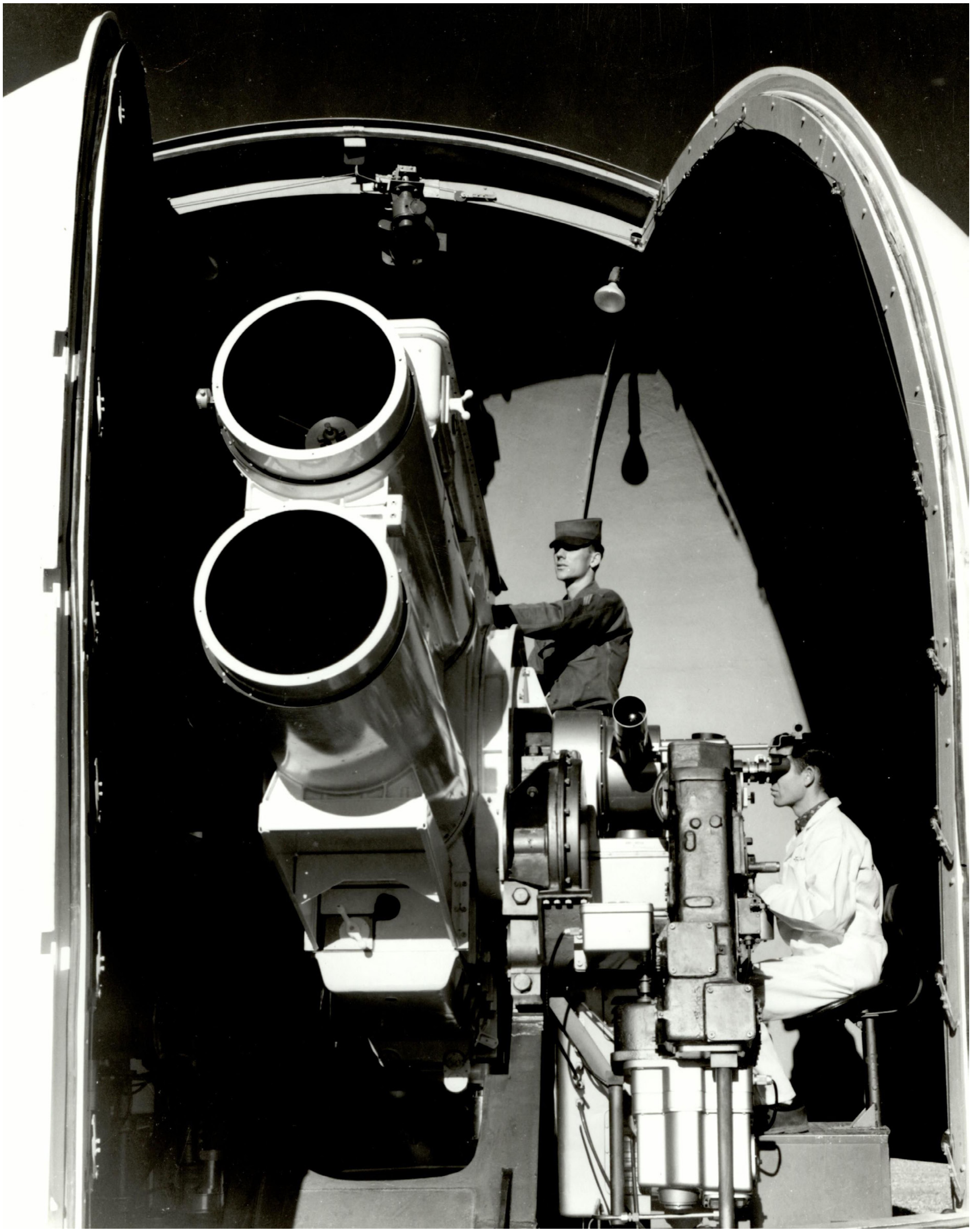

Figure 51. ROTI in 16-foot astrodome, circa 1963 (*courtesy WSMR Museum Archives)*.

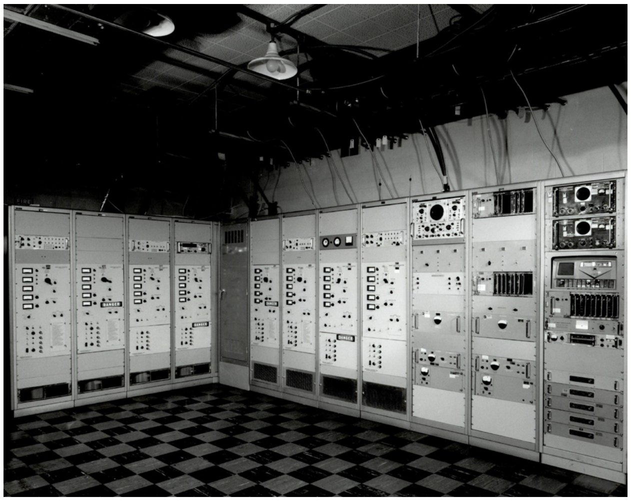

Figure 52. U-52 timing station at Salinas Peak, circa 1963 (*courtesy WSMR Museum Archives)*.

Figure 53. Variety of dishes and antennas on Property 32272, circa 1971 (*courtesy WSMR Museum Archives)*.

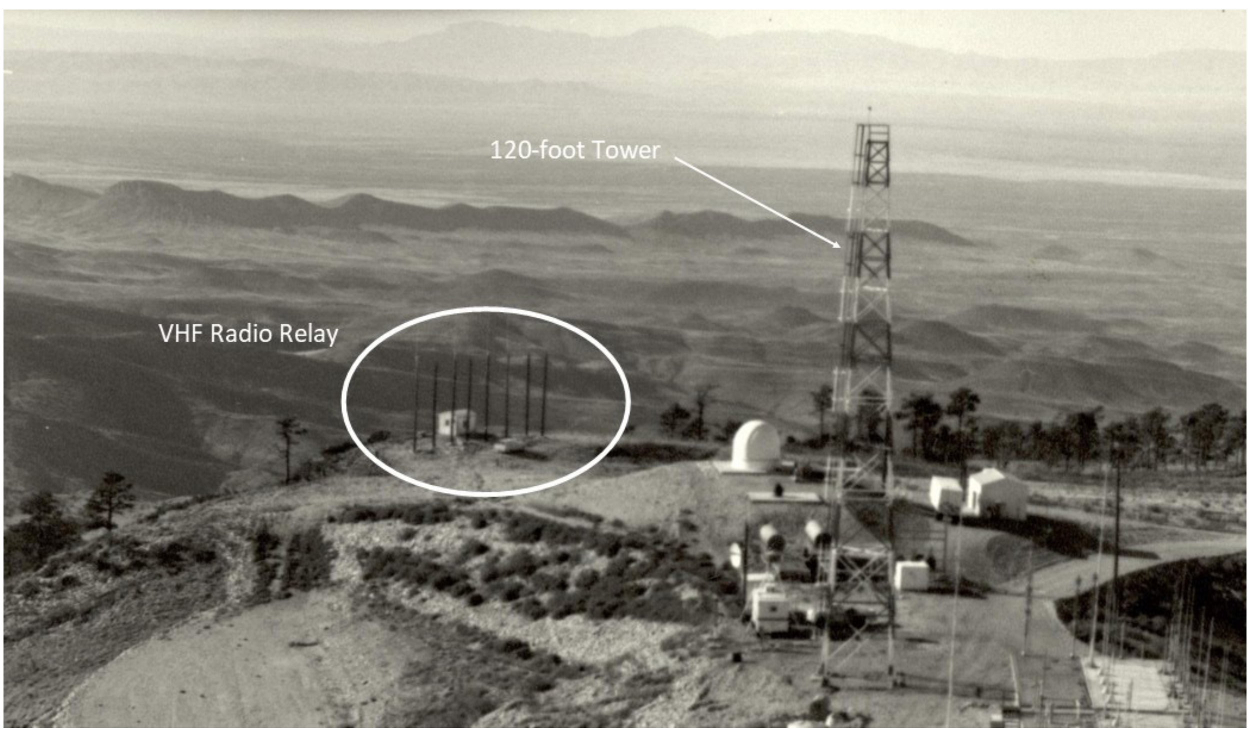

Figure 54. Salinas Peak, view to west, November 26,1963 (*courtesy WSMR Museum Archives)*.

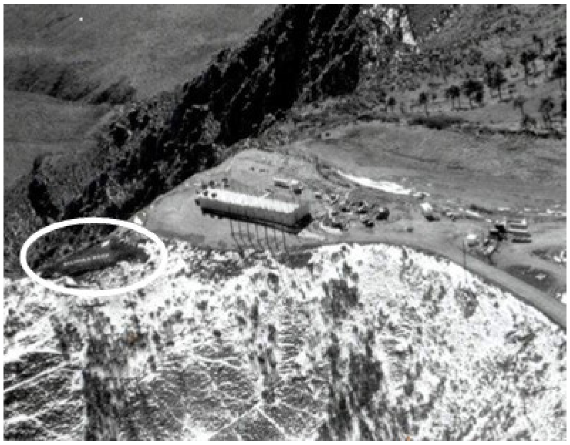

Figure 55. Site name in white-washed rocks at left, February 26, 1963 (*Jim Andress Collection, WSMR Museum Archives)*.

Figure 56. Site name in white washed rocks, November 26, 1963 (*courtesy WSMR Museum Archives)*.

Photos taken in February of 1963 also show for the first time another linear grouping of wooden antenna poles on the western end of the site. These served as antennas for Very High Frequency (VHF) radio relays. The radio relays served the wireless communication needs for numerous agencies, particularly those traveling the hugely varied terrain of WSMR.

A memo from 1963 describes the installation of the new IRIG timing system installed in the Communications Building to be used with a dedicated AN/TRC-29 antenna. The dedicated space on the south side of the building, second room from the west was used to install timing receivers, relay transmitters, and auxiliary monitoring facilities (WSMR 1963; Drawing SCA-H1374). This station would be designated U-52.

In the early 1960s the range had been developed to the point where multiple permanent sites were well-established. For reasons likely to do with easy identification from the sky, many sites, including launch complexes were identified by spelling out the site names in white-painted rocks. Very few remain today, and even those that do, have lost the white paint that so easily identified them from aircraft. Salinas Peak had two of these identifiers, one on the south side of the ROTI dome and a large one on the slope of the hill to the east of Property 32272. It is interesting to note that by the late 1960s these identifiers were mostly removed or obscured range-wide. It is possible that the growing presence of orbital satellites made this practice undesirable.

In 1964, efforts were made to exploit the small peak to the east of the site known as Tartar Knob. In an attempt to develop the site, a radio receiver building with poles was planned. The access road first appears in a November 1965 aerial image of the site. A second access road, a spur to the north from the Tartar Knob access road, traveled alongside the ridge and its vestiges can still be seen traveling down a steep meadow to the northeast.

An aerial survey of sites in 1965 reveals a few changes to the Salinas Peak Site. The 10-foot astrodome appears to have been re-installed at the cinetheodolite pad. On the west side of the site, between the optical domes and VHF radio relay, a cleared area appears to have been paved. Numerous vans and mobile instrumentation are parked on the site. Another addition

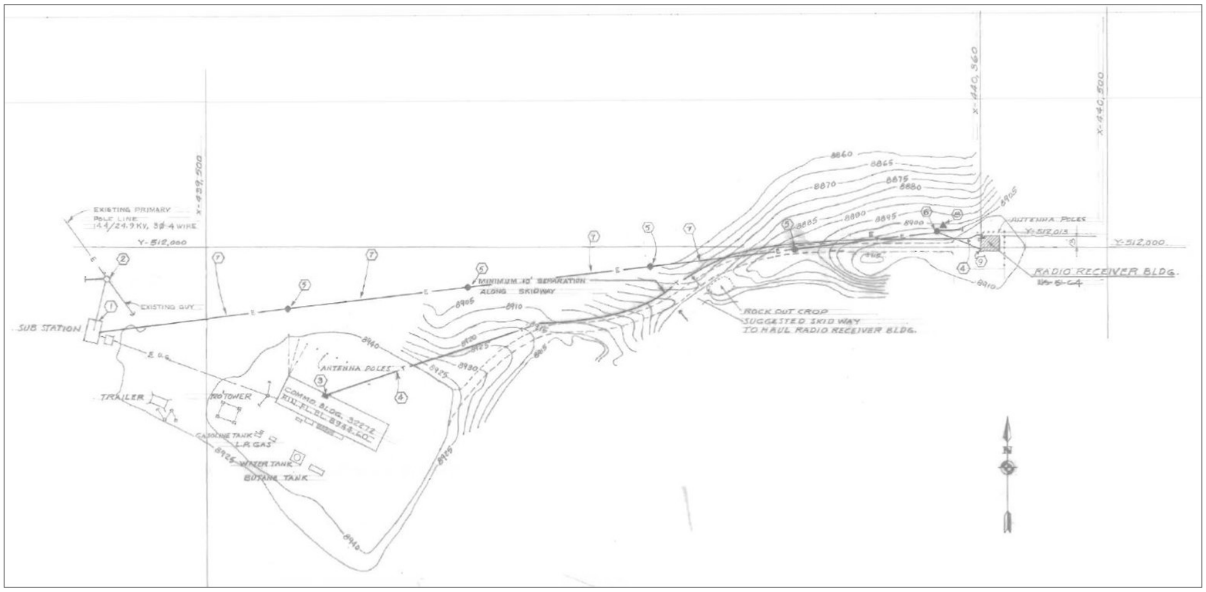

Figure 57. Proposed Radio Receiver at Tartar Knob, from Drawing WS-ME-1 1964.

to the site was a portable, Butler-type building placed outside the north elevation of Property 32272.

In 1965, a second small Butler-type portable building was placed next to the first at the VHF Radio Area. A 1971 photo shows the appearance of a free-standing, steel-frame antenna at the site which was probably added in the late 1960s or early 1970s. The wood-frame staircase to the ROTI was also removed in this time period.

In late 1965, an article in *Wind and Sand* described a new radar-based instrumentation system called Optical Research Radiometrical Analysis Systems (ORRAS) and GLOW.[5] Designed, built, and implemented at WSMR, the system had five modes of tracking re-entry vehicles, recording and measuring radiation emissions to discriminate warheads from dummy warheads. The GLOW mounts were mounted at Salinas Peak and Red Butte site, just over the range boundary, northwest of Stallion Site (Wind and Sand 1964:1). No further information about the location of the radar at Salinas Peak or success or failure of the system could be ascertained.

While it is known that helicopters had landed on the site where mobile equipment was often parked, a funding request in 1969 was put out for improvement of the site including grading, surfacing and marking. The request states that an existing landing pad (Drawing WS-74-67-14), located on the hillside south of Property 32272 was reported comparatively unsafe by pilots (Starkweather 1969:2).

In the Spring of 1970, the Salinas Range Camp at the base of the mountain was given a designation of "Troop Command inactivation" (Field 1970:1). After only ten years of operation, the support camp was turned in and remained inactive until the site was mostly demolished in 2010 including the barracks. Another indication of changes includes a work order re-assigning the optical instrumentation building (Property 32270) and instructions to move equipment into

5 No references to the acronym GLOW could be found.

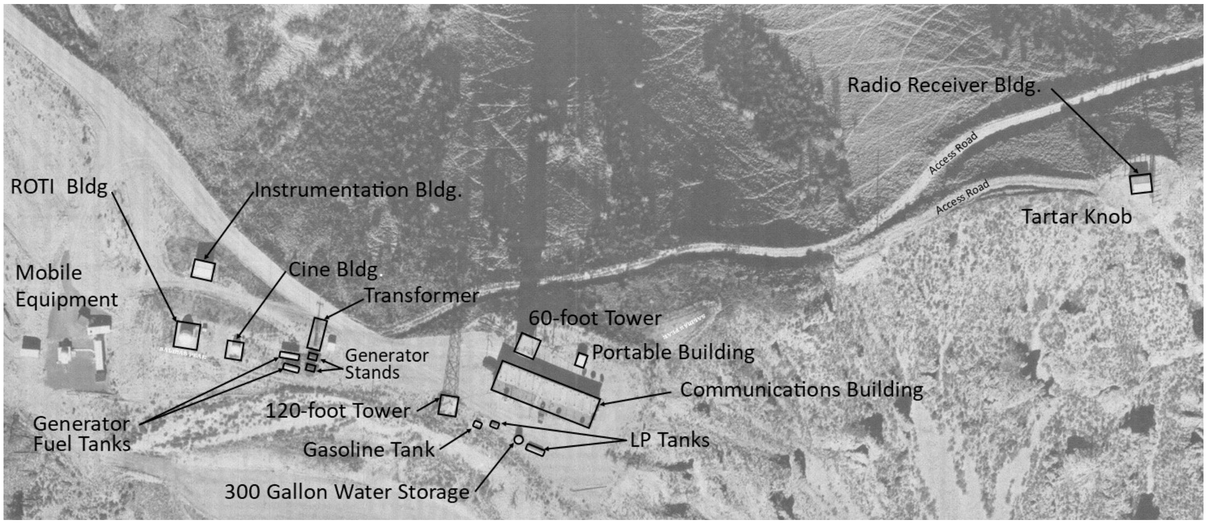

Figure 58. Aerial Photo of Salinas Peak, November 20, 1965 (*courtesy WSMR Museum Archives)*.

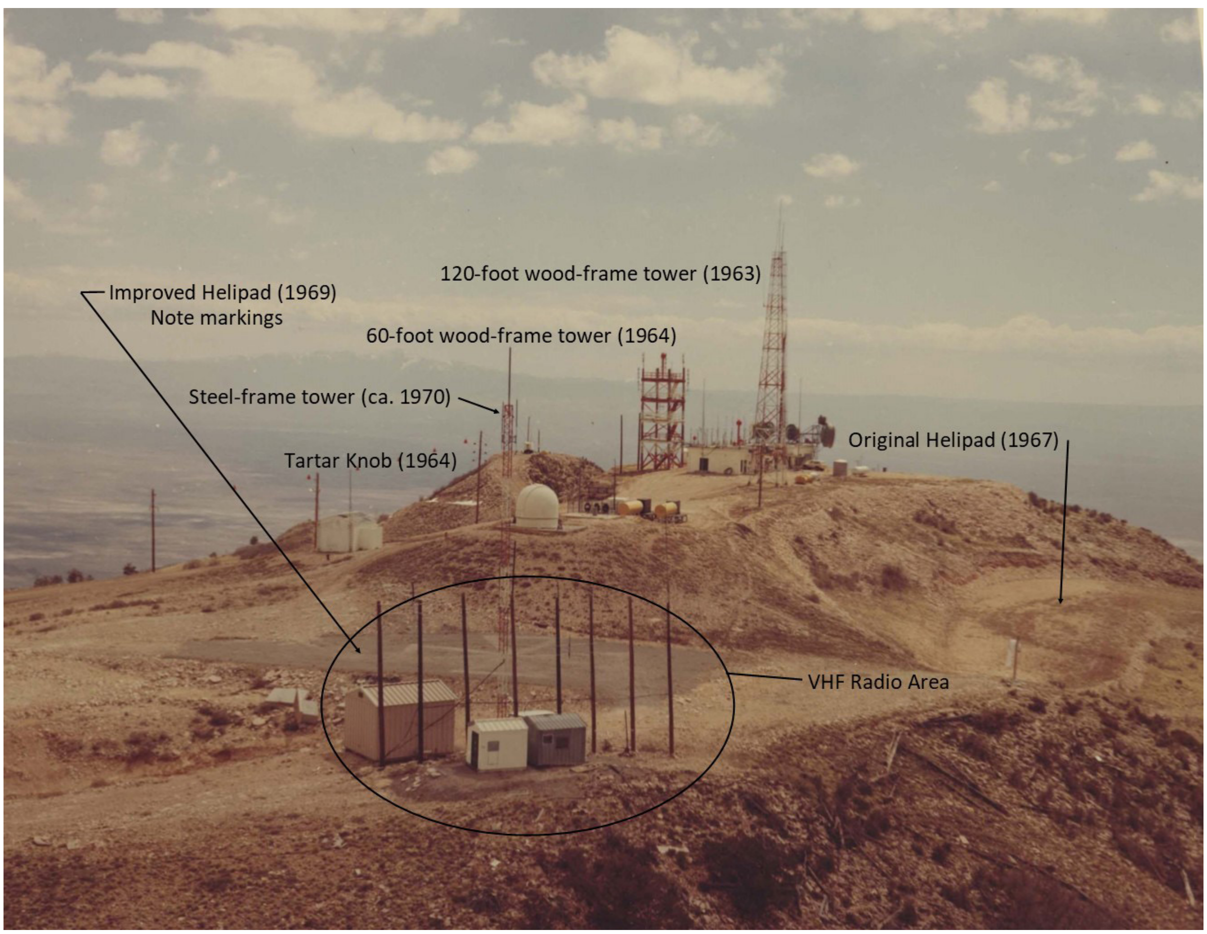

Figure 59. Salinas Peak, view to east, circa 1971 (*Jim Andress Collection, WSMR Museum Archives)*.

the ROTI dome (Pierce 1971). This is a clear sign that the ROTI was deactivated by then and the instrument likely removed from the site.

Records for the 1970s and 1980s are sparse and photographs are relied on for tracking changes to the site through the end of the Cold War. For example, by 1973, the cinetheodolite dome and instrument had been removed though the 16-foot ROTI dome remained until likely the late 1970s – both were removed by the end of the Cold War though the concrete portions remained until the new Telemetry Building (Property 32292) and prominent radome (Property 32296) were constructed in 1992. The floor slab for the new building was likely poured over the reinforced concrete ROTI pit.

Salinas Peak is occasionally mentioned in the 1970s and 1980s for its participation in various electronic relay support activities. In 1973, the site was used to relay a television signal from KNME-TV in Albuquerque to the Main Post to provide Public Television access to the housing area. The signal was carried over 120 miles from Sandia Crest in Albuquerque (Missile Ranger 1973:1). Salinas Peak was also instrumental in the execution of the new Drone Formation Control System (DFCS), a program developed by IBM in the mid-1970s to remotely pilot a formation of drone aircraft. Salinas Peak was one of six "interrogator stations" ranging from 4,290 feet to 8,958 feet in elevation that were part of the DFCS network (Missile Ranger 1977:3).

A new, larger premanufactured building (Property H5103) was added in the early 1970s to the VHF Radio Area (Figure 59). The building was referred to as the "Telemetry Building" as it also housed Telemetry Group radios (Ken Lawson, personal communication 2022). By the end of the Cold War, both smaller portable buildings had been removed from the site leaving only the larger Property H5103. The portable, Butler-type building placed outside the north elevation of Property 32272 was removed by the 1980s and the adjacent 60-foot, wood frame tower remained through the end of the Cold War, though was replaced by a steel-frame tower, probably in the 1990s.

A third addition to the Communications Building was undertaken in 2004 as part of an Air Force laser propagation project. Apparently, there was an engineer who expressed dismay that no bathroom facilities were available at night when the tests were taking place. It is likely that the Air Force paid for the addition which included sleeping quarters. The concrete slab (Property 32288) on the north side of the Tartar Knob access road was constructed for the same project (Ken Lawson, personal communication 2022).

The small Butler-type building and poles at Tartar Knob were gone by 1972 and replaced with a small trailer and portable antenna. The site would be redeveloped in the early 2000s by the Navy with the installation of a radar mount with guided missile director and radar system. The site is currently unoccupied but the equipment remains.

Other than Properties 32292 and 32296, one final substantial structure was added in the 1990s, a large, high-bay, steel-frame building clad in metal panels (Property 32258). Constructed for the High-Altitude Balloon Experiment (HABE), the building was placed on the site as a balloon inflation building for use as part of a proposed orbital laser program funded by the Air Force Research Laboratory (AFRL) (John Winstead, personal communication 2021).

As a remote site, little in the way of a social history was ever recorded for the better part of the

Figure 60. Salinas Peak, view to east, 1991 (*Jim Andress Collection, WSMR Museum Archives)*.

Figure 61. Salinas Peak from Tartar Knob, view to southwest, March, 2022.

Cold War. The newspaper contains vignettes like training chefs at Main Post to serve remote outposts like Salinas Peak. It also mentions that in 1966 the site was manned by a "seven-man commo group" and Land-Air Corporation contractors to operate microwave and radio nets as well as range instrumentation (Wind and Sand 1966c:3). A heroic act on the site in 1979 saved the Army almost $50,000 when Facilities Engineering employee Fred L. Hollis stopped an electrical van from rolling off the site to a 2,000-foot drop. Hollis received a $970 cash award for his effort (Missile Ranger 1979:13). More recently, Salinas Peak was the subject of a 2016 *Missile Ranger* article which sheds some light on the experience of the personnel that work at the site (Salas De Santiago 2016).

Ancillary features such as antenna poles, dishes, and antennas attached to Property 32272 have been added and removed over the years and this narrative is limited to substantive buildings, structures, and objects. The original 3,000-gallon water storage tank was removed and replaced with a smaller plastic unit placed closer to the building. The gasoline storage tank was replaced by two units in the early 1970s, but both have been removed, and only one diesel storage tank remains at the generator site. Both generators have been replaced with new units since the end of the Cold War.

The site's topography is its most identifiable feature and, while support facilities have come and gone, the most prominent properties — the Communications Building (Property 32272), the 120-foot antenna tower (Property 32264), and the Instrumentation Building (Property 32270) — still anchor the site in some historic context. In all, the site has gone through multiple iterations in its 60-year history.

7. Description of Resources

This chapter opens with an overview of the location and layout of the Salinas Peak site. Significant alterations have been made to the site and its individual component buildings since its original construction in 1959-1963, but retains most of its topographical character despite alterations and additions over the decades. The following section presents a descriptive overview of each existing property followed by a summary of its use and evolution.

The current inventory focused on the recording of buildings, structures, and objects at the Salinas Peak site. The NPS defines buildings as properties that principally provide shelter for any form of human activity. Structures are constructed properties that fall outside the typical definition of buildings. Objects are less formal properties that are often of pre-manufactured origin and mobile in nature. The resources recorded at the Salinas Peak site are buildings, structures, and objects per the NPS definitions. For additional details of the recorded properties, see the HCPI forms included within Appendix A.

The Salinas Peak site inventory effort resulted in the recordation of ten historic resources. The recorded properties were assigned HCPI numbers, were documented on WSMR-specific HCPI forms, and the inventory was logged as NMCRIS activity number 150014. The recorded resource locations are displayed in Figure 62.

7.1 Salinas Peak Site Layout

The Salinas Peak site is located on the highest peak in the San Andres Mountains at 8,965 feet in elevation. The core of the installation is formed by a central Communications Building (Property 32272) and an associated antenna tower (Property 32264). Several historic pre-manufactured buildings and support facilities are also located at the site, as are several post-Cold War additions. WSMR property records contain no acreage descriptions and there are no delineations on the ground to define the limits of the site. Tartar Knob, located along a sub-ridge to the east of the main site, is generally considered part of the Salinas Peak installation.

Salinas Peak is accessed from an unpaved roadway that runs up the northwest side of the mountain in a serpentine manner. A pole line with electric service takes a more direct route to serve the site. A spur road runs east to Tartar Knob and a second semi-abandoned spur runs down the mountain on the south side of the site.

Central to the site is the 1959 Communications Building (Property 32272) which received two additions, one in 1960 and a second in 2004. The building is flanked by two, tall steel-frame antenna towers on the north and south sides at the west end. Directly to the west are the original generator stands, but both generators are recent replacements. A large steel container, placed in front of the generator stands acts as a control station for the backup generators. A new transformer was installed near the substation just north of the generators. To the west of that area on the berm of what once housed the two optical instrumentation facilities is a large Telemetry Building and accompanying, fabric covered radome on a steel-frame base (Properties 32292 and 32296, constructed in 1992) – a substantial concrete retaining wall is placed on three sides but not the east side. Property 32270, the former Instrumentation Building is currently used for storage. The former HABE Building (Property 22358, constructed circa 1995) is placed

Figure 62. Location of resources documented at Salinas Peak (*2020 imagery background*).

on the former helipad. While now abandoned, the VHF Radio Area at the west end retains its Cold War support building (Property H5103, constructed circa 1971) and antenna poles. Tartar Knob retains its circa-2006 Navy installation. Water is delivered to two newer, plastic water storage tanks, placed on the south sides of Properties 32272 and 32292.

7.2 Property Types

The recorded Cold War properties at Salinas Peak are grouped into functional types whose purposes are reflected architecturally and structurally. Two such property categories were identified for the recorded properties: Electronic Equipment Facilities and Miscellaneous Facilities.

7.3 Building Styles

In terms of "style," the only significant permanent building at Salinas Peak, the Communications Building (Property 32272), is a typical post and lintel, concrete frame building with CMU infill walls. This is a common type of permanent building at WSMR, and these buildings generally lack any meaningful stylistic attributes, instead being constructed with an emphasis on function and long service life. However, DOD guidance recognizes that buildings like Property 32272 can derive stylistic cues from the Modern movement (Moore et al. 2010). Whether designed "in-house" by the Army Corps of Engineers or by such notable architects as Kenneth S. Clark, stylistic cues such as a horizontal emphasis in elevations and windows, flat, or very shallow gabled roofs and a complete lack of decorative elements all point to influence from International Modern style. Clark's loosely Modernistic design influence is visible in some of the buildings he designed at WSMR, but any International Modern design elements expressed in Property 32272 are very subtle, and the building is not a good example of the style.

The former Instrumentation Building (Property 32270) is considered semi-permanent and is a premanufactured, steel-frame building clad in sheetmetal panels. Manufactured by Armco, Butler, and others, these buildings have no discernible style and were designed for pure functionality. For habitation or climate control of equipment, heating, ventilation, or air-conditioning (HVAC) was treated like a modular add-on. Most of the support and infrastructure properties at Salinas Peak can be described as Industrial Vernacular – that is, they do not fall into recognized, high-style categories but are designed and utilized for their function. Therefore, the all-encompassing term "vernacular" applies to these miscellaneous support properties.

7.4 Salinas Peak Electronic and Communications Equipment Facilities

Electronic and communications equipment facilities at Salinas Peak were used to conduct the site's communications and instrumentation mission. Electronic and Communications Equipment Facilities are defined by the Army as "facilities for research, development, and testing of electronic, electrical, and communication equipment. Typical operations involve radio, radar, sonar, transmitters, receivers, control units, avionics, and guided weapon electronics" (US Army 2006). Property 32272 was the main communications building at Salinas Peak and was one of the original properties constructed at the location. Property 32272 falls under Army Category Code 131-80; currently there is no sub-category in Army guidance for the extension -80, only the primary 131 category code. This category code is defined as buildings used for automation, printing and publication, telecommunications, records management, and visual information services (US Army 2006:29). Property 33270, the former Instrumentation Building, served as an electronic equipment building for the two optical instrumentation facilities. It falls under Army Category Code 31740 which is defined as "a building used for research, development, and testing of electronic equipment…" (US Army 2006:154). Property H5103, the former radio communications building, is not considered real property and therefore has no Category Code. The other Cold War Electronic and Communications facilities at Salinas Peak is the 120-foot tower constructed in 1963 (Property 32264).

7.4.1 Property 32272

Property 32272 is a one-story, irregular plan, post and lintel, concrete frame building infilled with CMU block. The perimeter of the main block features an integrated concrete overhang. Constructed on a concrete slab foundation, the building has a rectangular plan modified by a smaller addition on the west elevation. The roof of main portion of the building is nearly flat to accommodate personnel access and numerous antenna installations, with only a shallow gabled pitch to facilitate runoff. The lower roofline of the west addition has a slight slope to the south and is enclosed on the north and west elevations by a CMU parapet. Both portions of the building roof appear to be finished in a white, elastomeric coating.

The concrete post and lintel structure of the building frames eight "bays" of CMU wall infill along the building's north and south elevations. The eastern four bays constitute the original portion of the building that was built in 1959, while the next three bays are formed by the 1960

Figure 63. Property 32272, south and east elevations, view to the northwest.

Figure 64. Property 32272, south and west elevations, view to the northeast.

addition. The slightly smaller 2004 addition forms the final bay. The 1960 addition maintained the 1959 building plan and extended it to the west, and is essentially identical in design and materials to the original 1959 construction. Fenestration on the building consists of metal personnel doors, two-panel recessed types on the main building and slab types on the addition. Windows are all replacement types with anodized aluminum frames and double-hung sash operation. The original building windows were horizontally-oriented, three light, steel-frame fixed types.

Starting at the east end of the south elevation, the first four bays make up the 1959 façade with the first two bays fitted with banks of four windows under which sit projecting concrete sills. An entry is placed at the east end of the third bay, with a single personnel door housing an upper glazed panel. A projecting CMU wind break straddles the concrete post of the bay. The sheltered opening has a single support wall on the east side and has a flat, cantilevered, concrete slab canopy. Centrally placed on the bay is a single, horizontally-oriented, two-light window with fixed steel sash. Two small louvers are placed in the upper right-hand corner of the bay. The fourth bay has a paired, slab-type personnel door placed off center to the east. Integrated into the concrete frame of the building is a projecting spar on which a steel-frame staircase leading to the rooftop rests. The last three bays of the south elevation represent the

Figure 65. Property 32272, north and west elevations, view to the southeast.

1960 addition. The easternmost contains an original paired personnel door offset to the east. The middle bay is blank and the westernmost bay is fitted with an original centrally-placed personnel door with a door-height narrow vent on the west side. The remainder of the elevation is formed by 2004 addition which includes three windows; one central small unit flanked by two standard-sized types. This elevation has a shed roof overhang. The elevation is fronted by an HVAC compressor unit and water storage tank at the steel-frame staircase, two additional HVAC compressor units to the west, and a stand-alone steel-frame antenna mount on a concrete slab near the last bay of the main building.

The west elevation is mostly formed by the 2004 addition, but a portion of the west elevation of the 1960 addition is exposed on the north portion of the wall. The base of the building is considerably more exposed due to a drop in grade along the west wall. The elevation of the addition has a single window offset to the south and a slightly projecting parapet wall at the top. Concrete bollards are placed at the end to protect below-grade septic tanks. The remainder of the elevation is the north portion of the main building's west elevation which has a two-leaf entrance with steel slab doors at the junction of the north wall of the addition. This entrance is fronted by a tall concrete slab, possibly an old loading dock.

The north elevation is a combination of the rear elevation of the addition and north side of the main building. The addition elevation has a CMU windbreak, open to the east and covered with a wood-frame, pitched roof. Within the windbreak, a single, slab-type personnel door with single upper glazing panel provides entry to the addition. The slightly projecting rooftop parapet of the addition continues from the west side and terminates at the main building. A single standard-sized type window is placed on the wall to the east of the windbreak. The remainder of the north elevation consists of the 1959/1960 main building which, at seven bays, is devoid of any fenestration.

The east elevation consists of two bays. The north bay contains a two-leaf entrance with steel slab doors. The south bay has no fenestration.

The roof of the main building is fitted with a steel-pipe perimeter railing that is open at the east end, and also includes an opening for access from the exterior staircase. The roof also contains original, evenly-spaced, 10-foot tall, 4-inch diameter steel pipes for mounting antennas. The roof is covered in a variety of antennas, especially on the east end overlooking the Tularosa Basin below.

History of Use

Property 32272 was constructed in 1959 as the Salinas Peak Communications Building, and was the first facility completed at the location, though the optical sites were concurrently under construction. As explained in the historic context and site evaluation, the building has served as an electronics' communication relay center due to its elevation and range-wide line-of-sight capability. A secondary benefit to the building is that the roof serves as a platform for a variety of parabolic dishes and antennas of all kinds.

A second addition was added within a year of the first in 1960, nearly doubling the size of the building. By 1961, the building appears to have been fully fitted out with equipment and was up and running. A 1961 floorplan illustrates the different services installed in the building, including ground-to-air relays, mobile services, acquisition, and the six microwave relays. The new time-code generation system was installed within Property 32272 in 1963. Designated U-52, the dedicated space on the south side of the building, second room from the west was used to install timing receivers, relay transmitters, and auxiliary monitoring facilities.

In 1973, the site was used to relay a television signal from KNME-TV in Albuquerque to the Main Post to provide Public Television access to the housing area. Property 32272 was one of six "interrogator stations" ranging from 4,290 feet to 8,958 feet for the DFCS, which was used to remotely pilot formations of drone aircraft.

The final western addition was made to the building in 2004, which provided space for sleeping quarters, a restroom, and shower facilities. The addition was made in support of an Air Force laser project and was used for only a short period of time – no architectural drawings for the addition could be located.

7.4.2 Property 32270

Property 32270 is a rectangular plan, steel-frame, pre-manufactured building constructed on a concrete slab foundation. Measuring 16 feet by 20 feet, the walls of the one-story building are clad in flush metal panels and the roof finished in standing seam panels. A homemade windbreak is attached at the center of the south elevation. The wood-frame structure is clad in corrugated metal panels as is the shed roof above. Open to the east, the windbreak protects a two-leaf entryway hung with recessed-panel steel doors. The gable-ended east and west elevations are both fitted with small air vents built into the upper gable ends. The north elevation is fitted with two steel-frame, four-light, fixed sash windows. An air-conditioning unit is placed on a steel frame on concrete pads on the east elevation. The interior is devoid of any equipment short of storage materials. A wall mounted heating unit is placed on the east wall. The building has clearly been out of use for some time.

History of Use

Property 32270 was constructed in 1959 as an electronic support facility. The building served as the electronics equipment building for the former optical instrument installations, the cine-theodolite and ROTI (Properties 32262 and 32271). Optical instrumentation work had ceased

Figure 66. Property 32270, north and west elevations, view to the southeast.

by the early 1970s, though the building remained assigned to the Instrumentation Group. It was not until 1979 that the building was declared excess (Perea 1979). The building was planned for use in 1983 to house equipment to help mitigate radio interference, but the project was never executed (Kosmider 1985). The building is currently used for storage.

Figure 67. Property 32270, west and south elevations, view to the northeast.

Figure 68. Property 33270, south and east elevations, view to the northwest.

Figure 69. Property 32270, interior, view to the northeast.

7.4.3 Property 32264

Property 32264 is a 120-foot tall steel-frame antenna tower located on individual triangular concrete footings. The tower is located outside the west end of Property 32272. The structure is braced by cross-members on the vertical surfaces and every other horizontal connection. A cable tray from the roof of the neighboring Property 32272 projects to the south, turns west and attaches to the antenna tower frame. On the opposite side of the tower is a steel access ladder enclosed within a safety cage that connects to the upper deck of the tower.

Figure 70. Property 32264, west elevation, view to the east.

History of Use

Property 32264 was constructed in 1963 as an antenna tower that supported communications antennas and related equipment for the neighboring Property 32272. No additional information was available regarding the specific uses of the tower. It remains in use today and is in good overall condition.

7.4.4 Property H5103

Property H5103 is a rectangular plan, steel-frame, pre-manufactured building constructed on a concrete slab foundation. The slab foundation is in turn constructed atop a rubble platform. Measuring 16 feet by 20 feet, the walls of the one-story building are clad in pressed metal panels and the roof finished in standing seam panels. The only fenestration on the building is a two-leaf entrance hung with recessed-panel steel doors on the south elevation. Both doors are fitted with upper lights, but the panes are broken. A single concrete step is placed in front of the entry. A blank metal panel has been attached in the upper gable, perhaps to block the air vents. The interior is filled with abandoned electronic equipment and is open to the elements. The building is associated with an antenna array composed of eight wood utility poles outside the building's west elevation. These poles supported the former VHF antenna array, which is no longer in operation. Outside the south elevation of the building is a steel lattice antenna tower that is anchored via a series of guy line cables. The building is not currently used or maintained.

Figure 71. Property H5103, south elevation, view to the northwest.

Figure 72. Property H5103 with associated antenna poles, view to the southwest.

History of Use

Property H5103 was added in the early 1970s to the VHF Radio Area as a radio equipment building. The building was referred to as the "Telemetry Building" as it also housed Telemetry Group radios (Ken Lawson, personal communication 2022). The designator "H" typically indicates that the building was formerly a HAFB building, but no property record data or historic records could be found to provide further information.

7.5 Miscellaneous Properties

The remainder of the Cold-War era facilities at Salinas Peak consist of miscellaneous support and infrastructural properties. These properties include several Liquid Propane Gas (LPG) tanks (Properties 32277, 32278, and 32279), two generator stands (Properties 32260 and 32274), and a portable pre-manufactured building (Property H2058). The electrical sub-station is no longer in its Cold War-era configuration.

7.5.1 Property 32260

Property 32260 is the southern of two generator stands that are located side-by-side west of Property 32272. Each of these generator stands consists of a raised steel platform with steel open-grate decking that is accessed from grade via a short staircase on the east side. Each of the stands currently supports generator equipment.

History of Use

Property 32260 was constructed in 1960 to support large generators that provided back-up electrical power to the Salinas Peak facilities. The two generator stands provide raised, leveled,

Figure 73. Property 32260, view to the northwest.

Figure 74. Overview of Properties 32260, 32274, and 32276, view to the southeast.

and balanced platforms for the heavy diesel generators. Salinas Peak is connected to the electrical grid via an electrical line that runs up its western ridge, but this powerline is frequently damaged due to the extreme weather conditions of the mountaintop location. The back-up generators were therefore mandatory equipment to keep the Salinas Peak installation operational during inclement conditions. The current generators have been replaced in recent years but the stands are original to the site.

7.5.2 Property 32274

Property 32274 is the northern of two generator stands that are located side-by-side west of Property 32272. Each of these generator stands consists of a raised steel platform with steel open-grate decking that is accessed from grade via a short staircase on the east side. Each of the stands currently supports generator equipment.

Figure 75. Property 32274, view to the southwest.

History of Use

Property 32274 was constructed in 1960 to support large generators that provided back-up electrical power to the Salinas Peak facilities. The two generator stands provided raised, leveled, and balanced platforms for the heavy diesel generators. Salinas Peak is connected to the electrical grid via an electrical line that runs up its western ridge, but this powerline is frequently damaged due to the extreme weather conditions of the mountaintop location. The back-up generators were therefore mandatory equipment to keep the Salinas Peak installation operational during inclement conditions. The current generators have been replaced in recent years but the stands are original to the site.

Figure 76. Property 32274, view to southwest.

7.5.3 Property 32277

Property 32277 is a 250-to-500-gallon liquid petroleum gas tank placed to the south of Property 32272. The tank is mounted on steel legs and placed on a concrete pad.

History of Use

In property records, 32277 is a 2,000-gallon LPG tank installed in October 1959. The tank does not appear in historic photos until 1963, and is clearly not 2,000 gallons as called out on the drawings. Regardless, the LPG tank serves Property 32272.

Figure 77. Property 32277, view to the southwest.

7.5.4 Property 32278

Property 32278 is a 2,000-gallon liquid petroleum gas tank placed to the south of Property 32272 and east of Property 32277. The tank is mounted on steel legs at both ends which in turn are placed on concrete piers.

History of Use

In property records, Property 32278 is mistakenly identified as a 2,000-gallon diesel storage tank installed in October 1959. The tank is an LPG tank as called out in the original drawings. This LPG tank provides propane to the nearby Property 32272.

Figure 78. Property 32278, view to the southwest.

7.5.5 Property 32279

Property 32279 is a 2,000-gallon liquid petroleum gas tank that is located on the west side of the site just north of Property 32258. The tank is mounted on curved steel stands which in turn are placed on concrete piers.

History of Use

In property records, Property 32279 is mistakenly identified as a 500-gallon LPG storage tank installed in September 1960. The tank is an LPG tank as called out in the original drawings and serves Property 32292 to the southeast.

Figure 79. Property 32279, view to the southeast.

7.5.6 Property H2058

Property H2058 is a small pre-manufactured, portable steel-frame building located outside the northeast corner of Property 32272. Although it lacks any identifiable manufacturer's markings, the building is consistent with units produced by Armco. The building is attached to a steel I-beam skid foundation, which projects outside the south elevation to form an entry deck, which is clad in sheetmetal. The building's walls are clad in flat steel wall panels and its low-pitch gable roof is clad in standing seam sheetmetal. A tubular vent assembly is attached to the roof peak. The east and west elevations have steel frame 4-light windows with awning operation, both of which are covered with steel security screens. The south elevation is equipped with a steel recessed-panel personnel door, which has an upper light that is also covered by a steel mesh security screen. The north elevation has a rectangular aperture cut into the wall, probably for the passage of ductwork associated with an evaporative cooler. The ductwork has been removed, and the opening has left the building's interior exposed to the elements.

History of Use

Property H2058 does not have a formal WSMR property number, and is therefore likely categorized as equipment rather than as real property. Therefore, records regarding the use and

Figure 80. Property H2058, south and west elevations, view to the northeast.

Figure 81. Property H2058, north and east elevations, view to the southwest.

history of the building are not maintained at WSMR DPW. Although the building itself was produced during the 1950s or 1960s, it is a late addition to the Salinas Peak site. Based on aerial photography, the building appears to have been moved to its current location sometime after the early 1990s. At the time of the current inventory, the building appeared to be used for storage and was in fair condition.

7.6 Post-Cold War Additions to Salinas Peak

Post-Cold War additions are not a functional type, but rather a chronological category to separate properties that were constructed at Salinas Peak after the end of the Cold War. Some of these are replacements that were built in place of original Cold War properties, so they are included in this report to facilitate future identification and management. As these properties are substantially younger than 50 years of age (post-1972) and also post-date the Cold War period (defined here as 1946 to 1989), they are not considered to be historic resources for the purposes of inventory and evaluation under Sections 106 and 110 of the NHPA. As such, these properties are not considered for NRHP eligibility either individually or as contributing elements to any possible district representing the Salinas Peak site.

7.6.1 Property 32258

Property 32258 is located on top of the former helipad and is a rectangular plan, steel-frame, pre-manufactured building constructed on a concrete slab foundation. With a footprint measuring 35 feet by 50 feet, the walls and shallow-gabled roof of the almost two-story-tall building are clad in corrugated sheetmetal panels. Designed as a "high-bay," the building has a tall,

Figure 82. Overview of Property 32258, view to the southwest.

roll-up door on the south elevation and a more standardized roll-up door on the north side. Concrete aprons are found at both doors. Additional fenestration is limited to a single, slab-type metal personnel door on the west elevation fronted by a concrete pad. The door is protected by a steel-frame windbreak, open to the north, clad in identical siding. A manufacturer's tag, labeled "Alliance, Oklahoma City" is found on the upper gable end. The interior is fitted with a large overhead crane hoist.

Figure 83. Property 32258, west and south elevations, view to the northeast.

History of Use

Property 32258 was constructed in the mid-1990s as a balloon inflation shelter for the HABE project. Funded by the AFRL out of Albuquerque, New Mexico, the balloon was intended to carry a laser beam director under autonomous control that was to serve as a surrogate beam director for a Space Based Laser (SBL). A counterpart to Airborne Laser (ABL), SBL was intended for deployment in outer space. The project was described in detail by John Winstead, Site Director for the US Navy Detachment at WSMR:

Figure 84. Property 32258, interior, view to the northwest.

> SBL was a counterpart to and intended for deployment into space. The intent was a beam director that was "free hanging" and [to] demonstrate [the] ability to remain pointed at a dynamic target boosting on ascent leg. The shelter at Salinas was configured to hang the HABE device at the south end and via the large roll up door from an overhead crane and stare at LC-36 and piggyback onto rockets launched from that location. In doing so the intent was to demonstrate the ability of the HABE to acquire, aim and track a boosting missile from an elevated location. After all the effort of constructing and preparing for HABE device to arrive to Salinas, the Project was defunded by Ballistic Missile Defense Office/Missile Defense Agency and all effort orphaned [John Winstead, personal communication 2021].

The building was not re-used after the end of the HABE project and is in some disrepair due to wind damage.

7.6.2 Property 32276

Property 32276 is a steel-frame structure that supports a raised, 1,000-gallon diesel storage tank. This diesel storage tank is associated with the nearby generator stands (Properties 32260 and 32274). The entire framework is placed on a concrete pad. The tank is a simple cylindrical steel structure laid horizontally. An integrated steel-frame staircase with handrail and platform on the south side provides access to the tank.

History of Use

Property 32276 supplies the nearby generators with fuel. Originally, two 3,000-gallon diesel storage tanks were to supply the generators. At some point in the 1990s the original storage tanks were retired and replaced by this single 1,000-gallon storage tank.

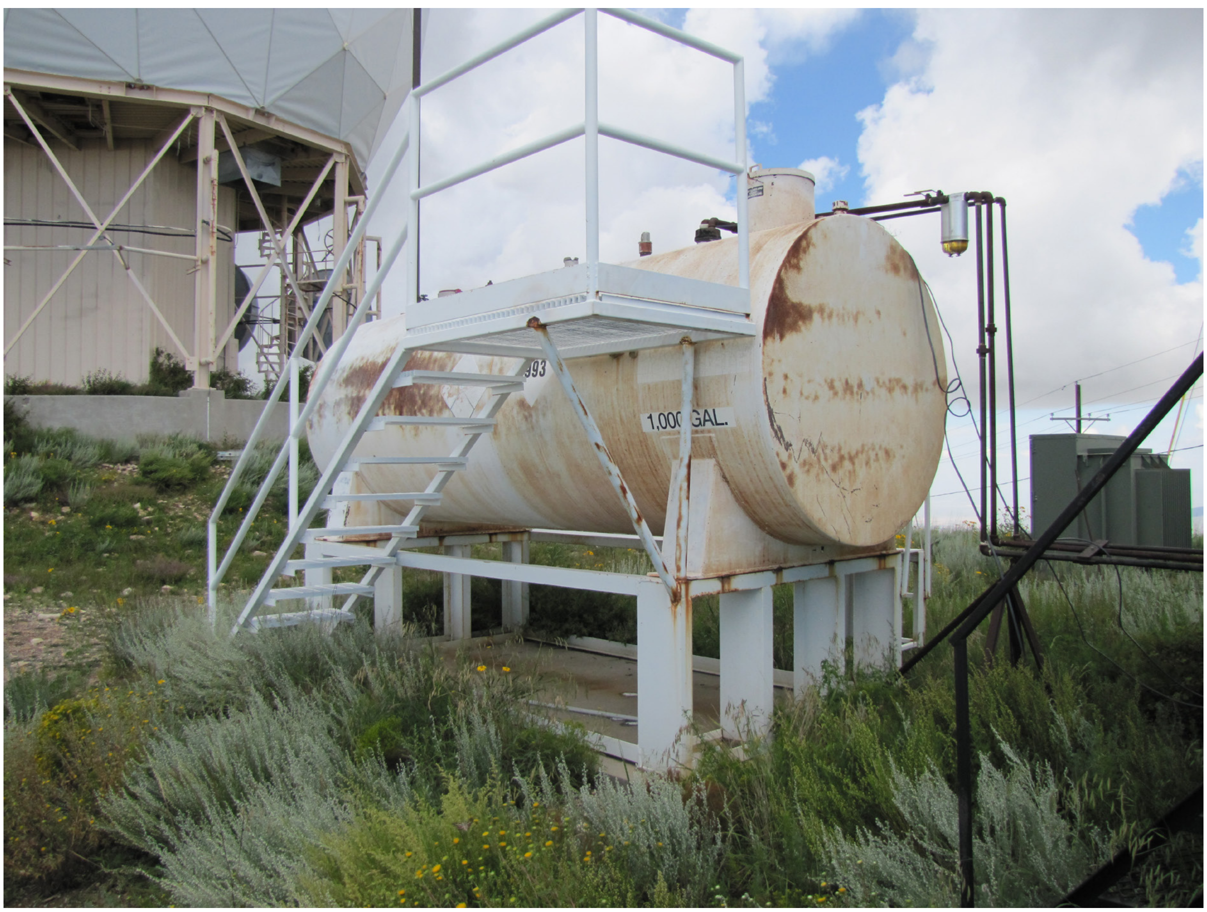

Figure 85. Property 32276, view to the northwest.

7.6.3 Property 32288

Located on the north side of the Tartar Knob access road, Property 32288 is a large concrete staging pad with a cantilevered steel-deck on the north side. The steel deck, attached to the pad with bolted I-beam members, is fitted with vertical steel pipes and chain for a handrail. Power for equipment and communications links was provided from a tall concrete stanchion directly across the road.

History of Use

The pad was constructed in conjunction with the addition to Property 32272 as part of an Air Force laser propagation project undertaken in 2004. The pad does not appear to have been reused since the end of the Air Force project.

Figure 86. Property 32288, view to the east.

Figure 87. Property 32288, view to the northeast.

7.6.4 Property 32292

Property 32292 is a one-story, rectangular-plan, CMU block building that is located on the former raised optical instrumentation site. Property 32292 is closely associated with the large radome (Property 32296) structure that is located just outside the building's east elevation; both properties were completed in 1992. A pitched, steel-framed roof which overhangs the building on the south elevation is obscured by parapet walls that rise beyond the roof on the remaining elevations. Fenestration is limited to steel, slab-type personnel doors. Single-leaf entrances are found on the north and east elevations, while the south elevation is equipped with both single-leaf and two-leaf entrances. The west elevation is plain with the exception of HVAC ductwork that is routed through the upper wall. Properties 32292 and 32296 are surrounded on three sides by a concrete retaining wall and a concrete pathway with steel handrail is found along the north side of the buildings.

History of Use

Property 32292 was constructed as a telemetry building in 1992. The building, also known as J-111, has remained in use as a telemetry station since it was constructed. Telemetry systems use sensors on-board test articles (rocket or missile) to relay information regarding its operation to ground recording stations via radio transmission. Typical telemetry data includes measurements of skin temperature, internal pressures, battery levels, fin positions, and timing information (Eckles 2013:156).

Figure 88. Property 32292, view to the southeast.

7.6.5 Property 32296

Property 32296 is a large radome structure that is located directly east of Property 32292. The structure consists of a large circular concrete base on which sit ten vertical steel I-beams which in turn support a decagonal steel framework. This framework acts as the base for a multi-faceted fabric-covered framework to protect the radar receiver inside the dome. Multiple cables emanating from the radome feed into the east elevation of the adjacent Property 32292.

History of Use

Property 32296 was constructed in 1992 as a telemetry radome that housed antenna equipment for the associated Property 32292 telemetry station. The primary structure, with the exception of the concrete base was originally located at the telemetry site known as Alamo Peak. It is likely that Salinas Peak was chosen for its central location within WSMR and high prominence, which provided it range-wide coverage.

Figure 89. Property 32296, view to the west.

7.6.6 Tartar Knob (Navy Radar Site)

Tartar Knob, a small ridgetop to the east of Salinas Peak proper, houses a rectilinear steel-frame radar stand placed on the northeast side of the small footprint. Directly behind the stand is a pair of steel containers whose space in-between is covered with a steel plate unifying the roof into a single plane. Two individual Conex containers are placed to the south of the radar stand.

History of Use

Referenced in the historic context, Tartar Knob was developed as a radio receiver station in 1964. The site was cleared of any permanent structures until 2006, when the US Navy Detachment installed a radar platform with associated moveable steel containers used as control rooms. The radar was a remote sensor used as part of the Advanced Air Defense Interceptor (AADI) project, which was part of the development of the Standard Missile 6 (SM-6). The radar sensor was used for testing of the AADI/SM-6 system between 2009 and 2011 (John Winstead, personal communication 2022). The SM-6 could be used against aircraft, ballistic missiles, and ground targets, and was deployed into the Navy fleet beginning in 2013.

Figure 90. Tartar Knob with Navy radar site, view to the northeast.

7.6.7 Steel-frame Antenna Tower (no facility number)

This structure is a steel-frame antenna tower that is located outside the north elevation of the Communications Building (Property 32272). The tower is constructed on an at-grade concrete slab foundation. The tower's structure is made up of four main support posts, braced by crossed steel members that lead to a wide platform at its top. Several conduits connect between the tower and the north elevation of Property 32272.

Figure 91. Replacement antenna tower, view to the west.

History of Use

This steel antenna tower replaced the original 50-foot tall wood-frame antenna tower that was constructed in 1964. The current tower, which is substantially taller, was constructed sometime during the 1990s and does not appear to have been assigned a WSMR real property number. Due to the lack of property number, no additional information regarding the tower could be found in WSMR real property records.

8. NRHP Eligibility Recommendations

In evaluating the recorded properties for individual eligibility, the Salinas Peak resources were assessed in terms of the applicable National Register Criteria. The four eligibility criteria are:

> (A) that are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (B) that are associated with the lives of persons significant in our past; or
>
> (C) that embody distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (D) that have yielded, or may be likely to yield, information important in prehistory or history.

Special Criteria Considerations are also applied in specific circumstances. One of these criteria considerations is applicable to the Salinas Peak resources: Criterion Consideration G. This consideration allows the NRHP nomination of properties that are younger than 50 years old, provided that they are of exceptional importance. Criterion Consideration G and how it applies to the recorded resources is discussed in further detail in the *Period of Significance* section below.

Throughout the resource evaluation process, the historic context of WSMR and the Salinas Peak installation was referenced in order to determine events that might constitute significance, facts about the people who were important to the history of the range, and historically notable attributes of technology and design. Of the evaluation criteria, Criterion B appears to be the least applicable to the Salinas Peak properties. Generally, any such associations are taken into account under the historical trends treated under Criterion A. Criterion D is not applicable in this case as the resources are unlikely to provide additional information about their design and construction. Criteria B and D were considered in the evaluation of the Salinas Peak resources wherever possible; however, the more systematic application was made with respect to Criteria A and C.

During the current inventory, a total of ten resources were recorded. The NRHP eligibility of the individual Salinas Peak properties is discussed in detail within the HCPI forms included in Appendix A. The property eligibility is also discussed at length in Chapter 8 below. As individual resources, none of the Salinas Peak properties are recommended for individual eligibility to the NRHP. However, the historic properties documented at the site are recommended as a historic district representing the Salinas Peak installation. The eligibility of the documented Salinas Peak properties is summarized in Table 1, and the proposed district boundary and contributing elements are shown in Figure 92.

Figure 92. Contributing elements to proposed Salinas Peak historic district (*2020 imagery background*).

Table 1. Salinas Peak Property Eligibility Summary.

Property	Property Function	Build Date	HCPI #	Individually Eligible?	Contributing Element?
32260	Generator Pad	1960	53351	No	Yes
32264	Antenna Tower	1963	53352	No	Yes
32270	Instrumentation Bldg.	1959	53353	No	Yes
32272	Communications Bldg.	1959	53354	No	Yes
32274	Generator Pad	1960	53355	No	Yes
32277	LPG Tank	1959	53356	No	No
32278	LPG Tank	1959	53357	No	No
32279	LPG Tank	1960	53358	No	No
H5103	VHF Support Bldg.	early 1970s	53359	No	Yes
H2058	Support Bldg.	Unknown	53360	No	No

8.1 Eligibility Criterion A

Criterion A allows for recognition of resources "that are associated with events that have made a significant contribution to the broad patterns of our history" (NPS 1995:2). This association can be with a specific event that marks "an important moment in American prehistory or history" or with a longer-term "pattern of events or a historic trend that made a significant contribution to the development of a community, a State, or the nation" (NPS 1995:12).

Per the guidance published by Lavin (1998), Cold War-era properties considered as eligible under Criterion A must be related to a specific historic theme related to the Cold War. Per the guidance offered in Lavin (1998), three specific themes are applicable to the Salinas Peak site: Basic Scientific Research; Materiel Development; and the multi-part theme of Command, Control, Communications, Computers, and Intelligence. This discussion will first explore in greater detail the relevant historic themes under which the resources were evaluated. This is followed by a discussion of the historic significance and eligibility of the Salinas Peak properties under Criterion A.

8.1.1 Historic Themes

Historic themes are used to define and categorize patterns of historic association. Per NPS guidance:

> A [historic] theme is a means of organizing properties into coherent patterns based on elements such as environment, social/ethnic groups, transportation

> networks, technology, or political developments that have influenced the development of an area during one or more periods of prehistory or history [NPS 1995:8].

Broad historic themes are presented within *National Register Bulletin 15*, which identifies general themes under "Areas of Significance." Among these, several are applicable to the Salinas Peak resources, such as Engineering, Invention, Military, and Science (NPS 1995:8). More specific guidance for the identification of historic themes relevant to Cold War military-industrial properties is provided by the Army (Lavin 1998). Lavin (1998) defines nine such Cold War themes, some with specific sub-themes or facilities, for Cold War military-industrial properties. Salinas Peak is related to aspects of three of these themes. The first is Basic Scientific Research, which represents general scientific research applicable to the development of military technology. The second theme is Materiel Development, the process through which the Army transformed technology into specific applications, weapons, and equipment. The third historic theme is that of Command, Control, Communications, Computers, and Intelligence, which represents the extensive development of communications and intelligence technologies undertaken by the Army during the Cold War. As a remote communications and instrumentation installation at a significant Army proving ground during the Cold War, the Salinas Peak site is associated with all three of the above historic themes described by Lavin (1998).

The theme of Basic Scientific Research is defined by Lavin as using "scientific knowledge to place the most technologically advanced equipment and weapons into the hands of its soldiers" (Lavin 1998:64). The theme of Basic Scientific Research is interrelated with the theme of Materiel Development. Scientific research developed new ideas and technology, which were transformed into weapons and equipment through the materiel development process (Lavin 1998:64). Through the mid-20th century, much of the scientific research conducted by the Army was done through research programs managed by the Army Technical Services. The USASC was among the seven branches of the Army Technical Services, which also included the Chemical Warfare Service, Corps of Engineers, Medical Department, Ordnance Department, Quartermaster Department, and Transportation Department.

As a communications facility originally planned by the USASC, one of the primary technical services of the Army, the Salinas Peak site is associated with the theme of Basic Scientific Research as defined by Lavin (1998:64). Salinas Peak is also associated with the theme of Basic Scientific Research through its role as an instrumentation site. Salinas Peak was home to ROTI, cinetheodolite, and ballistic camera installations and served as a hub for the range timing networ during the Cold War. Although the USASC was absorbed into Army ECOM as part of the 1962 AMC reorganization, the Salinas Peak facility continued to be operated by successor organizations through the end of the Cold War. Communications, instrumentation, and timing signal generation and coordination were part of the scientific foundation that drove the materiel development process at WSMR.

The theme of Materiel Development is defined as "the process of transforming a concept into an actual weapon or piece of equipment… [in order to]…use superior technology to gain an advantage over the Warsaw Pact Forces" (Lavin 1998:66). The themes of Materiel Development and Basic Scientific Research are related, as both were concerned with "obtaining sufficient quantities of technologically superior equipment" (Lavin 1998:63). Scientific research expanded technological knowledge, which in turn could be used to develop new weapons and equipment through the materiel development process (Lavin 1998:64).

Materiel development activities were carried out at Army designated Research, Development, and Engineering centers and proving grounds, with WSMR being a significant Army proving ground (Lavin 1998:69). In addition to its association with Basic Scientific Research through its connection to the USASC and the range instrumentation network, Salinas Peak performed a critical support role in the materiel development process at WSMR. As noted in the historic context, reliable communications were vital to the safe operation of WSMR. Guidance systems, tracking, telemetry, ground control, timing, and range communications all relied on the WSMR communication network. Salinas Peak was a vital hub in that network, providing communications across the significant natural barrier of the San Andres Mountains. Because of its important role in supporting the materiel development process at WSMR, Salinas Peak is associated with the theme of Materiel Development as defined by Lavin (1998:69).

Through its communications role, Salinas Peak is also associated with the historic theme of Command, Control, Communications, Computers, and Intelligence (per Lavin 1998:78). The historic theme of Command, Control, Communications, Computers, and Intelligence focuses on the role that communications and electronics played in Army command and control systems, intelligence gathering, and global communication systems (Lavin 1998:78). Facilities associated with this theme include antenna arrays and installation communication facilities, and the Salinas Peak installation is a combination of both these facility types (Lavin 1998:98).

The above associated historic themes remain applicable to the extant properties at Salinas Peak, although the location's built environment has undergone numerous changes throughout its history. Property 32272, the Communications Building at Salinas Peak, was constructed in 1959. By 1961, several support facilities and the ROTI and cinetheodolite installations were also present at the site. By the mid-1960s, a 120-foot steel antenna tower (Property 32264) and a 60-foot wood antenna tower had been added to the site. A similar wood antenna tower was constructed at the WSMR Sacramento Peak frequency monitoring station in the Lincoln National Forest. The communications role of the Salinas Peak facility remained consistent throughout the facility updates and administrative changes of the 1960s, and the association with the historic themes is still expressed by the physical characteristics of the extant Salinas Peak facilities, particularly Properties 32272 and 32264. While many of the other properties at Salinas Peak have been removed and replaced throughout the years, these changes represent technological updates that are consistent with the technical nature of the Salinas Peak site. This is discussed further in the section on integrity below.

The nucleus of the historic Salinas Peak site is formed by Property 32272 and its associated antenna tower (Property 32264). Associated with these core facilities are two Cold War instrumentation buildings (Properties 32270 and H5103). Original infrastructural support properties remaining at Salinas Peak include two generator platforms (Properties 32260 and 32274) and several LPG tanks (Properties 32277, 32278, and 32279). A historic portable building, Property H2058, was relocated to the site sometime after the end of the Cold War. Post-Cold War additions or replacements at Salinas Peak include a telemetry installation (Properties 32292 and 32296), high-bay building (Property 32258), diesel storage tank (Property 32276), an unnumbered antenna tower, and the Navy Tartar Knob radar installation. The main access road, several short access drives, and the spur road to Tartar Knob help to define the Salinas Peak site on the mountain landscape.

Although Salinas Peak consists of a limited number of extant Cold War resources and does not encompass a large acreage, it does fulfill many of the criteria of a historic military landscape as defined by Loechl et al. (1994). As the primary Salinas Peak properties possess significant associations with the identified historic themes, it is recommended that the Salinas Peak installation is eligible as a historic district under Criterion A. None of the Salinas Peak properties are recommended for individual eligibility under Criterion A given that the individual properties lack specific, individual associations with historic events or trends; the association is conveyed by the overall installation and its unique mountaintop location on Salinas Peak, the highest peak in the San Andres Mountains. The dramatic location itself conveys a great deal about the importance of communications and instrumentation at WSMR and the efforts required to establish and maintain these remote locations. The Advisory Council on Historic Preservation (ACHP) has published guidance on scientific and technical facilities that recommends that the association is often the most important aspect of integrity for these types of properties, which by their very nature, often experience significant turnover in terms of their built environment (ACHP 1991; 2009). This guidance is discussed in additional detail below in the section on integrity.

The Salinas Peak site has been significantly altered throughout the years, but Properties 32272 and 32264 still form a recognizable core of the installation that has remained relatively unchanged since the Cold War. These properties still convey the communications role of the site to the modern viewer. The various contemporaneous infrastructural support facilities can also inform on the general composition and layout of the facility and convey to the modern viewer that Salinas Peak was a remote location where self-sufficiency was vital to the site's operation. The consideration of the Salinas Peak properties as contributing elements to a historic district is discussed in Section 8.8 on military landscapes and districts. Specifics regarding contributing and non-contributing properties are summarized in the eligibility summary table (Table 1). Contributing properties and the recommended boundary for the proposed district are shown in Figure 92.

8.2 Eligibility Criterion B

According to guidance in *National Register Bulletin 32*, nomination under Criterion B requires clear associations with a specific *individual's* life and works. The development and operation of the Salinas Peak installation involved the efforts of numerous service members, contractors, scientists, and technicians, which makes it difficult to identify the accomplishments of any specific individual. Additionally, for a property to be nominated based on association with an individual significant to history, it must possess a meaningful association with that person's life or works during the period when they achieved significance. This is not the case with any of the documented Salinas Peak properties. Accordingly, Epsilon Systems recommends that the historic associations of the Salinas Peak properties are generally more appropriately considered under the broader scope of Criterion A.

8.3 Eligibility Criterion C

The Salinas Peak properties are fairly typical examples of the utilitarian building and structure types that are commonplace at DOD test ranges. The most significant Cold War properties remaining at the site consist of Properties 32264, 32270, and 32272. The primary building at the site, Property 32272, is a one-story, rectangular building of concrete post and lintel and CMU wall infill construction. The concrete and CMU construction of Property 32272 is typical of many Cold War DOD facilities and does not possess distinction of type, period, or method of construction. While Property 32272 does possess some subtle aspects of International Modern style, it is not a good example of the style. Nor does the property possess artistic value or exhibit a high degree of craftsmanship. As such, Property 32272 is not recommended for individual eligibility under Criterion C.

Property 32264 is a freestanding steel lattice antenna tower that is associated with Property 32272. This style of tower is quite common and lacks any architectural distinction of type, period, or method of construction. It is not representative of any recognizable style, nor does it possess artistic value or exhibit a high degree of craftsmanship. For these reasons, Property 32264 is not considered to be individually eligible under Criterion C.

Properties 32270 and H5103 are two additional extant Cold War properties at the Salinas Peak site. These two buildings are pre-manufactured steel frame buildings, which are common at DOD facilities. These buildings are clad in a variety of sheetmetal panels and are popular for their inexpensive construction, durability, and adaptability. The steel frame building has its origins in the Quonset hut, the hugely successful WWII-era pre-manufactured building with its characteristic half-round shape. Major manufacturers of these common pre-manufactured buildings were the Butler and Armco companies. These “Butler-type” buildings, which were functionally equivalent to Quonset huts, were capable of being assembled quickly and inexpensively and were adapted for many uses. These utilitarian buildings are driven by function rather than form, and lack distinction in their type, period, or method of construction. Nor do they represent the work of a master or possess high artistic value. For these reasons, Properties 32270 and H5103 are not recommended for individual eligibility under Criterion C. However, Properties 32270 and H5103 do provide contextual information on the site layout and infrastructure and are recommended as contributing elements to the recommended historic district discussed in further detail below.

The remaining properties at the site consist of minor infrastructural properties that lack distinction of type, period, and method of construction, nor do they possess elements of any recognized architectural style. As such, they are not recommended for individual eligibility under Criterion C.

For additional discussion of the recorded properties’ eligibility under Criterion C, the reader is directed to the individual property HCPI forms included in Appendix A. The final clause of Criterion C, “…a significant and distinguishable entity whose components may lack individual distinction” (NPS 1995:2), refers to districts. As previously mentioned, the collective Salinas Peak installation represents such a distinguishable entity and it possesses significant historic associations with the previously referenced historic themes. As such, it is a likely candidate for a potential historic district per the important final clause of Criterion C. The district considerations for the Salinas Peak site are discussed in further detail in Section 8.8.10 below.

8.4 Eligibility Criterion D

Per NRHP guidance, Criterion D is most often applied to archeological districts and sites, but can be applied to buildings, structures, and objects (NPS 1995:21). However, for buildings, structures, and objects to be eligible under Criterion D, the properties themselves must be the principal source of important information, which is usually related to design and construction details (NPS 1995:21). This is not the case with the Salinas Peak resources, as the design and construction details of the properties are already well documented and additional data is unlikely to be derived from the physical resources themselves. As such, no information potential exists in further study of the Salinas Peak buildings, structures, and objects. Therefore, none of the Salinas Peak properties are recommended as eligible under Criterion D.

8.5 Previous Research

Two of the Salinas Peak properties have been previously recorded. Properties 32270 and 32272 were recorded on HCPI forms by Laura Newcomer of Ecological Communications Corporation (ECC) in 2010. The ECC recording did not recommend Properties 32270 and 32272 as NRHP-eligible and no historic district was identified or recommended as part of the ECC inventory effort. The limited scope of the 2010 recording did not address the possibility of a historic district, nor did it include a complete historic context. The current inventory seeks to provide a comprehensive inventory of all the Salinas Peak resources and evaluate them within an appropriate historic context.

8.6 Period of Significance and Criterion Consideration G

The period of significance for Salinas Peak started with the construction of its access road and first facilities in 1959 and extended through the end of the Cold War. The Salinas Peak site continued to change and update its facilities through the end of the Cold War as technologies improved and WSMR mission priorities changed. The location continues to operate today as a communications and instrumentation installation and remains a key location for range communications at WSMR. The period of significance of Salinas Peak is therefore defined here as spanning the period between 1959 and 1989.

The term “historic,” per NRHP guidance, represents events, activities, and properties that are over 50 years old — post-1972 as of this writing. Post-1972 activities and properties at Salinas Peak are still meaningful to recent history, but are not technically considered historic. The post-1972 activities and properties at Salinas Peak, being less than 50 years of age, are considered within the framework of Criterion Consideration G. This consideration applies to both properties and events that are less than 50 years old, if they are of “exceptional importance” to recent history. Additionally, per guidance in *National Register Bulletin 15*, properties that are more than 50 years old but possess significant associations with events less than 50 years old must be evaluated under Criterion Consideration G (NPS 1995:43). Criterion Consideration G therefore applies to the continuing use and adaptation of the original Salinas Peak properties constructed prior to 1972, as well as properties built within the last 50 years.

The historic themes and associations of Salinas Peak that are relevant to its eligibility under Criterion A are primarily over 50 years old. The installation was originally established in 1959 and its peak period of activity was likely during the 1960s when it was also the location of ROTI and cinetheodolite instrumentation installations. A 1961 article in the *Wind and Sand* newspaper described how Salinas Peak consumed approximately 15,000 gallons of water, all of which had to be hauled by truck from Stallion Range Center (Wind and Sand 1961). The same article describes how it was anticipated that 60 personnel would soon be working at Salinas Peak, which would require an estimated 25,000 gallons of water a day (Wind and Sand 1961). Although the article does not specify, these consumption numbers also likely included water usage at the associated Stallion Range Camp, where Salinas Peak personnel stayed during work rotations. Even if these numbers were exaggerated, they provide an idea of how busy Salinas Peak was during the 1960s. Salinas Range Camp was placed on inactive status in 1971, providing a good proxy measure of when staffing at the site was reduced. As noted in the context, the instrumentation installations on Salinas Peak were also likely inoperative by the early 1970s. By comparison, a 2016 *Missile Ranger* article describes how only two personnel operate the Salinas Peak facilities today (Salas de Santiago 2016). Automation, instrumentation advances, and significant technological changes drastically reduced the number of essential personnel and activity level at Salinas Peak through time. For these reasons, the site's associations with the relevant Cold War historic themes were mostly established during its first decade of operation and remained little changed throughout the remainder of the Cold War. The location's association with the USASC and the WSSCA is also historic in nature. While Salinas Peak continued to operate as a communications facility for the remainder of the Cold War, this latter period of operation does not meet the standard for exceptional importance as stipulated for eligibility under Criterion Consideration G.

Specific to the recommendation of Salinas Peak as a historic district, it is not necessary to demonstrate exceptional importance under Criterion Consideration G as the majority of the contributing properties are in fact historic. Per NRHP guidance, a district with a majority of properties over 50 years old can also include contributing resources that are less than 50 years old without demonstrating exceptional importance of the district itself or those contributing elements that are less than 50 years old (Sherfy and Luce 1998:10).

8.7 Integrity of Salinas Peak

Per the guidance in Lavin (1998), Cold War-era Army military-industrial properties that are eligible for consideration under one or more specific Cold War themes must be judged in terms of historic integrity. This discussion primarily focuses on the integrity of the Salinas Peak installation as a whole as a prerequisite for addressing the possibility of a NRHP district in the following section. For details regarding the integrity of individual properties, the reader is directed to the property descriptions in Chapter 7 and the HCPI forms in Appendix A.

Integrity, or the ability of the property to convey its significance via its physical attributes, is evaluated by seven qualities. These are the qualities of location, design, setting, materials, workmanship, feeling, and association. These specific qualities are derived from NRHP guidance and can be considered individually in regards to the historic character of the Salinas Peak site.

The quality of location is related to, yet distinctive from, the quality of setting. The quality of location simply refers to the place where the historic events occurred, while setting refers to the "character of the place" and "how, not just where, the property is situated and its relationship to surrounding features and open space" (NPS 1995:45). NPS guidance states, "The actual location of a historic property, complemented by its setting, is particularly important in recapturing the sense of historic events and persons" (NPS 1995:44). As such, it is clear that the aspect of location has remained entirely consistent for Salinas Peak. The slightly more subtle aspect of setting has remained relatively little changed since the facility was constructed in 1959, although some of the properties at the site have been removed or replaced through time. The replacement facilities did not alter the distinct mountaintop setting of Salinas Peak, which along with the aspect of location, has remained consistent throughout the history of the site. In regards to the aspects of location and setting, Salinas Peak retains a high level of historical integrity.

The aspects of workmanship and materials are more applicable to individual properties, but can be applied to consideration of the general historic fabric of Salinas Peak. Workmanship is defined as "the evidence of artisans' labor and skill in constructing or altering a building, structure, object, or site. Workmanship can apply to the property as a whole or to its individual components" (NPS 1995:45). Materials are "the physical elements that were combined or deposited…to form a historic property" (NPS 1995:45). The basic workmanship and materials of the primary Salinas Peak properties remains mostly intact. Property 32272, the original Communications Building at the location, has been modified with two additions. However, the first of these additions was made in 1960 using essentially identical materials to the original portion of the building, and therefore represents a historic modification that did not significantly alter the workmanship or materials of the building. The second addition was made in 2004 and varies in dimensions from the 1959 and 1960 portions of the building; however, this addition is of CMU construction and therefore generally similar to the rest of the building in terms of materials. The workmanship and materials of the associated antenna tower (Property 32264) are unaltered, other than changes in antennas and associated equipment. The two Cold War period pre-manufactured buildings at Salinas Peak (Properties 32270 and H5103) also retain integrity of their workmanship and materials, although Property H5103 has been left open to the elements and is in generally poor condition. The remaining properties at the site are minor support elements, including two generator platforms (Properties 32260 and 32274) and several LPG storage tanks (Properties 32277, 32278, and 32279). The workmanship and materials of these support facilities remain mostly intact, although the original diesel storage structure (Property 32276) has been completely replaced.

Related to setting, workmanship, and materials is the quality of design, which is defined as "the combination of elements that create the form, plan, space, structure, and style of a property" (NPS 1995:44). The overall design of the Salinas Peak installation has remained fairly consistent since its original construction in 1959, which is partially attributable to the limited space available at the mountaintop site. At the core of the site is the original Communications Building (Property 32272) and associated 120-foot antenna tower (Property 32264). To the west of Property 32272 is a raised and leveled area that was originally occupied by the ROTI (Property 32262) and cinetheodolite (Property 32271) installations. The associated support building (Property 32270) remains in place today. The remnant ROTI and cinetheodolite foundations were supplanted by the construction of Properties 32292 and 32296 in 1992, which occupied the same approximate location. Also during the 1990s, Property 32258 was constructed atop the improved helicopter landing pad that was added to the site in 1969. Other aspects of the site, such as the main access road and spur road to the Tartar Knob instrumentation site, have changed very little since the mid-1960s. Despite the removal and replacement of some of its facilities, the original site plan of the Salinas Peak installation remains evident and discernable to the modern viewer and the site overall retains fair integrity of its original design.

Cumulatively, the aspects of setting, design, workmanship, and materials contribute to the more general aspects of feeling and association. According to NPS guidance, feeling "is a property's expression of the aesthetic or historic sense of a particular period of time" and "results from the presence of physical features that, taken together, convey the property's historic character" (NPS 1995:45). Closely related to feeling is association, which is "if it is the place where the event or activity occurred and is sufficiently intact to convey that relationship to an observer. Like feeling, association requires the presence of physical features that convey a property's historic character" (NPS 1995:45). NPS guidelines are clear that not only must a property be "associated with an important historic context" but must also retain "historic integrity of those features necessary to convey its significance" in order to be eligible to the NRHP (NPS 1995:3).

The feeling of the Salinas Peak installation is primarily derived from its distinctive location on the summit of Salinas Peak and its function as a remote communications and instrumentation site. Since the location derives so much of its distinction from its unique and prominent mountaintop location, it still retains much of its Cold War feeling, despite the turnover in its built environment. The primary communications facility at the site, Property 32272, remains intact and in use. Property 32272 and the associated Property 32264 antenna tower still convey the site's association with the WSMR communication network to the modern viewer. Although the Salinas Peak facilities have been updated and replaced through time, it still retains several of its original Cold War properties and its dramatic setting and location remains unchanged. Salinas Peak is therefore still able to convey its association with the identified historic themes and its role as a WSMR communications hub during the Cold War.

Some of the changes made to Salinas Peak occurred during the 1960s and 1970s, and therefore are period alterations that were consistent with the Cold War-era military operation of the site. The ROTI and cinetheodolite installations were added during the early 1960s and remained for about a decade. The ROTI at Salinas Peak was likely removed from the site by 1973, although its dome remained at the site through the late 1970s. The cinetheodolite instrument and dome were removed from Salinas Peak by 1973. An improved helicopter landing pad was added to the site in 1969. Property H5103 was added to Salinas Peak during the early 1970s in the VHF Radio Area. Various portable buildings and antenna arrays were added, relocated, and removed throughout the Cold War operation of the site. These changes to the site represent historic alterations that are consistent with the task and purpose of Salinas Peak and do not represent meaningful impacts to its integrity.

Three major post-Cold War additions to Salinas Peak were made during the 1990s. A new telemetry building (Property 32292) and associated radome (Property 32296) were added to Salinas Peak in 1992, and Property 32258 was also constructed during the late 1990s. The other post-Cold War additions to Salinas Peak are relatively minor infrastructural properties that did not make any significant impact to the location's built environment. While these post-Cold War additions have altered the appearance of the Salinas Peak installation, they are still consistent with the site's original purpose and function. The continued use of historic technical facilities is addressed in guidance issued by the ACHP (1991; 2009).

The ACHP guidance on technical and scientific facilities states that "it is important to remember that these facilities and their equipment need to change and evolve through time, *and that it is through continued use that much of the equipment still exists at all*" (ACHP 1991:9; emphasis in original). The guidance further notes that continuity of use actually may help preserve association, despite the modifications that might be necessary: "Few structures in use today will undergo modification to such an extent that all integrity is lost. In most cases there should be continuity in function, and thus in integrity of design and materials, and there may always be integrity of association" (ACHP 1991:33). In consideration of this guidance, it is the opinion of Epsilon Systems that Salinas Peak retains integrity of its Cold War feeling and association, and the updating of its facilities through time has not adversely impacted the location's overall historic integrity.

8.8 Salinas Peak as a Military Landscape and District

The wider perspective of a historic military landscape was considered as part of the Salinas Peak inventory. Military landscapes are those that have been uniquely shaped in support of military missions, and historic military landscapes are those that have significant associations with historically important persons, events, or patterns or represent significant examples of design or construction (Loechl et al. 1994:9). Per the guidance, an identified historic military landscape is typically recorded as a historic district or site (Loechl et al. 1994). Historic military landscapes are evaluated within the framework of an appropriate historic context that allows for the associated military mission, chronological period, geographic context, and historic themes of a military landscape to be identified and understood (Loechl et al. 1994:19-20). For the purpose of the present undertaking, this historic context is provided within Chapter 6 of this report.

In addition to the historic context of a military landscape, the physical characteristics of the landscape must also be considered. Landscape characteristics are "the tangible evidence of the activities and habits of the people who occupied, developed, used, and shaped the land to serve human needs; they may reflect the beliefs, attitudes, traditions, and values of these people" (Loechl et al. 1994:36). Specific to the evaluation of historic military landscapes, nine such characteristics are identified. These characteristics are Spatial Organization and Land Use; Response to Natural Environment; Expression of Military Cultural Values; Circulation Networks; Boundary Demarcations; Vegetation; Buildings, Structures, and Objects; Clusters of Buildings, Structures, and Objects; and Archaeological Sites (Loechl et al. 1994:36-40). Each of these characteristics is discussed in relation to the Salinas Peak installation below.

8.8.1 Spatial Organization and Land Use

The implementation of military missions directs the way the land of a military installation is utilized and how it is spatially organized (Loechl et al. 1994:36). Salinas Peak is the highest peak in the San Andres Mountains, which provided it an ideal position as both a communications relay hub and instrumentation site. The extant Cold War-era built environment at Salinas Peak consists of 10 properties located atop the summit of Salinas Peak. The mountaintop itself is a roughly east-west oriented ridgeline that is relatively broad and flat, so it was amenable for construction. The site includes a helicopter landing pad, but is primarily accessed via a winding, dirt access road that connects to WSMR Range Road 13. The original core of the site was formed by Property 32272 and its associated antenna towers, a ROTI and cinetheodolite installation, and a number of minor support properties such as generator platforms, fuel storage tanks, water tanks, and LPG tanks. The location is distinctive due to its lofty position atop Salinas Peak, and the margins of the site are mostly demarcated by steep grades that descend down the slopes of the mountain on almost all sides. The small size of the site and low number of buildings and structures precluded any additional spatial boundaries or internal divisions within the site.

8.8.2 Response to Natural Environment

Significant natural features often influence the location and organization of military installations, and climatic factors can influence the types of facilities constructed at these installations (Loechl et al. 1994:37). This holds true in the case of Salinas Peak, as its mountaintop location was ideally suited to receive and broadcast wireless signals that were critical to the WSMR communications network. Its prominent position and impressive viewshed also made the location well-suited as a location for optical instrumentation. The site is constructed on the summit of Salinas Peak, the highest peak in the 75-mile long San Andres mountain range, which overlooks the Tularosa Basin and the interior of WSMR to the east and the Jornada del Muerto to the west. A highly prominent mountain, Salinas Peak rises 4,600 feet above the floor of the neighboring Tularosa Basin. To the east of Salinas Peak, the mountain slopes decline dramatically into a series of canyons and ridges that descend to the bajada of the Tularosa Basin, while the western slopes are slightly more gradual as they decline to the desert flats of the Jornada del Muerto.

The location of the site high in the San Andres Mountains facilitated reception and broadcasting of radio signals across the significant natural barrier of the San Andres and Oscura Mountains, which divide the WSMR North Range area from the southern portion of the range. The lofty position also facilitated communications across the region. The 8,965 feet elevation of the site frequently exposed it to severe weather conditions and high winds. Wind gusts above 100 miles per hour have been recorded at Salinas Peak, with the highest recorded wind speed clocking in at 122 miles per hour (Salas De Santiago 2016:3). Salinas Peak routinely experiences the highest wind speeds of any location at WSMR, and is also subject to severe thunderstorms during the summer monsoon season. Winter temperatures are frequently in the low teens, but feel much colder due to wind chill. The extreme conditions of the location fairly frequently cause interruption to the site's electrical power supply, so the site has to be self-sufficient for power and heating. The original 1960s generator stands (Properties 32260 and 32274) support two large generator units supplied with fuel by a nearby diesel storage tank. Most of the Salinas Peak buildings occupied by personnel or temperature sensitive equipment are supplied by LPG tanks for heating. Water storage tanks have been fixtures at Salinas Peak since the site was established, and have been replaced through time. These support facilities ensured the self-sufficient operation of Salinas Peak despite its remote location and extreme weather conditions.

8.8.3 Expression of Military Cultural Traditions

According to Loechl et al. (1994), military cultural traditions are expressed at military installations in both organizational and aesthetic senses. These military values include hierarchy, uniformity, discipline, utility, and patriotism (Loechl et al. 1994:38). However, these values are more specific to personnel and administrative areas of military installations, while Salinas Peak is a remote, mountaintop communications facility. As such, it expresses the technical requirements and limited infrastructure required of its remote location and communications mission, rather than the hierarchical or patriotic values that would be displayed at military barracks or housing areas.

However, the military value of utility is expressed in the types of buildings and structures encountered at the installation. Property 32272 is a simple concrete and CMU building that is typical of the utilitarian buildings found at many DOD facilities. Associated facilities are either pre-manufactured, steel frame buildings, or steel lattice antenna towers. The utilitarian nature of the buildings and structures at Salinas Peak are typical of communications and instrumentation facilities at WSMR, which emphasized function rather than form in order to meet the needs of the RDT&E mission.

8.8.4 Circulation Networks

Loechl et al. (1994) defines circulation networks as roads and transportation routes that facilitate the movement of troops and supplies across military installations. These networks can include major primary and secondary roads as well as smaller local roads and access routes to specific areas (Loechl et al. 1994:38).

As an isolated mountaintop location, Salinas Peak does not possess “circulation networks” in the same sense as that defined by Loechl et al. (1994). Salinas Peak is accessed via Range Road 13 and the gravel-surfaced Range Road 327, which essentially dead-ends at the site. The serpentine Range Road 327 is the single dedicated access road to Salinas Peak, and climbs the last five miles to the summit via a series of steep grades and switchbacks. Within the site itself, the access road forms a loop around Property 32272, and a narrow spur road continues east to the Tartar Knob site along the ridgeline. Individual properties are accessed via short gravel drives. The site has also historically been equipped with a helicopter pad, providing an alternative means of emergency access, although its usage would likely be limited by wind and weather conditions.

8.8.5 Boundary Demarcations

Boundary demarcations on military installations define the limits of the overall installation as well as specific areas of land use within the larger installation, and unlike city limits, are often quite visible (Loechl et al. 1994:39). This is not the case at Salinas Peak, which lacks a perimeter fence or other obvious boundary markers around the site. Rather, the site is limited by the steep slopes that surround the location on almost all sides. Vegetation atop Salinas Peak was likely sparse in its natural state, but has been mostly cleared from the site. The gravel access roads and graded areas around the installation also serve to demarcate the site on the mountainous landscape.

8.8.6 Vegetation

Vegetation can be important to the definition of landscapes as it bears a direct relationship to long-established patterns of land use. Landscaped residential areas or intentionally cleared areas both communicate different aspects of the military mission on the land. Forests or groves of trees can be used as boundary markers or buffers against surrounding communities (Loechl et al. 1994:39). Salinas Peak is an example where intentionally clearing serves to demarcate the military installation on the landscape.

Vegetation in the area consists of a mixture of Ponderosa Pine Forest and Pinyon Pine Woodland (Muldavin et al. 2000a; Muldavin et al. 2000b). The Ponderosa Pine Forest is mostly limited to the highest elevations of the San Andres Mountains and is indicated by a mixture of Ponderosa Pine (*Pinus ponderosa*) woodlands, deciduous oak (*Quercus gambelii*) woodlands, and montane grasslands. The Pinyon Pine Woodlands are more common and are widespread across the San Andres and Oscura Mountains. Pinyon Pine Woodlands consist of a combination of pinyon (*Pinus edulis*), juniper (*Juniperus monosperma*), and evergreen oak (*Quercus grisea and Q. turbinella*) woodlands, along with mountain mahogany (*Cercocarpus montanus*) and wavy-leaf (*Quercus undulata*) montane scrub (Muldavin et al. 2000a; Muldavin et al. 2000b). Conditions on the top of Salinas Peak are not amenable to forest development, as the summit is exposed to high winds, mostly lacks developed soils, and is not well-watered. The generally arid and rugged San Andres Mountains mostly support limited forests along sheltered eastern and northern slopes, which retain more moisture. The natural vegetation that was found on Salinas Peak has mostly been cleared around the installation for both ease of access as well as to provide a defensible space in the event of brush fires. Areas of the site were also cleared and graded for the construction of buildings and structures. The cleared area of Salinas Peak clearly contrasts with the surrounding areas of alpine grasslands, scrub, and forests, making Salinas Peak stand out on the landscape as a discrete area of military activity.

8.8.7 Buildings, Structures, and Objects

Buildings, structures, and objects are often the most prominent features on the landscape and traditionally the focus of the NHPA compliance process. As defined by the NPS, buildings are designed to shelter some sort of human activity, while structures are designed for functions other than sheltering people and their works (NPS 1995). Objects are generally smaller and can be moveable, and are often commemorative or artistic in nature such as water fountains or statues (Loechl et al. 1994:40). The buildings, structures and objects at Salinas Peak are the primary expression of the military mission on the landscape and define the orientation and layout of the complex. The Salinas Peak inventory effort resulted in the recordation of ten buildings, structures, and objects. These properties are located in a definable cluster that is an expression of the functional activities conducted at the Salinas Peak installation.

8.8.8 Clusters of Buildings, Structures, and Objects

According to Loechl et al. (1994:40), the organizational and spatial relationships among buildings, structures, and objects at military installations are one of the most important characteristics of military landscapes. Due to its relatively small total acreage and number of properties, Salinas Peak consists of one primary organizational cluster. The Navy radar installation on Tartar Knob could be considered as a secondary cluster, but this installation post-dates the Cold

War and only consists of one semi-permanent radar structure. Property 32272 formed the original core of the site and remains intact today, and is associated with an antenna tower (Property 32264). Two other Cold War buildings (Properties 32270 and H5103) remain intact at the site, along with a small array of Cold War period support and infrastructural properties. These support facilities include two generator platforms (Properties 32260 and 32274) and several LPG storage tanks (Properties 32277, 32278, and 32279). Additional buildings and structures have been added to the Salinas Peak installation after the end of the Cold War, including Properties 32258, 32292, and 32296.

8.8.9 Archaeological Sites

Military installations often include prehistoric and historic archaeological sites, but most predate the military use of the land and are unrelated to the military mission of the installation (Loechl et al. 1994:40). Accordingly, the current inventory was thematically oriented towards extant Cold War buildings, structures, and objects at Salinas Peak.

The perspective of historic military landscapes is thematically limited to military use of the landscape, but historic archaeological sites can nonetheless inform on past military missions of the installation (Loechl et al. 1994:40). Some military forts and training areas in the Southwest have long histories that began with the concession of the region to the US by Mexico as part of the Treaty of Guadalupe Hidalgo in 1848. Fort Bliss is an excellent example, which was first established in 1849 and has steadily transitioned from a small isolated frontier outpost to a major center for Army training and maneuvers. No such extensive history exists for the Salinas Peak installation, as the earliest military activity at the site dates from the late 1950s. Accordingly, no historic archaeological sites related to the military use of the area prior to the establishment of the Salinas Peak installation were encountered during the inventory.

8.8.10 Salinas Peak as a Historic District

Consideration of Salinas Peak within an appropriate historic context and analysis of its physical landscape characteristics show that it meets the definition of a historic military landscape as presented by Loechl et al. (1994). Not only is the Salinas Peak installation an identifiable expression of the military mission on the land, it also possesses significant associations with patterns and events significant to history. Per the guidance offered in Loechl et al. (1994), historic military landscapes are nominated as historic sites or districts. The language specific to historic districts is contained within Criterion C.

Historic districts are nominated under the important final clause of Criterion C, which allows for properties “that represent a significant and distinguishable entity whose components may lack individual distinction” (NPS 1995:2), to be nominated to the NRHP. In essence, the district clause of Criterion C allows recognition of groups of properties whose whole is greater than the sum of their parts (King 2004:113).

According to NRHP guidance, “A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development” (NPS 1995:5). Salinas Peak represents a significant concentration of buildings, structures, and objects that are associated with the USASC and the historic communications and instrumentation networks that supported RDT&E efforts at WSMR. Salinas Peak also possesses significant associations with three of the Cold War historic themes identified by Lavin (1998). Salinas Peak therefore represents the manifestation of a military mission on the land and it continues to be used as part of the WSMR communications network today. While the Salinas Peak properties lack distinction when considered as individual resources, they achieve greater significance when considered as a collective within the context of the Cold War historic themes discussed above.

The Salinas Peak installation does possess some issues of integrity, as some of its Cold War properties have been removed or replaced, and new facilities added to the site. However, ACHP guidance on technical and scientific facilities advises that these facilities and their equipment need to change through time, and continuity of use helps to preserve the associations of these facilities (ACHP 1991). The function of the Salinas Peak installation has not changed meaningfully through time, as it remains a distinctive location for WSMR communications and instrumentation facilities. The dramatic location of the Salinas Peak site communicates a great deal about its historic associations, which somewhat mitigates the changes made to its site fixtures through time. The remaining Cold War properties at Salinas Peak retain physical features that are relevant to the identified historic themes and pertinent to the historic context of the site. Mostly through the mountaintop location of these facilities, the Salinas Peak installation remains capable of conveying its historic character and association to modern viewers.

It is therefore the recommendation of Epsilon Systems that Salinas Peak is a recognizable historic military landscape eligible to the NRHP as a historic district under Criteria A and C due to its significant associations with the identified Cold War themes of Basic Scientific Research; Materiel Development; and the multi-part theme of Command, Control, Communications, Computers, and Intelligence (Lavin 1998). While none of the Salinas Peak properties are recommended for individual eligibility, several of the documented properties are recommended for eligibility as contributing elements to the identified Salinas Peak historic district (see Table 1).

As the Salinas Peak installation lacks any associated fenced limits or other obvious boundary markers, the limits of the proposed historic district are somewhat arbitrary. A basic boundary that encloses the primary Salinas Peak properties and the associated cleared portions of the site is proposed as the historic district boundary (Figure 92). No Cold War-era elements of the Salinas Peak built environment were observed beyond this proposed boundary.

The proposed improvements to Salinas Peak represent a federal undertaking as defined by Section 106 of the NHPA. NHPA Section 106 regulations state that if there are historic properties in the project location that may be affected by a federal undertaking, the agency official shall assess adverse effects, if any, in accordance with the Criteria of Adverse Effect defined in 36 CFR 800.5. Application of the Criteria of Adverse Effect is largely an assessment of an undertaking's impacts on the historic integrity of a historic property and how an undertaking will affect those features of a historic property that contribute to its eligibility for listing in the National Register. Effects can be direct, indirect, and cumulative, as discussed in Section 9.1. This section applies the Criteria of Adverse Effect to the impacts that the proposed project may have on the recommended Salinas Peak historic district. Additionally, the ACHP has published guidance on the consideration of "highly technical and scientific" facilities which is also relevant to this analysis (ACHP 1991; 2009).

Section 9.1 includes a discussion of the various Criteria of Adverse Effect and is followed by a general analysis of these criteria in relation to the proposed modifications to the Salinas Peak site, which is recommended as a historic district. The proposed modifications to the Salinas Peak site are discussed in Chapter 3. For the reasons discussed here, Epsilon Systems recommends that the project will have no adverse effect on the recommended Salinas Peak historic district or any of its contributing properties.

9.1 Criteria of Adverse Effect

The definition of effect is contained within 36 CFR Part 800: "Effect means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register."

Per 36 CFR Part 800, an adverse effect occurs "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association…. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative." Examples of adverse effects may include, but are not limited to, the following:

> I. Physical destruction of or damage to all or part of the property;
>
> II. Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR Part 68) and applicable guidelines;
>
> III. Removal of property from its historic location;
>
> IV. Change of the character of the property's use or of physical features within the property's setting that contributes to its historic significance;
>
> V. Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
>
> VI. Neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

Figure 94. View of proposed helipad location, which has been previously graded.

> VII. Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

Effects can be direct, indirect, and cumulative. Direct effects include physical destruction or damage. Indirect effects include the introduction of visual, auditory, or vibration impacts as well as neglect to a historic property. The assessment of cumulative effects involves the consideration of not only the impacts of the current project, but also how known past or present projects, or foreseeable future projects, contribute to the overall cumulative impacts to an eligible resource.

9.2 Effects Analysis

The proposed undertaking will involve a series of improvements to the Salinas Peak installation. The Secretary's Standards for the Treatment of Historic Properties (36 CFR Part 68) is primarily oriented towards buildings and the guidance is not very applicable in this particular case. Other guidance, such as that offered by the ACHP (1991;

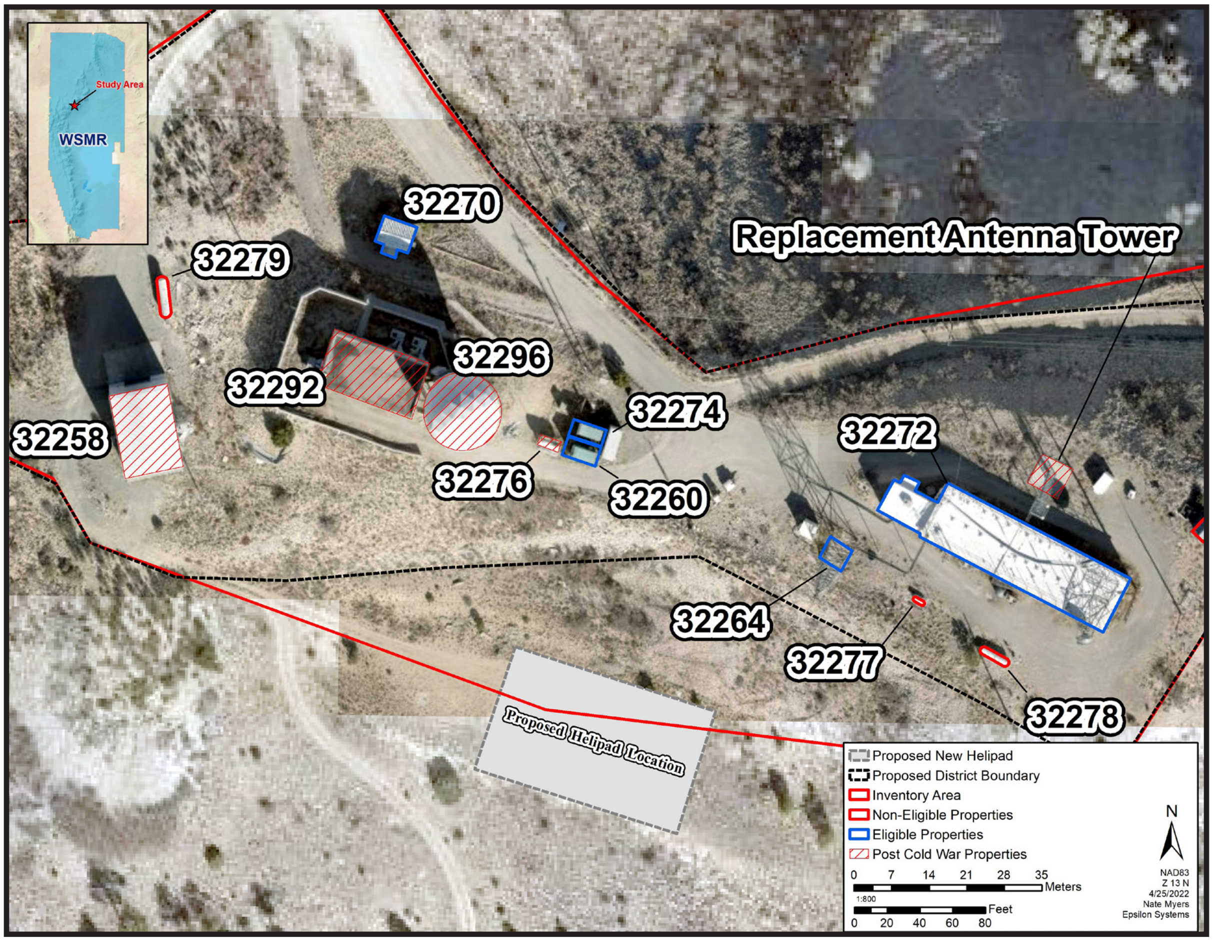

Figure 95. Location of proposed helipad at Salinas Peak.

2009) for technical and scientific facilities is perhaps more relevant in this situation and is drawn upon for this analysis.

The ACHP (1991; 2009) offers guidance on balancing historic preservation with technological changes and advancement and is relevant to the proposed improvements to Salinas Peak. ACHP guidance on technical and scientific facilities, states that "it is important to remember that these facilities and their equipment need to change and evolve through time, *and that it is through continued use that much of the equipment still exists at all*" (ACHP 1991:9; emphasis in original). The guidance further notes that continuity of use actually may help preserve association, despite the modifications that might be necessary: "Few structures in use today will undergo modification to such an extent that all integrity is lost. In most cases there should be continuity in function, and thus in integrity of design and materials, and there may always be integrity of association" (ACHP 1991:33). The proposed improvements are consistent with the historic use and identity of Salinas Peak, and in consideration of this guidance, do not present meaningful impacts to the Salinas Peak site. Instead, as noted in the guidance, these improvements will actually help support the continued operation of Salinas Peak, which will likely help to maintain the location's historic associations with communications and instrumentation at

WSMR. The Criteria of Adverse Effect are applied to the proposed Salinas Peak improvements below, sometimes in tandem as the Criteria often overlap in terms of their applicability.

10. Summary and Conclusions

Communications are the backbone of managing the activities of a test range that encompasses over 4,000 square miles. WSMR's immense and varied land mass requires the ability to not only convey multiple types of electronic data, but to do so in an unobstructed manner. The Salinas Peak site was set up to facilitate improved flow of communications, both voice and instrumentation data links. Time-code generation would be added later. Optical instrumentation was set up concurrently but was not long-lived at the site.

In January 2022, Epsilon Systems was retained to conduct an inventory of the Salinas Peak site properties and evaluate them for their NRHP eligibility. The inventory limits were determined in consultation with James Bowman, Cultural Resources Manager at WSMR, as the immediate site containing buildings, structures, and objects

Epsilon Systems conducted an on-site inventory and recorded ten properties at Salinas Peak. The recorded resources relate specifically to the Cold War military-industrial historic themes of Basic Scientific Research; Materiel Development; and the multi-part theme of Command, Control, Communications, Computers, and Intelligence (per Lavin 1998) that are significant to our national history. All of the documented resources date to the Cold War era (1946 to 1989); no prehistoric resources were recorded or evaluated. The current inventory was logged as NMCRIS number 150014 with ARMS.

While none of the recorded properties are recommended for individual eligibility under the NRHP Criteria, it was found that the Salinas Peak site represents a historic military landscape (per Loechl et al. 1994) that dates to an identified period of significance associated with the Cold War operation of WSMR (1959 to 1989). The Salinas Peak site has accrued some recent additions that post-date its Cold War-era period of significance; however, it is the recommendation of Epsilon Systems that Salinas Peak retains sufficient historic integrity of its physical features to convey its historic significance. As such, Epsilon Systems recommends that the Salinas Peak site is recognizable as a historic military landscape that is best managed as a historic district, per Department of the Army guidance (Loechl et al. 1994).

It is the recommendation of Epsilon Systems that the proposed improvements to the Salinas Peak site will not pose a significant impact to the physical traits and qualities that make Salinas Peak eligible as a historic district. TThe project also proposes to clear a location for a new helipad south of Property 32272. The proposed helipad location will not impact any eligible properties and is actually in the same approximate location as an earlier helicopter landing pad, so it is consistent with the historic site setting and aesthetic. As such, the proposed improvements do not pose an adverse effect to the physical qualities that make the Salinas Peak site eligible as a historic district. Therefore, Epsilon Systems recommends that the proposed undertaking will have no adverse effect on any historic properties listed, or eligible for listing, in the NRHP.

References Cited

Advisory Council on Historic Preservation (ACHP)

1991 *Balancing Historic Preservation Needs with the Operation of Highly Scientific or Technical Facilities*. A Report to the US House of Representatives, Committee on Interior and Insular Affairs, Subcommittee on National Parks and Public Lands, and the Committee on Science, Space, and Technology. Advisory Council on Historic Preservation, Washington D.C.

2009 *Consideration of Highly Technical and Scientific Facilities in the Section 106 Process*. Draft Memorandum, Advisory Council on Historic Preservation, Washington D.C.

Aerospace Corporation

1963 Range Data Book – White Sands Missile Range: Volume II – Instrumentation. Report No. ATN-63(3153-07)-1 Vol II. San Bernardino, California.

Andress, James

1963 Microwave System at White Sands. Telephony Magazine. Jim Andress Communications Collection, 17.001. WSMR Museum Archives.

1987 The WSMR Fiber Optic Cable Project. Jim Andress Communications Collection, 17.001. WSMR Museum Archives.

1988 WSMR's New Lightwave/Fiber Optic Transport System. Jim Andress Communications Collection, 17.001. July. WSMR Museum Archives.

2007 Getting to the Top of the World. *Hands Across History* 3(3):3, 6.

n.d. WSMR Communications Organizations. Hand-written list. Jim Andress Communications Collection, 17.001. WSMR Museum Archives.

Arnold, Norman W.

1946 Facilities and Instrumentation at White Sands Proving Ground. The Committee on Special Weapons Test Ranges. 8 July. White Sands Proving Ground

Barton, David K.

2014 Range instrumentation radar at White Sands Proving Ground WSPG, 1946-1958, Memorandum on file, Environmental Division, White Sands Missile Range, New Mexico.

Bateman, William T.

1962 ROTI Final Report: Development of Recording Optical Tracking Instrument (ROTI) Range Instrumentation Development Division. 1 May. Integrated Range Mission, White Sands Missile Range, New Mexico.

Bellinger, Kenneth

2000 Range Optical Instrumentation Thru the Years 1940-2000. WSMR Museum Archives 06.055.001, White Sands Missile Range, New Mexico.

Billups, Benjamin

1959 Monograph-WSMR History. 3 September. White Sands Missile Range, New Mexico.

Bowker, R.R.

1956 American Architects Directory, First edition, 1956. December 1955. R.R. Bowker LLC. Electronic Document, https://aiahistoricaldirectory.atlassian.net/wiki/spaces/AHDAA/pages/20644319/1956+American+Architects+Directory, accessed March 22, 2022.

1962 American Architects Directory, First edition, 1956. December 1955. R.R Bowker LLC. Electronic Document, https://aiahistoricaldirectory.atlassian.net/wiki/spaces/AHDAA/pages/20677106/1962+American+Architects+Directory, accessed March 22, 2022.

Bullard, John W.

1965 *History of the Redstone Missile System*. Army Missile Command, Redstone Arsenal Alabama.

Bumgarner, Raymond A.

2011 The Physical Science Laboratory's (PSL) First 25 Years: (1946-1971). Second Edition. Physical Science Laboratory. New Mexico State University.

Caldwell, Ginny

1957 Innocent Rumor Monger (IRM). 8(3). 19 April. Wind and Sand. White Sands Missile Range, New Mexico

Carroll, Thomas P.

1974 Historical Origins of the Sergeant Missile Powerplant. In *History of Rocketry and Astronautics, Proceedings of the Seventh and Eighth History Symposia of the International Academy of Astronautics, Baku, U.S.S.R. 1973, Amsterdam, Netherlands, 1974:*121-146. American Astronautical Society, San Diego.

Coker, Kathy R. and Carol E. Rios

1988 A Concise History of the U.S. Army Signal Corps, Office of the Command Historian US Army Signal Center and Fort Gordon, September.

Commscope

2017 Microwave Communication Basics: The Theory, practices, and Technologies that Link the Wireless World. Commscope Inc., Hickory, North Carolina.

Corliss, William R.

1974 Histories of the Space Tracking and Data Acquisition Network (STADAN), The Manned Space Flight Network (MSFN), and the NASA Communications Network (NASCOM). NASA, Washington D.C.

Delgado, R. F.

1981 Photo-Optical Instrumentation: An Overview. Optical Engineering, September/October.

DeVorkin, David H.

1987 Organizing for Space Research: The V-2 Rocket Panel. *Historical Studies in the Physical and Biological Sciences* 18(1):1-24.

1992 *Science With a Vengeance: How the Military Created the US Space Sciences After World War II*. Smithsonian Institution, New York.

Eckles, Jim

2013 Pocketful of Rockets: History and Stories Behind White Sands Missile Range. Fiddlebike Partnership, Las Cruces, New Mexico.

Eidenbach, Peter L., Richard L. Wessel, Lisa M. Meyer, and Gail C. Wimberly

1996 *Star Throwers of the Tularosa: The Early Cold War Legacy of White Sands Missile Range*. Human Systems Research Report 9422. Human Systems Research, Tularosa, New Mexico.

Esser, Phillip S.

2017 Historic Context for Astrodome Instrumentation Shelters and Types, White Sands Missile Range. Epsilon Systems Solutions, Inc.

Field, J.M.

1970 Disposition Form: Real Estate Notice of Facilities Action. 21 May. WSMR Museum Archives 97.810.240. White Sands Missile Range, New Mexico.

Holloman Air Force Base (HAFB)

1949 Organization of a Specialized Technical Group, Holloman Air Force Base. Manuscript on file, Environmental Division, White Sands Missile Range, New Mexico.

Hawley, J. W.

1986 Physiographic Provinces. In *New Mexico in Maps*, edited by J. L. Williams, pp. 23-27. University of New Mexico Press, Albuquerque.

Joint Board on Scientific Information Policy

1945 Radar: A Report on Science at War, Released for the Office of Scientific Research and Development, the War Department, and the Navy Department. Electronic Document, http://www.ibiblio.org/hyperwar/USN/ref/Radar-OSRD/index.html#XIV, accessed April 27, 2020.

Kammer, David

1997 Historical Significance of the Askania Cinetheodolite Towers Located on Holloman Air Force Base and White Sands Missile Range. New Mexico Natural Heritage Program Report.

Kennedy, Gregory P.

2009 *The Rockets and Missiles of White Sands Proving Ground 1945-1958*. Schiffer Military History, Atglen, Pennsylvania.

King, Thomas

2004 *Cultural Resource Laws and Practice: An Introductory Guide*. 2nd ed. Altamira Press, Walnut Creek, California.

Korfmacher, Kurt

2015 *History of Cinetheodolite and Other Optical Tracking Technology at White Sands Missile Range, New Mexico, 1945-1965*. Submitted to White Sands Missile Range, New Mexico, as Amaterra Environmental Technical Report No. 70.

Kosmider, Gary L.

1985 Disposition Form: Transfer of Building 32270. 17 March. White Sands Missile Range, New Mexico.

Laidlaw, W.E.

1959 A Resumé of Significant Achievements During Calendar Years 1956, 1957, and 1958 at White Sands Missile Range.

Lavin, Mary

1998 *Thematic Study and Guidelines: Identification and Evaluation of the US Army Cold War Era Military-Industrial Historic Properties*. US Army Environmental Center, Aberdeen Proving Ground, Maryland.

Loechl, Suzanne Keith, Samuel A. Batzli, and Susan I. Enscore

1994 *Guidelines for Documenting and Evaluating Historic Military Landscapes: An Integrated Landscape Approach*. AEC Technical Guideline Prepared by the United States Construction and Engineering Laboratory, Champaign Illinois. Copies available electronically.

Mabe, Ruth

1958 Thousands of Eyes Keep Watch Over Range: Six Organizations Use Millions in Equipment. *Wind and Sand* 5 September: 2-3. White Sands Missile Range, New Mexico.

1967 Range Modernization Job Nears Completion. Wind and Sand. 14(31). 24 February. White Sands Missile Range, New Mexico.

Mangum, Cledous M.

1951 *Paperclip or Project 63 Personnel*. Manuscript on file, Environmental Division, White Sands Missile Range, New Mexico.

MARS

n.d Brief History of Air Force MARS. Electronic Document, http://marsradiowatch.com/air-force.php, Accessed November 7, 2013.

McClain, Carl J.

1962 Job Order Request: ARTRAC Antenna. Salinas Peak. WSMR Museum Archives 97.810.240. White Sands Missile Range, New Mexico.

Miles, Richard C. (editor)

1961 Initiation of the Jet Propulsion Laboratory. In *Development of the Corporal: The Embryo of the Army Missile Program.* Historical Monograph No. 4, pp. 1-10. Army Missile Command, Huntsville, Alabama.

Missile Range Instrumentation

1960 The Missile, December: 12-22.

Missile Ranger

1972 COL Holderman to model rocket meet. 23(13). 16 June. White Sands Missile Range, New Mexico.

1973 Educational TV adds new Dimension at WSMR. 24(27). 21 September. White Sands Missile Range, New Mexico.

1975 Research meteorologist's paper included in book. 25(43). 17 January. White Sands Missile Range, New Mexico.

1977 Drones Controllable in Formation. 27(45). 18 February. White Sands Missile Range, New Mexico.

1979 Employees Daring Erans Cash Reward. 31(24). 22 June. White Sands Missile Range, New Mexico.

Moore, David W. Jr., Justin B. Edgington, and Emily T. Payne

2010 A Guide to Architecture and Engineering Firms of the Cold War Era. Department of Defense Legacy Resource Management Program, Project 09-034.

Muldavin, E., Y. Chauvin, and G. Harper

2000a The Vegetation of White Sands Missile Range, New Mexico, Volume I: Handbook of Vegetation Communities. Prepared under Cooperative Agreement No. 14-16-002-91-233 White Sands Missile Range, US Fish and Wildlife Service, The Nature Conservancy, and the University of New Mexico. Albuquerque.

Muldavin, E., G. Harper, P. Neville, and Y. Chauvin

2000b The Vegetation of White Sands Missile Range, New Mexico, Volume II: Vegetation Map. Prepared under Cooperative Agreement No. 14-16-002-91-233 White Sands Missile Range, US Fish and Wildlife Service, The Nature Conservancy, and the University of New Mexico. Albuquerque.

Naugle, John E.

1991 *First Among Equals: The Selection of NASA Space Science Experiments*. NASA History Series, Washington D.C.

National Range Operations (NRO)

1971 Guide to Radar Systems. Performance Evaluation Division, National Range Operations.

1976 National Range Instrumentation and Support System Capabilities. Range Programs Division. US Army Test and Evaluation Command. Appendix A.

National Park Service (NPS)

1995 *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. US Department of the Interior, National Park Service, Cultural Resources Division, Washington D.C. Copies available electronically.

2011 The Origins of Executive Order 11593: Protection and Enhancement of the Cultural Environment. Facts for Feds, May 2011. US Department of the Interior, National Park Service, Federal Preservation Institute, Washington D.C.

New Mexico Architecture (NMA)

1966 Kenneth Clark is named Fellow of A.I.A. July-August.

Perea, Fred A.

1979 32270: Excess Building. Plans and Services Division. 17 September. White Sands Missile Range, New Mexico.

Pierce, James H.

1971 Assignment of Building Number S-32270. 4 May. WSMR Museum Archives 97.810.240. White Sands Missile Range, New Mexico.

Pike, B.

1954 Control of Environment for Askania Theodolites. US Navy. Memorandum 1767. US Naval Ordnance Test Station, Inyokern, California.

Poisall, C.R.

1956 New Multiplexing System Provides Time Signals for All Range Sites. 6(49). 9 March. White Sands Missile Range, New Mexico.

Pond-Woolpert Joint Venture

2019 Planning Charette Report: Joint Directed Energy Test Capability, PN 93005: J-DETC Central Energy Facility, PN 93666: Salinas Peak HEL Facility. Manuscript on file, White Sands Missile Range, New Mexico.

Raines, Rebecca Robbins

1996 Getting the Message Through: A Branch History of the U.S. Army Signal Corps, Center of Military History, US Army, Washington DC. Electronic Document, https://history.army.mil/books/30-17/Front.htm#app, accessed April 6, 2020.

Range Instrumentation Development Division

1959 Advanced Range Testing Reporting and Control Plan (ARTRAC). Prepared for Integrated Range Mission. White Sands Missile Range, New Mexico. 15 March.

Range Instrumentation Directorate

1962 White Sands Missile Range Presentation to Range Instrumentation Study Group. Range Instrumentation Development Division, Administrative Services Branch. December.

Reynold, A.L.

1962 IRIG Timing Implementation. Memo to All Stations. Integrated Range Mission. 30 July.

Riggs, L. A., and C. H. Graham

1947 Photographic Measurements of Atmospheric Boil. Journal of the Optical Society of America:15-20.

Rocketeer

1980 Amateur Radio Operators Supply Link between Military, Families. Naval Air Weapons Station, China Lake, California. December 19.

Salas De Santiago, Adriana

2016 A Day at WSMR: Working at a 9,000 Foot-High Peak. *Missile Ranger* 69(22), 16 May:3.

Scavullo, Joseph J., and Frederick J. Paul

1965 Aerospace Ranges: Instrumentation. D. Van Nostrand, New York.

Sherfy, Marcella and W. Ray Luce

1998 National Register Bulletin 22: Guidelines for Evaluating and Nominating Properties that Have Achieved Significance Within the Past Fifty Years. US Department of the Interior, National Park Service, National Register of Historic Places, Washington D.C. Copies available electronically.

Signal Missile Support Agency (SMSA)

1960 *A Technical Catalog of Resources and Capabilities*. White Sands Missile Range, New Mexico.

Simmons, Eve

1952 Historical Information, White Sands Proving Ground, New Mexico: 9 July 1945 to 31 December 1952. Manuscript on file, Environmental Division, White Sands Missile Range, New Mexico.

Smith, Charles P., Jr.

1954 *Upper Atmosphere Research Report No. XXI: Summary of Upper Atmosphere Rocket Research Firings*. Naval Research Laboratory, Washington D.C.

Sonnichsen, C.L.

1960 *Tularosa: Last of the Frontier West*. University of New Mexico Press, Albuquerque.

SquareRoot Services

2022 Topographic Survey Sheet of Salinas Peak and Proposed Laydown Yard. SquareRoot Services Project Number 22033, Hobbs, NM. Manuscript on file, Environmental Division, White Sands Missile Range, New Mexico.

Starkweather, F. T.

1969 Funding Request. 20 October 1969. WSMR Museum Archives 97.810.240. White Sands Missile Range, New Mexico.

1990 Historic San Augustine Ranch is Post's Neighbor. Missile Ranger. 43(48). 30 November.

Test Department

1953 NOTS-Modified Askania Cinetheodolites. Technical Report No. 2066, NOTS 772. NAVORD, Naval Ordnance Test Station.

US Army

2006 Guide to Army Real Property Category Codes. Department of the Army Pamphlet 415–28. 11 April. Headquarters Department of the Army Washington, DC.

2019 Form DD1391: J-DETC Salinas Directed Energy Facility. Manuscript on file, White Sands Missile Range, New Mexico.

United States Army Signal Corps (USASC)

1959 Quadrennial Report of the Chief Signal Officer, U. S. Army, May 1955 to April 1959, Office of the Chief Signal Officer Department of the Army, Electronic Document, https://play.google.com/books/reader?id= fYzWAAAAMAAJ&hl =en&pg=GBS. PA63, accessed April 29, 2020.

Wallace, Laurel

2004 *Historic Highways in the NMDOT System*. New Mexico Department of Transportation Technical Series 2004-1, Santa Fe.

Western Regional Climate Center (WRCC)

2022 Carrizozo, New Mexico, Period of Record Monthly Climate Summary. Electronic document, http://www.wrcc.dri.edu , accessed April 19th, 2022.

White, Perry L.

1955 Radar Data for Optical Tracking. Missile Away! 3(3):18-21.

White Sands Missile Range (WSMR)

1959 Fact Sheet on Cable Hoist Story. 20 May 1959.

1960 Diary: 1957, 1958, 1959, White Sands Proving Ground. WSMR Museum Archives 97.009. White Sands Missile Range, New Mexico.

1963 Funding/Implementation Request – Instrumentation Building for Timing Facilities at Salinas Peak Site. WSMR Realty Disposition Form, manuscript on file with WSMR Public Works, White Sands Missile Range, New Mexico.

1964 Note: Salinas Peak G-129. 17 January 1964. WSMR Museum Archives 97.810.240. White Sands Missile Range, New Mexico.

1966 White Sands Missile Range Organizational Realignment Pamphlet. White Sands Missile Range, New Mexico.

1986 White Sands Missile Range Technical Capabilities. U.S. Government Printing Office. Denver, Colorado.

2012 Historic American Buildings Survey, Range Control Center, HABS No. NM-WSMRRCC. Manuscript on file, Environmental Division, White Sands Missile Range, New Mexico.

White Sands Missile Range (WSMR) Museum

2014 White Sands Missile Range Hall of Fame: Mr. Ozro M. Covington. Electronic document, http://www.wsmr-history.org/halloffame12.htm, accessed January 9, 2014.

White Sands Proving Ground

1952 Progress Report: Calendar Year 1951. White Sands Proving Ground, New Mexico.

White Sands Signal Corps Agency (WSSCA)

1953 Historical Record of the Signal Corps at White Sands Proving Ground. White Sands Proving Ground, New Mexico.

1955 Signals for Missiles: Historical Report of Events, July 1945 – December 1954. Prepared by Personnel and Administrative Division (WSSCA), White Sands Proving Ground, New Mexico.

Wind and Sand

1950 Signal News. 1(1), 16 March. White Sands Missile Range, New Mexico.

1951 S.C.E.L.'s Bells, 1(22), 19 January. White Sands Missile Range, New Mexico.

1953a WSSCA Fricassee. 3(51), 12 March. White Sands Missile Range, New Mexico.

1953b Signal Corps Has Active Role In Growth of Proving Ground. 4(16), 9 July. White Sands Missile Range, New Mexico.

1953c New Signal Corps Company Assigned to White Sands. 4(17), 16 July. White Sands Missile Range, New Mexico.

1956 Konegan Leaves Post After 9 Years Service. 7(1), 6 April:5. White Sands Missile Range, New Mexico.

1957a Giant WSSA Program Began with Ten Men. 7(40), 11 January. White Sands Missile Range, New Mexico.

1957b Frequency Coordinators Trap Awry Radio Signals. 8(35), 29 November. White Sands Missile Range, New Mexico.

1958a Fast-Growing Signal Agency Renamed. 9(23), 5 September. White Sands Missile Range, New Mexico.

1961 Gunga Dins Take Water Up Range. 7(8), 26 May: 1, 8. White Sands Missile Range, New Mexico.

1962a Materiel Command Is Put Into Operation By U.S. Army. 8(18), 10 August. White Sands Missile Range, New Mexico.

1962b Signal Agency Shifts Names. 8(20), 24 August. White Sands Missile Range, New Mexico.

1962c Sharp New Outfit Rides Radio Waves. 8(35), 7 December. White Sands Missile Range, New Mexico.

1962d 80,000 Circuit Miles of Wire in SMSA Lines. 8(5). 11 May. White Sands Missile Range, New Mexico.

1964 New Tracking Instruments ORRAS and GLOW, Under Study at White Sands. 10(24). 4 December. White Sands Missile Range, New Mexico.

1966a Organizational Realignment Names Deputies. 13(41), 22 April. White Sands Missile Range, New Mexico.

1966b White Sands Marks 21st Birthday Tomorrow. 13(52), 8 July. White Sands Missile Range, New Mexico.

1966c Stallion; 'Horse' with a Big Job Located in Middle of Vast Desert. 13(43), 6 May. White Sands Missile Range, New Mexico.

Wosika, V. Pearson

1959 New Optical Recorders Will Give Boost to Range 'Eyes'. *Wind and Sand* 10(1):1,8. White Sands Missile Range, New Mexico.