

WHITE SANDS SPACE HARBOR AREA 1

(Space Shuttle Landing Facility Area 1)

White Sands Missile Range

Range Road 10, approximately 4.2 miles northeast of intersection  
with Range Road 7

White Sands vicinity

Dona Ana County

New Mexico

HAER NM-28

*HAER NM-28*

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

INTERMOUNTAIN REGIONAL OFFICE

National Park Service

U.S. Department of the Interior

12795 West Alameda Parkway

Denver, CO 80228

HISTORIC AMERICAN ENGINEERING RECORD

WHITE SANDS SPACE HARBOR AREA 1  
(Space Shuttle Landing Facility Area 1)

HAER NO. NM-28

Location: White Sands Missile Range  
Range Road 10, approximately 4.2 miles northeast of  
intersection with Range Road 7  
White Sands vicinity  
Doña Ana County  
New Mexico

U.S.G.S 7.5. Minute Las Cruces, New Mexico,  
Quadrangle, Universal Transverse Mercator Coordinates:  
E 32.93817 N 106.41016 Zone 13S, NAD 1983

Present Owner: Commander, U.S. Army White Sands Missile Range,  
New Mexico 88002-5018

Present Use: Vacant

Significance: Space Shuttle Landing Facility Area 1 was an essential  
component of the White Sands Space Harbor (WSSH) from  
1976-2011. It has a direct association with the U.S.  
Space Shuttle Program (SSP) as the site of the landing  
of Space Transportation System (STS)-3 *Columbia* in  
March 1982; this is the only STS landing to take place  
outside Edwards Air Force Base in California and  
Kennedy Space Center in Florida. The Space Shuttle  
Landing Facility Area 1 is comprised of three runways,  
a control tower, a weather tower, a helicopter staging  
area, navigational aids and support facilities, a HUB  
maintenance building, a fire station, portable storage  
buildings, and a generator building.

Area 1 is considered to have national significance and  
is eligible for listing in the National Register of  
Historic Places (NRHP) under Criterion A for its  
association with the NASA SSP with a period of  
significance of 1976-2011. Because it achieved  
significance within the past fifty years, Criterion  
Consideration G also applies.

Report

Prepared by: Robbie D. Jones, Senior Historian  
New South Associates  
118 South 11<sup>th</sup> Street  
Nashville, TN 37206

Date: September 2013

LIST OF ACRONYMS

ABGR	Alamogordo Bombing and Gunnery Range
ABS	Anti-lock Braking System
ACHP	Advisory Council on Historic Preservation
ACI	Archaeological Consultants, Inc.
AIAA	American Institute of Aeronautics and Astronautics
APE	Area of Potential Effects
ATC	Air Traffic Control
BTT	Basic Training Target
CCC	Civilian Conservation Corps
CIT	California Institute of Technology
CONEX	Container Express
DC-X	Delta Clipper, Experimental
DoD	Department of Defense
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HPO	Historic Preservation Officer
HPWG	Historic Preservation Working Group
HUB	Harbor Utility Building
IGS	Inter Glide Slope
IHA	InoMedic Health Applications, LLC
JSC	Johnson Space Center
KSC	Kennedy Space Center
LC	Launch Complex
MD	McDonnell Douglas
MSBLS	Microwave Scanning Beam Landing System
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NAVAIDS	Navigational Aids
NEPA	National Environmental Policy Act
NHL	National Historic Landmark

NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSA	New South Associates
OCC	Operations Control Center
ORD	Army Ordinance Department
PAPI	Precision Approach Path Indicator
RFP	Request for Proposal
SCAPE	Self Contained Atmospheric Protective Ensemble
SHPO	State Historic Preservation Officer
SSP	Space Shuttle Program
SSRT	Single Stage Rocket Technology
STA	Shuttle Training Aircraft
STS	Space Transportation System
TACAN	Tactical Air Navigation
TAL	Transoceanic Abort Landing
UHF	Ultrahigh Frequency
USAAF	United States Army Air Force
USAF	United States Air Force
VITT	Vehicle Integration Test Team
WPA	Works Progress Administration
WSMR	White Sands Missile Range
WSNM	White Sands National Monument
WSPG	White Sands Proving Ground
WSSH	White Sands Space Harbor
WSTF	White Sands Test Facility

PART I. HISTORICAL INFORMATION

A. INTRODUCTION

The Space Shuttle Landing Facility, located on the U.S. Army White Sands Missile Range (WSMR) near Las Cruces in Doña Ana County, New Mexico, was an essential component of the White Sands Space Harbor (WSSH). The National Aeronautics and Space Administration (NASA) operated and managed the WSSH for astronaut training operations and as an alternate landing facility for the U.S. Space Shuttle Program (SSP) from 1976-2011. It has a direct association with the SSP as the site of the landing of Space Transportation System (STS)-3 *Columbia* in March 1982. The WSSH is located on the WSMR northeast of the NASA-operated White Sands Testing Facility (WSTF). The WSSH facility included the runways and support facilities (Area 1); the orbiter deservice area (Area 2); operations control center (Area 3); and original operations control center/deservice area/Delta Clipper site (Area 4). NASA formally ended the SSP on August 31, 2011, and in the summer of 2012 disposed of the WSSH and released use of the property to WSMR.

The WSSH Space Shuttle Landing Facility lies at the north end of the WSSH and contains approximately 4,900 acres. Area 1 is comprised of twenty-eight resources, including three runways, a control tower, a weather tower, a helicopter staging area, navigational aids and support facilities, a HUB maintenance facility, a fire station, portable storage buildings, and a generator building. The runways were constructed between 1976 and 1988. The HUB maintenance facility and support buildings are prefabricated and were located together between 1984 and 1992 to house training and landing needs. The Control Tower was purpose-built in 1979 and Weather Tower No. 4 was assembled in phases from 1982-2005. The WSSH Space Shuttle Landing Facility was vacated in 2011 and all electronic equipment, machinery, and furnishings were removed. In the summer of 2012, the U.S. Army initiated occupation and reuse of the facility and the Control Tower was relocated from WSSH to the WSMR Museum for storage and future exhibition.

B. PHYSICAL HISTORY OF WSSH AREA 1

1. DATE OF CONSTRUCTION

The first component of WSSH Area 1 to be constructed was Runway 17/35, completed in 1976. Runway 23/05 followed in 1977-78; it intersects Runway 17/35 near its center creating an "X" shaped footprint. The Control Tower was purpose built in 1979. The Weather Tower structures were assembled from 1982-2005. The Harbor Utility Building (HUB) complex is comprised of six prefabricated buildings created between 1984 and 1992. Runway 20/02, a Waterhole, and a Helicopter Staging Area were constructed in 1988. Navigational aids and support facilities were added from 1988-1995.

2. ARCHITECT/ENGINEER

Dennis G. Perrin, NASA WSTF engineer, is the engineer-of-record for the Control Tower. No other architects or engineers were identified.

3. BUILDER/CONTRACTOR/SUPPLIER

None identified.

4. ORIGINAL PLANS AND CONSTRUCTION

NASA WSTF Facility Manager and engineer Dennis G. Perrin drafted a set of engineering drawings with the assistance of Lockheed Martin contract employee J.A. "Andy" Dorris. Robert Maveety served as engineering supervisor and Ken Blair as drafting supervisor. There are four sheets of drawings, including a site plan, base foundation plan, plan view, elevations, and construction details. Plans were created around 1988 for construction of new asphalt directional markings for the runways. No other plans were identified.

5. ALTERATIONS AND ADDITIONS

Runway 17/35 was built in 1976 on the footprint of the earlier Northrup Strip. The original strip was upgraded, lengthened to 15,000', and widened to 100' with 50' shoulders. Around 1982, a cantilevered walkway was added to the Control Tower. Both Runways 17/35 and 23/05 were upgraded and lengthened between 1986 and 1989 to 35,000' in length and widened to allow 300' sidelines. Between 1988 and 1995, the runways were upgraded with modern navigational aids such as lighting and asphalt directional markings as well as prefabricated metal support buildings, portable synthetic sheds, and repurposed metal trailers. Around 2005, the covered vehicle bay attached to the Fire Station was enclosed and some navigational aids were upgraded. Many of the exteriors of the HUB buildings have been covered with spray foam insulation. The Weather Towers were upgraded as new technology became available. Once the WSSH Space Shuttle Landing Facility was vacated in 2011, all electronic equipment, machinery, and furnishings were removed. The U.S. Army initiated occupation and reuse of the facility in the summer of 2012. As a condition of a Memorandum of Agreement executed between NASA, the U.S. Army and the NM-SHPO in August 2012, the Control Tower was relocated from WSSH to the WSMR Museum in the summer of 2012 where it was placed in storage for future exhibition and public interpretation.

PART II. STRUCTURAL/DESIGN INFORMATION

A. GENERAL DESCRIPTION

1. ENVIRONMENT

The White Sands Space Harbor (WSSH) is located on the U.S. Army White Sands Missile Range (WSMR) near Las Cruces in Doña Ana County, New Mexico. This military post lies in the Tularosa basin along the upper edge of the Chihuahuan Desert, a vast eco-region straddling the U.S.-Mexico border in the central and northern portions of the Mexican Plateau. The Tularosa basin is an arid high-desert region covering approximately 6,000 square miles between the Rio Grande and Pecos River in south-central New Mexico with elevations ranging from approximately 3,800-4,200' feet above sea level. This stark desert is composed of the world's largest surface deposit of gypsum, a very soft sulfate mineral made of sulfur and calcium. Gypsum is derived from the Greek word gypsos, which means "chalk" or "plaster." Located between two towering mountain ranges, the gypsum sand dune is commonly known as "White Sands."<sup>1</sup>

The landlocked, bowl-shaped Tularosa basin is 150 miles long and 50-60 miles in width. It is located between the San Andres Range to the west and the Sacramento Mountains to the east. The unique sand dunes originated many millions of years ago when a shallow, glacial lake called Lake Otero covered south-central New Mexico. When the lake eventually evaporated, it left behind gypsum bearing marine deposits nearly 1,600' thick. The exposed northern region of the lakebed is a 1,600-square mile area called the Alkali Flat. The southern region contains an ephemeral lake, or playa, called Lake Lucero with a very high mineral content. Although summer temperatures can easily exceed 100 degrees, the unique white sand reflects the sun's rays and the grains are so fine they are cool and silky to the touch. Gypsum is commonly

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<sup>1</sup> Andreloi 1998: Section 3.1.2.2; Bennett, Jeffrey, and Douglas Wilder. "Physical Resources Foundation Report: White Sands National Monument. Natural Resources Report NPS/NRPC/NRR-2009/166." National Park Service, Fort Collins, Colorado, 2009: 9.

used to make plaster of Paris, fertilizers, drywall and Portland cement.<sup>2</sup>

The near ceaseless desert winds, clocked at more than fifty miles per hour, push the fine gypsum grains to form crests as high as sixty feet on the upwind side, and under the pressure of gravity, the sand slides down steep slipfaces, giving the sands dynamic movement. Each year, the most active dunes advance to the northeast more than thirty feet, covering almost everything in their path; the more stable dunes move very little. The gypsum dunes are a harsh and dry environment with fierce sandstorms, flash floods, and temperatures ranging from below zero in winter to more than 110 degrees in summer. Only a few plants and animals have adapted to survive.<sup>3</sup>

## 2. CHARACTER

Isolated, spacious, and built on the Northrup Strip within a federal installation, the location of 100-square mile WSSH at the WSMR offered some definite advantages for the expansive runways needed for the SSP. Area 1 of the Space Shuttle Landing Facility is comprised of three runways, a control tower, a weather tower, a helicopter staging area, navigational aids and support facilities, a HUB maintenance facility, a fire station, portable storage buildings, and a generator building. The immense "X" shaped intersecting runways are its dominating feature. The few support buildings and structures are organized around the runways. The control tower and the HUB buildings are clustered together on the east side of the intersection. The navigation aids and support facilities are located along the runways. The Space Shuttle Landing Facility is surrounded by open desert and ringed by mountain ranges.

## 3. CONDITION OF FABRIC

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<sup>2</sup> Andreoli 1998: Section 3.1.4; Welsh, Michael. "Dunes and Dreams: A History of White Sands National Monument. Administrative History: White Sands National Monument." National Park Service, Division of History, Intermountain Cultural Resources Center, Santa Fe, New Mexico, Professional Paper No. 55, 1995: Chapter 1; Bennett and Wilder 2009: 9.

<sup>3</sup> Andreoli, 1998: Section 3.1.2.2; Andreoli, 1998: Section 3.2.3; Welsh, 1995: Chapter 1; Bennett & Wilder, 2009: 7-18.

When documented in March 2012, the Space Shuttle Landing Facility had been abandoned and vacated, but was in overall fair to good condition. The exterior of some of the facility's buildings exhibited some minor rust and deferred maintenance. The portable interior equipment within the HUB Maintenance Facility had been removed, but the attached furnishings were in place. Due to the harsh desert environment and lack of maintenance, the runways had quickly deteriorated due to shifting sands, flash floods, and extreme temperature variations.

B. CONSTRUCTION

The Space Shuttle Landing Facility is composed of a variety of buildings and structures. Documentation of each component follows in HAER Nos. NM-28-A through NM-28-T.

C. MECHANICAL/OPERATION

Several buildings featured electricity to power interior lights, electronic navigational equipment, radios, and wall-mounted air conditioning units. Non potable water was supplied by a freestanding water tank at the HUB Maintenance Facility. A manmade Waterhole provided water for maintaining the runways. Generators provided back-up power at the HUB complex. The Weather Towers are monitored and maintained by the U.S. Army. The Fire Station was maintained by the U.S. Air Force. The Navigational Aids and Support Facilities were powered by portable generators or underground electrical cables connecting to the HUB Maintenance Facility.

PART III. SOURCES OF INFORMATION

A. ENGINEERING PLANS AND DRAWINGS

NASA engineers prepared four sheets of Control Tower drawings, including a site plan, base foundation plan, plan view, elevations, and construction details in the spring of 1979. There are no original engineering plans or drawings for the HUB Maintenance Facility, Runways, or the majority of the Navigational Aids and Support Facilities. Plans were created around 1988 for construction of new asphalt navigational markings for the Runways. NASA staff created an as-built, not-to-scale site plan of the HUB Maintenance Facility, which was used as a base map for this report.

B. EARLY VIEWS AND HISTORICAL DATA

Historic photographs and maps of the WSSH are very limited. A body of recent aerial photographs were located and photocopied for inclusion in the HAER document to supplement the current ground photography. Those photographs are located on pages 21 through 31 of this document. The other historical data comes from a variety of sources cited in the Bibliography below.

C. INTERVIEWS

The following NASA and WSMR employees were interviewed for this documentation.

Robert E. Mitchell, WSTF Manager, September 2011.

Frank Offutt, WSSH Manager, September 2011.

Timothy Davis, WSTF Historic Preservation Officer, September 2011 and March 2012.

Bill Godby, WSMR Historic Preservation Officer, September 2011.

Doyle Piland, WSMR Museum Archivist, September 2011.

Dennis G. Perrin, NASA Johnson Space Center, Houston, Texas, and  
WSTF Facility Manager (1975-1989), June 2013.

D. BIBLIOGRAPHY

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- Lerner, Preston. "Black Day at White Sands." *Air & Space Smithsonian Magazine*, August 2010.
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Paczynski." Published online, 2000. Website  
[http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlex  
Mr.aspx](http://www.army.mil/PAO/WSHist/HallFame/Pages/PaczynskiAlexMr.aspx), accessed September 19, 2011.

E. LIKELY SOURCES NOT YET INVESTIGATED

Research was conducted at WSSH and WSTF using primary and  
secondary sources. Sources that were not investigated that may  
contain secondary information are archived at the Lyndon B.  
Johnson Space Center in Houston, Texas.

Additional oral history interviews with other engineers and  
technicians could also prove useful.

PART IV. PROJECT INFORMATION

In 2011-2012, New South Associates (NSA), under contract with InoMedic Health Applications, LLC (IHA) of Kennedy Space Center, Florida, and in coordination with NASA and the U.S. Army, conducted background research and a historic architecture survey of resources at the NASA WSSH. The survey included the documentation and evaluation for NRHP eligibility for seventy-two resources located in four distinct areas. Based on this research, NSA determined that no properties remained at WSSH from the period prior to NASA acquisition in 1963 except for the footprint of the packed gypsum Runway 17/35.<sup>4</sup>

NSA recommended that the three NASA WSSH Runways and the Control Tower in Area 1 were individually eligible for listing in the NRHP and eligible as contributing resources to the "WSSH Shuttle Landing Facility District" under Criterion A and Criterion Consideration G for their association with the NASA SSP. None of the other sixty-eight inventoried properties were recommended individually eligible for listing in the NRHP due to lack of historical association with the NASA SSP or other historic contexts, lack of unique design or construction features, or insufficient integrity; however, nineteen of these properties, all of which lie within Area 1, were recommended as contributing resources to "WSSH Shuttle Landing Facility District," even though they were not recommended individually eligible for the NRHP. The historic district contained a total of twenty-eight resources: twenty-three are contributing and five are non-contributing.

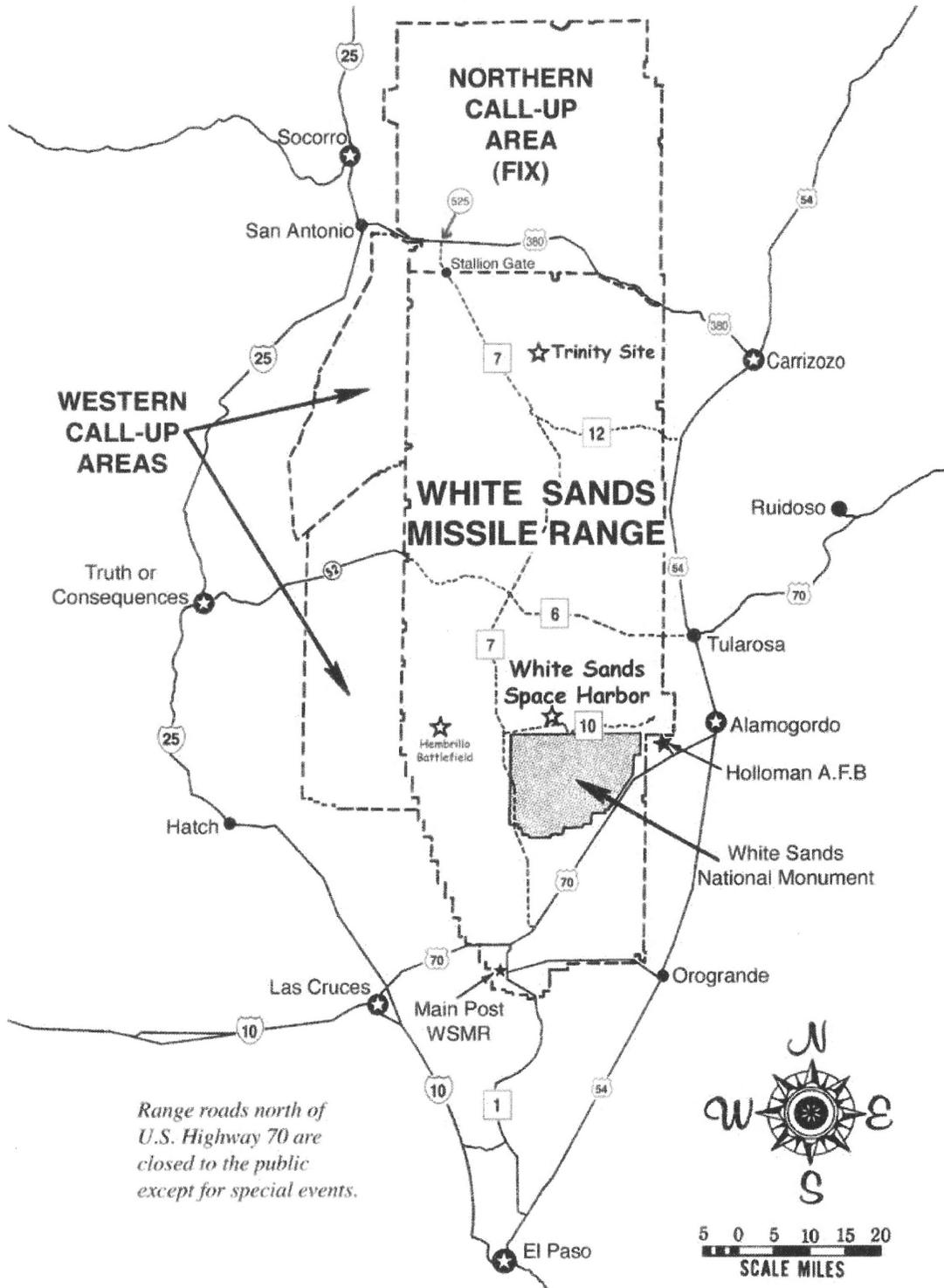
After formally ending the SSP on August 31, 2011, NASA disposed of the WSSH and released use of the property to the U.S. Army WSMR. The property transfer was a federal undertaking on federally-owned property and subject to compliance with Section 106 of the NRHP Act of 1966, as amended. The undertaking

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<sup>4</sup> Reed, Mary Beth, and Robbie D. Jones. "Historic Architecture Survey and National Register of Historic Places Evaluation of the NASA White Sands Space Harbor on the U.S. Army White Sands Missile Range, Doña Ana County, New Mexico." New South Associates, Stone Mountain, Georgia, 2012. Unpublished report on file at NASA WSTF, Las Cruces, New Mexico.

resulted in an Adverse Effect to the NRHP-eligible WSSH Shuttle Landing Facility District. To mitigate the adverse effects, NASA completed HAER Level II documentation of the historic district and relocated the Control Tower to the WSMR Museum for conservation, exhibition, and public interpretation.

The mitigation plan was defined in a Memorandum of Agreement (MOA), executed between NASA, the U.S. Army, and the NM-SHPO in August 2012. The properties within the historic district were documented with large format photography in March 2012.



*Range roads north of U.S. Highway 70 are closed to the public except for special events.*

Figure 1. Map of White Sands Military Reservation showing White Sands Space Harbor (Source: U.S. Army).

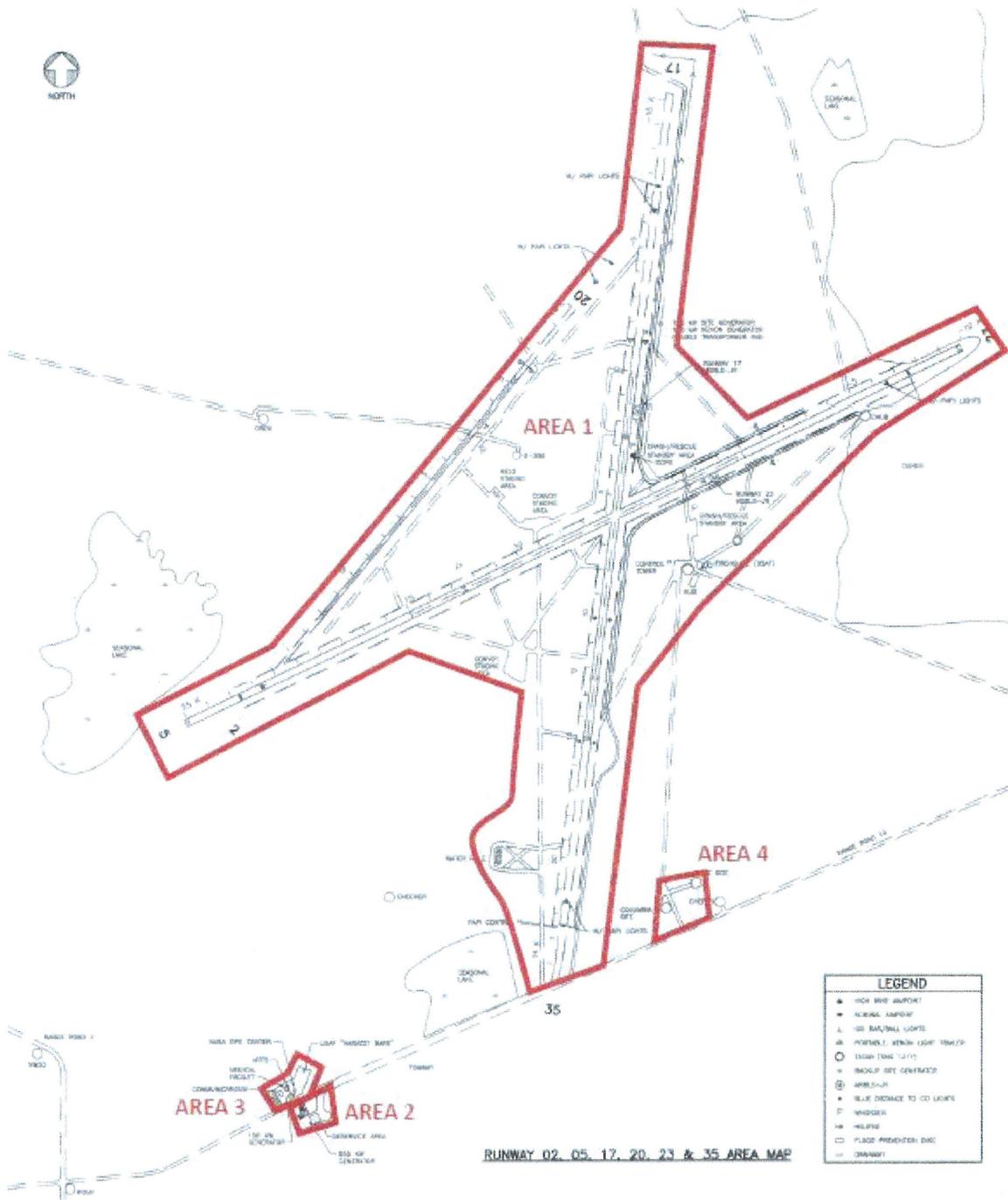


Figure 2. Map of White Sands Space Harbor showing location of Area 1, which delineates the approximately 4,900-acre NRHP boundaries of the WSSH Space Shuttle Landing Facility (Source: NASA WSTF).

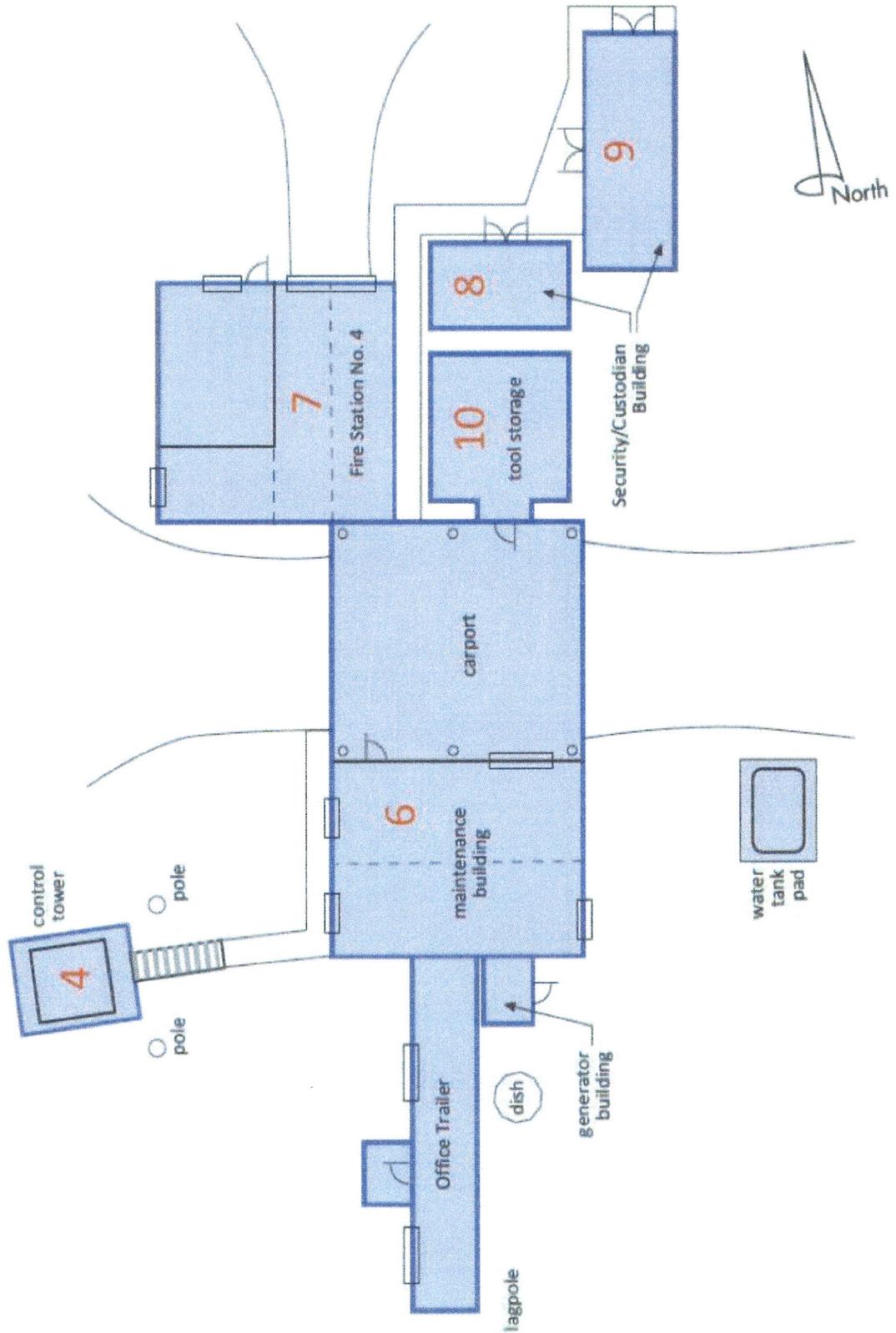


Figure 3. Plan view detail of the HUB Complex, Area 1.