Lessons from the Past

New Mexico Heritage on the Department of Army
White Sands Missile Range, New Mexico
Prepared by Human Systems Research, Inc.

From Sagebrush to Star Wars

by Cheryl D. Young

A Lesson Plan for White Sands Missile Range following the Model of Teaching with Historic Places by the National Park Service and the National Trust for Historic Preservation.

White Sands Missile Range (WSMR) played an important part in testing programs for U.S. missiles and rockets from the end of Word War II until 1989, considered the end of the Cold War. The Range is located within the Tularosa Basin of southern New Mexico, on mostly flat terrain between two mountain ranges. The location of the missile range provided an isolated and restricted test facility for many of the U.S. Army, Navy, and Air Force missile and rocket programs. White Sands Missile Range was first named White Sands Proving Ground (Fulwyler 1994), taking its name from the extensive dunes of gypsum sands within its boundaries. Today, the base encom-passes 2,000,000 acres. That is 3,200 square miles, or roughly the size of the states of Delaware and Rhode Island.

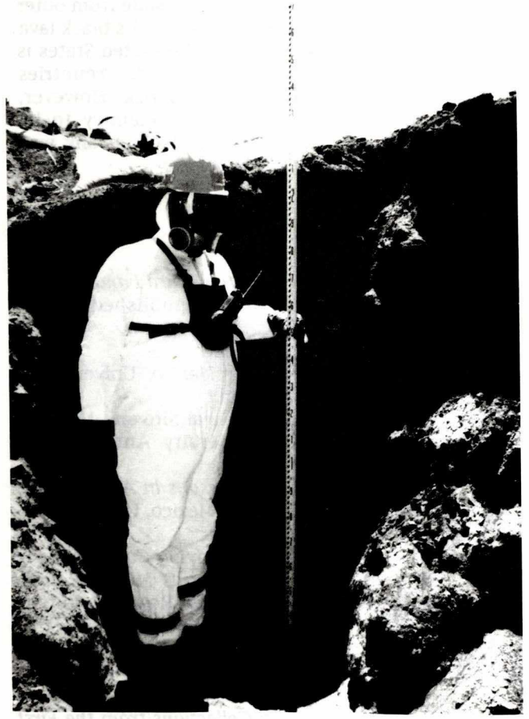

Figure 1. Dump site worker stands in a dump trench dressed in safety gear. He is holding a stadia rod to measure the depth of the trench.

The U.S. Army selected this spot because of its isolation and built two test facilities here in 1945 at the end of World War II. The first was the Trinity Site, located southeast of Socorro, New Mexico, for testing the first atomic bomb. This location, part of the area known as the Alamogordo Bombing Range, was used to test how efficiently the first atomic bomb worked (Fulwyler 1994). The Alamogordo Bombing Range later became part of WSPG. The bomb had been developed by the Manhattan Project in a top-secret laboratory at Los Alamos. It was tested at Trinity Site, located in the *Jornada del Muerto,* which appropriately means "Route of the Dead Man" or "Journey of Death" in Spanish (Szasz 1984). Testing actually took place after the Germans had surrendered but before the end of the war with Japan, and use of the bomb at Hiroshima and Nagasaki shortened the war. Watching the first atomic bomb test in the desert at Trinity Site, the director of the Manhattan Project, Robert Oppenheimer (Rhodes 1986:449), recalled "a line from the *Bhagavad-Gita...* 'I am become death, the shatterer of worlds'"(Goodchild 1985). "The blinding white light that erupted over the Jornada del Muerto at 5:30 a.m. July 16, 1945, signaled the dawn of a new era in the world" (Fulwyler 1994).

The second facility, east of Las Cruces, was selected for launch complexes and test facilities related to missile and rocket testing. At the end of World War II, several German rocket scientists, led by Dr. Wernher von Braun, fled Russian troops and surrendered to American soldiers. The U.S. Army then procured parts from the German A-4 rocket program and covertly shipped them to the United States. The Allied Military Intelligence Officers decided to "temporarily" bring over the German scientists to assist in our missile launches. The parts were shipped to WSPG, and many of the German scientists helped establish the V-2 program (Boehm 1997:2-4). The next year, in 1946, the Navy was invited to establish the Naval Missile Test Facility, and a cooperative Army-Navy effort was

inaugurated (Fulwyler 1994:38). Launches began at what the U.S. Army now calls Launch Complex 33. Nearby is the U.S.S. Desert Ship, the only commissioned ship on land, from which naval missiles are tested.

Trinity Site and the early launch complexes on White Sands Missile Range represent important events in the history of the United States. They are being documented and preserved by the U.S. Army for the people of this country.

Before the U.S. Army took over WSPG, the area was occupied for over 75 years by miners, cattle ranchers, and later sheep and goat herders. According to Jim Eckles, Public Affairs Office, White Sands Missile Range, (personal communication, 1996), as part of the national emergency of 1942, those who still earned their livelihood from ranching were asked to leave, and a lease program was established to compensate ranchers for the loss of income. Temporarily, they gave up their land for the war effort, but later, the permanent status of WSPG created mixed reactions. After World War II, a co-use plan existed between the ranchers and WSPG. By the early 1950s, this plan was abandoned, because mission testing and ranching proved incompatible (Eckles, personal communication 1996). By the 1950s, efforts were made to gain control of all the land. Some ranchers were less willing to vacate their property (Baird 1990:160), but today's boundaries were established by 1953 (Eckles, personal communication 1996). At many ranch locations, evidence still exists today of household items and supplies left behind in haste in 1942.

The Cold War and the Race for Space perpetuated the use of White Sands Missile Range. The primary competition was the United Soviet Socialist Republic (U.S.S.R.), and school children in 1957 were very disappointed to see the Soviets launch Sputnik into orbit before the United States could launch a satellite. Similarly, the fear that the Russians had larger missiles aimed at large cities on the east and west coasts of the United States kept the government testing such rockets as Hermes, Corporal, Nike-Ajax, Redstone, and many others.

On the other hand, WSPG was good for the economy of the nearby communities, especially Las Cruces (Boehm 1997:30, 33-34). Government funds and contracts became available as military spending increased, spurred by the Cold War (Boehm 1997:43-44). As the threat of Russian technology intensified the Cold War, the efforts of military personnel and civilians amplified the role of WSMR.

Yet, even with WSMR's pivotal role in the later part of the twentieth century, New Mexico remains invisible to most of the United States and the world. Confusion concerning New Mexico "underscores a historical anomaly that has been with New Mexico for at least the past four hundred years" (Simmons 1987). New Mexico struggled for more than 60 years before becoming the forty-seventh state in 1912 (Larson 1987). Contemporary maps often replace New Mexico with Arizona, California, Texas, Nevada, or Colorado. Maybe this is good. Until recently, WSMR has existed under a veil of secrecy, continuing its testing.

But today the range is becoming more open. It is full of natural resources, such as deer, antelope, oryx (introduced from Africa), and mountain lions. The range contains archaeological resources dating back 12,000 years to the earliest hunters in the area, as well as hearths and collecting sites from Archaic hunters, and villages and farm sites from Indians living here 600 to 1,000 years ago. Ranching and mining sites abound in the mountains and within the basin; these are all that remain of unsuccessful endeavors and of the successful ranches that were abandoned as the U.S. Army began its occupation of this huge test facility. And now, there are the remains of the test facilities, starting with the earliest encampments at Trinity and at WSPG Headquarters. Trinity is all but abandoned, but Headquarters has become the center for White Sands Missile Range. One occasionally encounters the remains of the early life at the base, such as the contents of the 1940s dump discussed in this lesson.

Work continues at WSMR on such projects as high-energy lasers and missile and rocket testing. Civilians live, work, and play alongside military personnel. WSMR includes a shuttle landing strip easily visible from outer space, with its white gypsum sand next to its black lava rock. The Cold War has ended and the United States is no longer in an arms or space race with the countries that formerly made up the Soviet Block. However, many believe that, in order for the country to be strong, it must be able to defend itself in any way necessary. Thus, the testing continues.

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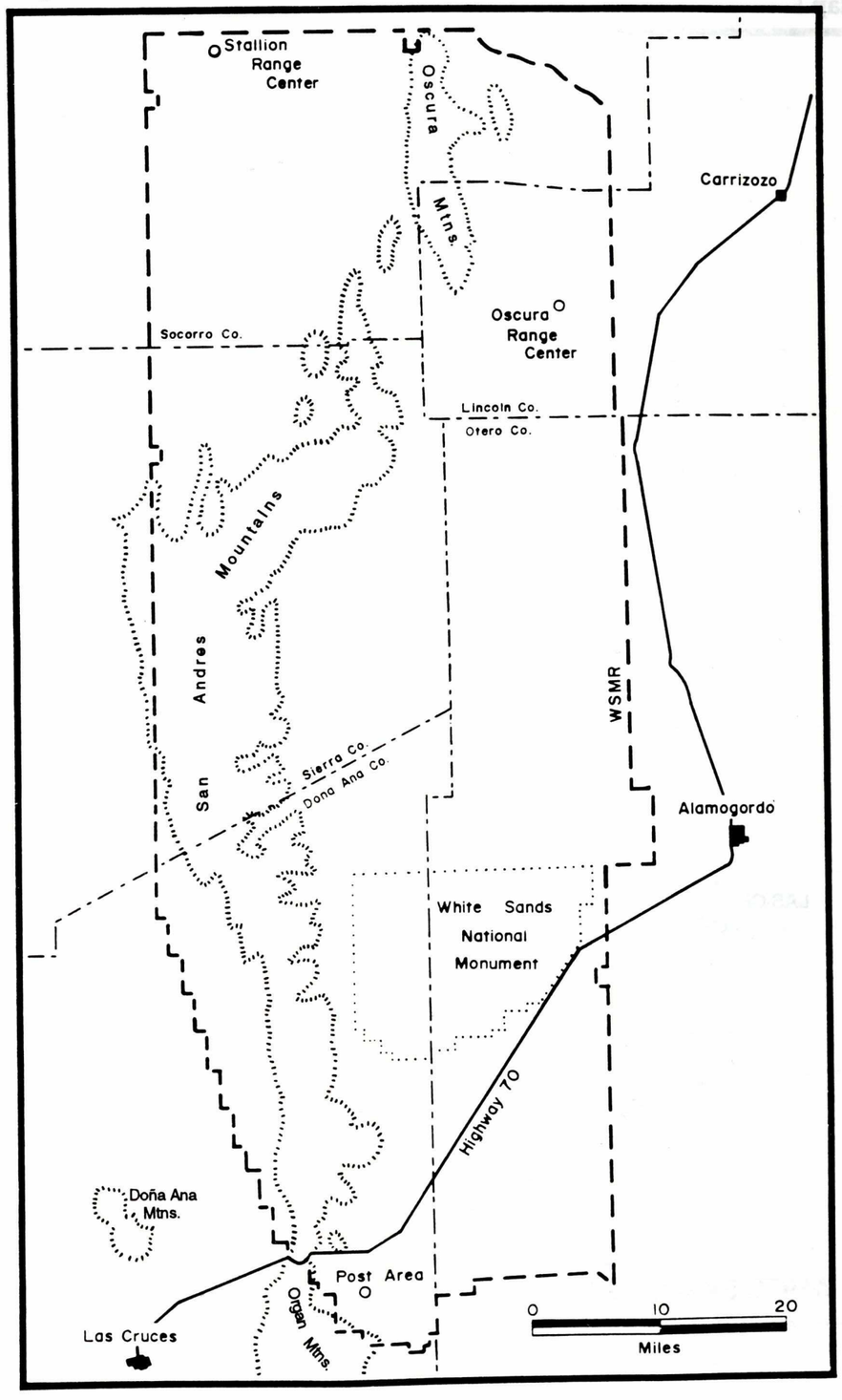
Map 6



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TEACHER INSTRUCTIONS

These lessons on the location, history, and archaeology of White Sands Missile Range are designed for the teacher to pick whatever is applicable for the individual class. Each activity can be simplified or made more challenging as the teacher deems necessary. Included in the packet is a list of possible readings for the teacher in addition to the student readings and the materials referenced in the readings. The student readings are sections of a work, not the complete writing. Further information may be obtained by writing WSMR or HSR (see addresses under Visiting the Site).

The vocabulary words are listed in **bold** print within each reading. Only the definitions for certain military or archaeological words will be included below.

archaeology: a method for studying past human cultures and analyzing material evidence (artifacts and sites)
archaeological site: a place where human activity occurred and material remains were left
artifact: any object made or used by humans
attribute: characteristics or properties of an object, such as size, color, or shape
classify: the act of arranging things into groups
classification: a systematic arrangement in groups or categories according to established criteria
context: the surroundings and other materials within which an artifact is found
data: information, especially information organized by analysis
hypothesis: a proposed explanation accounting for a set of facts that can be tested by further investigation
inference: a conclusion derived from observations
material remains: objects, trash, or other items left behind from a former inhabitant
scientific analysis: conclusions made through careful observation and examination of evidence
sherd or pot shard: a piece of broken pottery
blockhouse: a concrete, reinforced observation building
commissary: military store dealing with food
exchange: military store dealing with nonfood items

OBJECTIVES FOR STUDENTS

- To recognize and understand where New Mexico and White Sands Missile Range are located within the geographic confines of the United States and the community in which the students are located.
- To explain the beginnings of White Sands Proving Ground, why the site was chosen, and who was originally involved.
- To understand the impact White Sands Missile Range had on the surrounding communities and how WSPG was impacted by these communities.
- To gain an understanding of archaeology, observation, typology, and inference, and how context affects each of these.
- To be able to analyze and evaluate history using both archaeological remains and historical documentation.

SETTING THE STAGE

Introduce the students to New Mexico and its location. Make sure the students are made aware that New Mexico is a state and not a country. Use the maps contained to reaffirm their grasp of U.S. geography. The fact that military spending increased after World War II greatly changed the economy of many Western states, New Mexico and California in particular. Compare these two states whose economies included both mining and agriculture before World War II. Perhaps discuss the reasons California has a larger population than New Mexico.

Discuss the importance of the space program to modern technology within the United States. Many products students use daily came as a direct result of the space program. Fax machines, modern computers, and Tang are just a few examples of technology students use each day without realizing their origin. Make sure they understand the significance of the Cold War in decisions made during the three decades following World War II. For example, the Soviet Union sending Sputnik into outer space became an impetus for increased efforts within the U.S. space program and in missile development.

TEACHING ACTIVITIES

Locating the Site

Provide the students with copies of the attached maps to complete the following exercises. More maps are available in Williams (1986). You may use as many or as few of the maps as necessary.

a. Have the students locate New Mexico and, if you are in another state, locate it as well. Discuss the states that border New Mexico (see Map 2) and notice where California is located (Map 3). Have the students compare the size of New Mexico to that of other Western states.

   · Does New Mexico's location lead to a natural increase in population? Why?

   · What is the largest state near New Mexico?

   · Considering the location of other Western states, which states do you think would have large populations? Why?

   · What highways are located in New Mexico? Of what importance is this for the state?

b. Discuss latitude and longitude and have students work the degree and mileage problems on Map 1. Many maps provide information on how to interpret these symbols.

c. Notice the location of White Sands Missile Range within the state of New Mexico.

   · For what reasons do you think this particular section within New Mexico was chosen to test fire missiles during and after World War II?

   · What roads are shown to traverse the missile range? Of what importance is this?

d. Have the students find Doña Ana County on Map 4. Next, have them locate their own county.

   · Is your county one of the counties containing part of White Sands Missile Range?

   · Do you think your county would have been a good location for the missile range? Why?

   · What changes within your county would you have anticipated if it had been the location for the missile range?

e. Examine Maps 5 and 6. Map 5 shows White Sands Proving Ground in 1945. Map 6 is a modern map of White Sands Missile Range.

   · Discuss any differences between the two maps. Why do you think these changes occurred?

   · What things are still the same?

Determining the Facts

Reading 1: Early History of White Sands Missile Range

Provide the students with copies of Reading 1. When they have completed the reading, have them answer the following questions:

a. What were the criteria for selecting the missile range location?

b. What was the most historic program of White Sands Missile Range and what was its origin?

c. Who surrendered to the Allies at the close of World War II and why?

d. Explain what Operation Paperclip was and its purpose.

e. Who headed the Paperclip crew and where did he stay while working at WSMR?

f. Was the Paperclip crew important to the development of the missile program? Why?

Reading 2: Relations with Surrounding Communities

Provide the students with Reading 2. Have the students discuss how WSMR and the surrounding communities interrelated. Have the students choose one the following activities.

a. Design an advertisement that a business might have placed in the *Wind & Sand*.

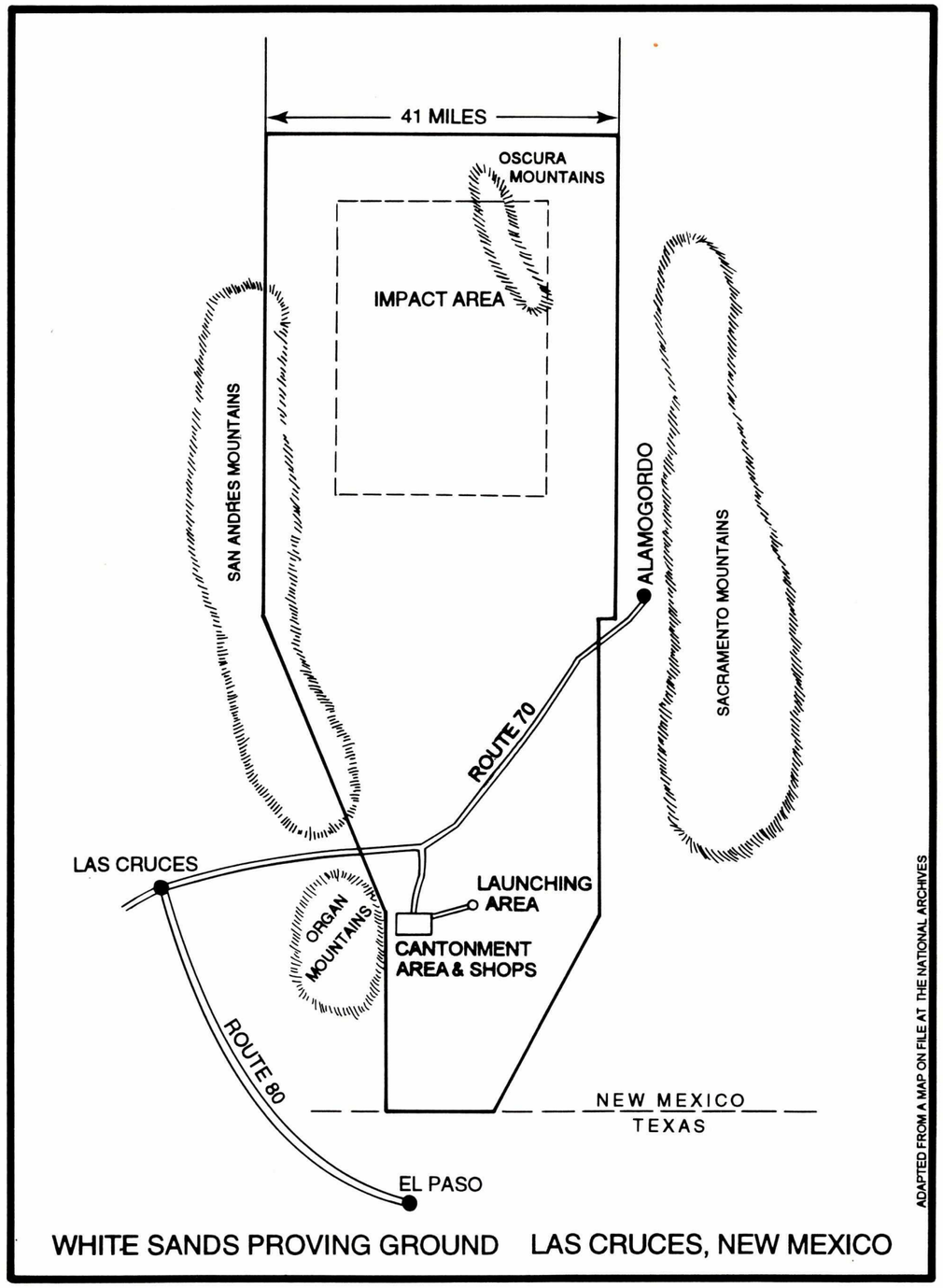
b. Write a short story about an incident involving WSMR or WSMR personnel that they think might have taken place within one of the nearby communities.

c. Draw a poster advertising an upcoming event involving WSMR and one of the surrounding communities that might have promoted dual cooperation. Include when, where, the time, and other pertinent information.

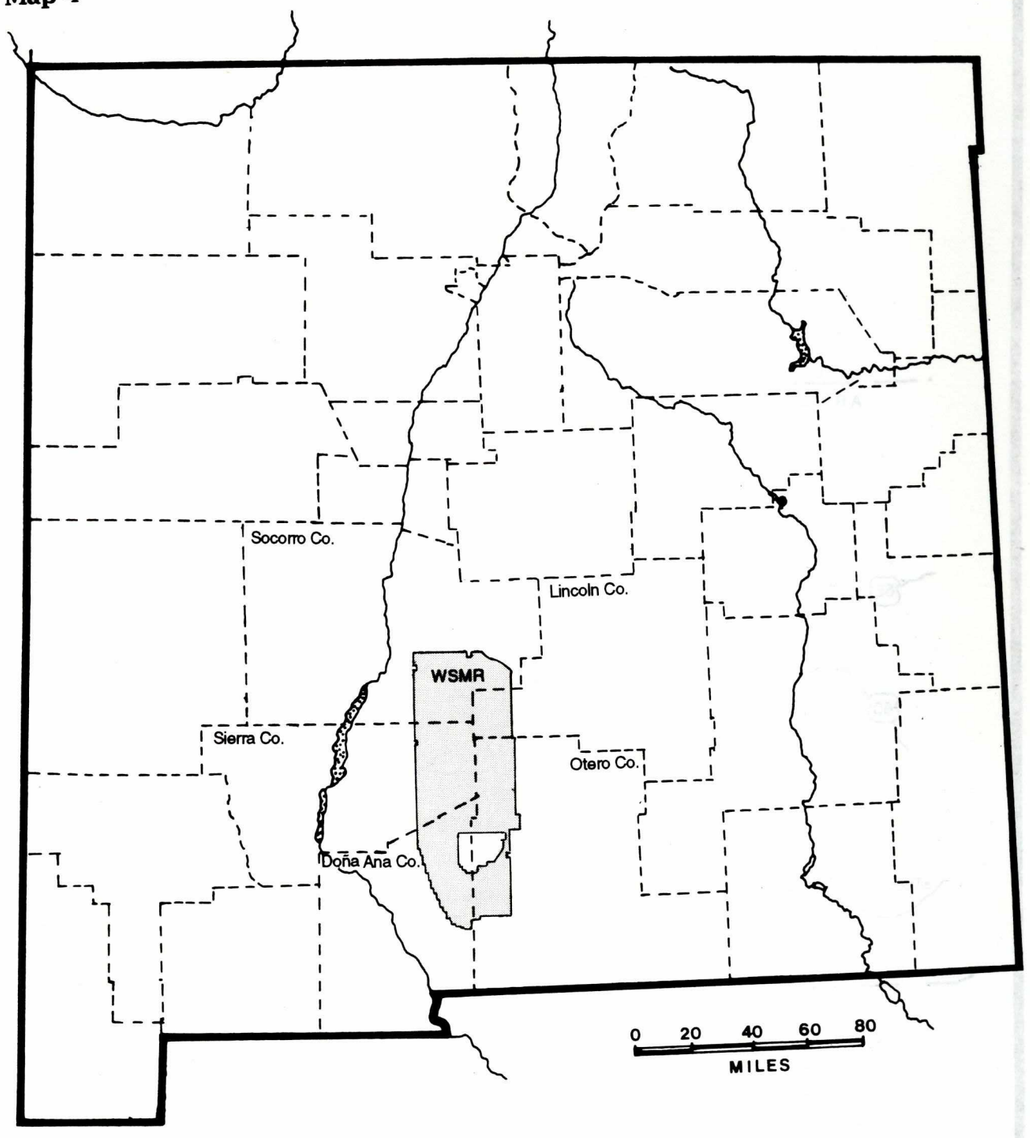
Reading 3: Why is the Past Important? and Observation and Inference

Provide the students with Reading 3 and cover any questions they may have. After a brief discussion of the differences between observation and inference, divide

Map 5



Map 4



the class into six groups. Copy the poem, "The Blind Men and the Elephant" (included here), adapted from the original by John Godfrey Saxe, and cut it into eight parts (by verse) and distribute parts 2 through 7, one to a group. You will read the first and the last verses of the poem to the students as introduction and closing.

a. Have the students read their part of the poem within their group and decide what animal is being described. Have one person in each group, in order, read that group's section aloud to the whole class.

b. Make two columns headed observation and inference on the board. Record the student interpretations from their individual sections.

c. Ask the students to guess the identity of the animal by analyzing the facts or data.

d. Discuss how the poem relates to science. Also discuss why the observations and inferences were inaccurate, even though their thoughts and ideas were valid. Have the students decide if context affected their analysis.

e. As an additional exercise, the students could rewrite the poem describing a different animal. Have them exchange poems and see it they can guess which animal they are describing. Discuss with the students how to adapt this activity to a specific type of archaeological site (a ranch, a school yard) or part of a site (just the backyard of a house, just the side of a road, just a park or campground).

Reading 4: Typology: The Organization of Scientific Data and Context

Provide the students with Reading 4. Make sure they understand the concepts of typology and context. Discuss how to divide objects into groups according to use, size, type, or other qualification criteria. Help them understand that groups of objects can be classified in different ways.

a. Give each student a list of 20 common objects the students would recognize.

b. Select a set of different headings into which the student can classify his or her own set of objects using typology, but vary the list by group.

c. After each student is finished, have the students with the same headings discuss their classification.

d. After they have shared their findings within the groups, lead the whole class in a discussion of the similarities or differences and the reasons their classifications were different.

e. Discuss how context could affect their findings and classifications.

Reading 5: What A Dump!

Provide the students with Reading 5. Hand out the photographs of the excavation process, then discuss the following questions:

a. Why were excavation personnel required to wear protective clothing?

b. What reasons were there to excavate only when winds were less than 10 mph?

c. Based on the types of artifacts recovered during the dump excavation, what do we know of life at White Sands Proving Ground during the mid-1940s.

d. What kind of information about context can archaeologists derive from material obtained from the dump? How would it differ from a situation in which the same materials came from their original locations, such as offices, tent habitations, the commissary, etc.

Visual Evidence

Figure 2 is a photograph of German Scientists from Operation Paperclip discussed in Reading 1. Figure 3 shows WSPG Headquarters in 1945 or 1946. Have the students decide if this building looked permanent or temporary, busy or isolated, friendly or official. Help them realize that entering WSMR was, and still is, carefully controlled. In the early years, cars were often inspected before being admitted to the Post. Figure 4 is an aerial view of WSPG in about 1948. Note how desolate and isolated it looks and see if you agree with the U.S. Army that the site was perfect for testing missiles. Figure 5 shows the layout of the Post in 1945, and the canvas hutments or tents (H) illustrate the "temporary" nature of WSPG. Figures 1 and 6 show the Dump Site being excavated. Note the special disposable suits and respirators. Figure 7 shows several of the dump artifacts before clean-up. This image may be useful at the end of the section "Putting it all Together."

- Is the layout of the Post in Figures 4 and 5 the same? If not, how is it different?

- Were the restrictions for entering the Post necessary? Why?

- By examining the photographs of the excavation process, does it seem that the people living at WSPG were as responsible to the environment in 1945 as they might have been? Why? Remember that we have much more strict environmental standards *today*,

because of a better knowledge of potential environmental hazards.

Putting it all Together

Students might enjoy discussing the differences in how the Missile Program is presented in history books and the attached readings. Students can compare these accounts with newspaper and magazine articles for the past 50 years. Missile programs from all over the country have been tested at White Sands Proving Ground/Missile Range, so students should be able to find newspapers, magazines, encyclopedias, popular books in the library, and other sources that contain information. Have them look for changes of focus in recent years, as we have moved beyond the Cold War.

Look over the bold vocabulary words necessary to the comprehension of each reading (also see list below). Have each student look up the definition of one or more of these words and have them use the word(s) within a sentence. Make sure the correct definition is used for each word as it relates to the reading.

The following activities will help involve the students in a study of the Dump Site from an archaeological perspective.

Activity 1: Locating a Testing Site

Provide the students with Map 3 and have them locate other possible sites for the missile range. Make sure they examine the sites using the criteria established by the U.S. Army in determining a site. Have them give reasons for their site and decide whether another site would have been feasible. For what reasons did the government look only in the west and not the east for a site? Climatic, vegetation, and landform maps of the state, such as those found in *New Mexico in Maps* (Williams 1986) and *Historical Atlas of New Mexico* (Beck and Haase 1969) may be helpful in this activity.

Activity 2: Understanding Interdependence

Discuss with the students how WSMR and the surrounding communities were interdependent economically, socially, and politically. Have the students decide if each of these things is separate or intricately interwoven. Discuss who needed whom the most, WSMR or the surrounding communities. Have the students state their reasons. How would the surrounding communities be different today without WSMR being located here? Have the students consider their own community and decide what factors have decisively effected their community. Have them compare the communities for similarities and differences.

Activity 3: Practicing Typology

Make sure your students have gone over Reading 4 before taking part in this activity. Give each student a copy of the alphabetical list of artifacts found at the WSMR Dump Site. Help them think of groups, or categories, into which the artifacts can be divided, such as Office, Recreation, Food Related, Work Related, Medical, Toiletry, Metal, Mess Hall, and so on. Have the students decide where each artifact should be placed. For this activity, students should not place an artifact into more than one category, even though the item might easily fit into several. They should be prepared to defend these assignments. Discuss the typology exercise and have students decide whether or not their assignments of artifacts to the various categories were well thought out.

Activity 4: Practicing Archaeological Observation and Inference

Break the students into groups of 3-5. Give each student a picture of one of the artifacts found in the dump site. Have the groups make observations and inferences within their groups using the artifacts and what they know about them. Then combine the groups so that the students are looking at about 10 artifacts. Are they as sure about their categories or more sure? Can they say more about their groupings? Can they answer questions such as

- Were the first men who lived at the base soldiers or civilians?
- Where did they eat? What did they eat? Can you tell where their food came from?
- What did they do in their spare time?
- What did the remains indicate about their work?

Activity 5: Understanding Archaeological Context

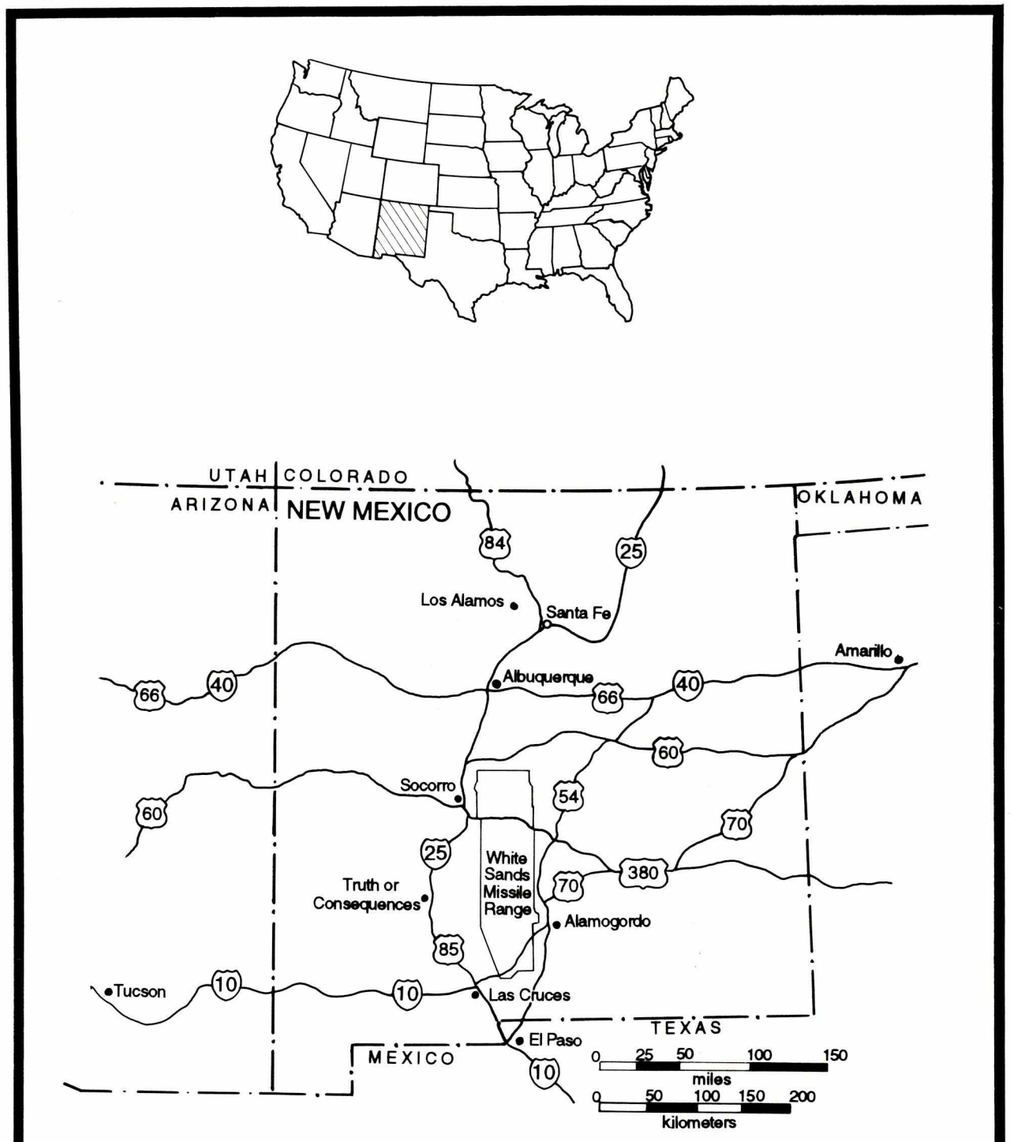
Have the students identify any differences they would now have in their inferences. Next, add the fact that the dump was contaminated by lead and the excavation was not as archaeologically thorough as usual, because of the contamination. Have the students discuss what they would do differently in another excavation. Have them decide if further study of the dump site is valid now or if it would be better to study the artifacts some time in the future, when we know more about them and may have developed the technology to counter the contamination. Is this study any different than studying prehistoric civilizations? Discuss the similarities and differences.

Vocabulary

Reading 1

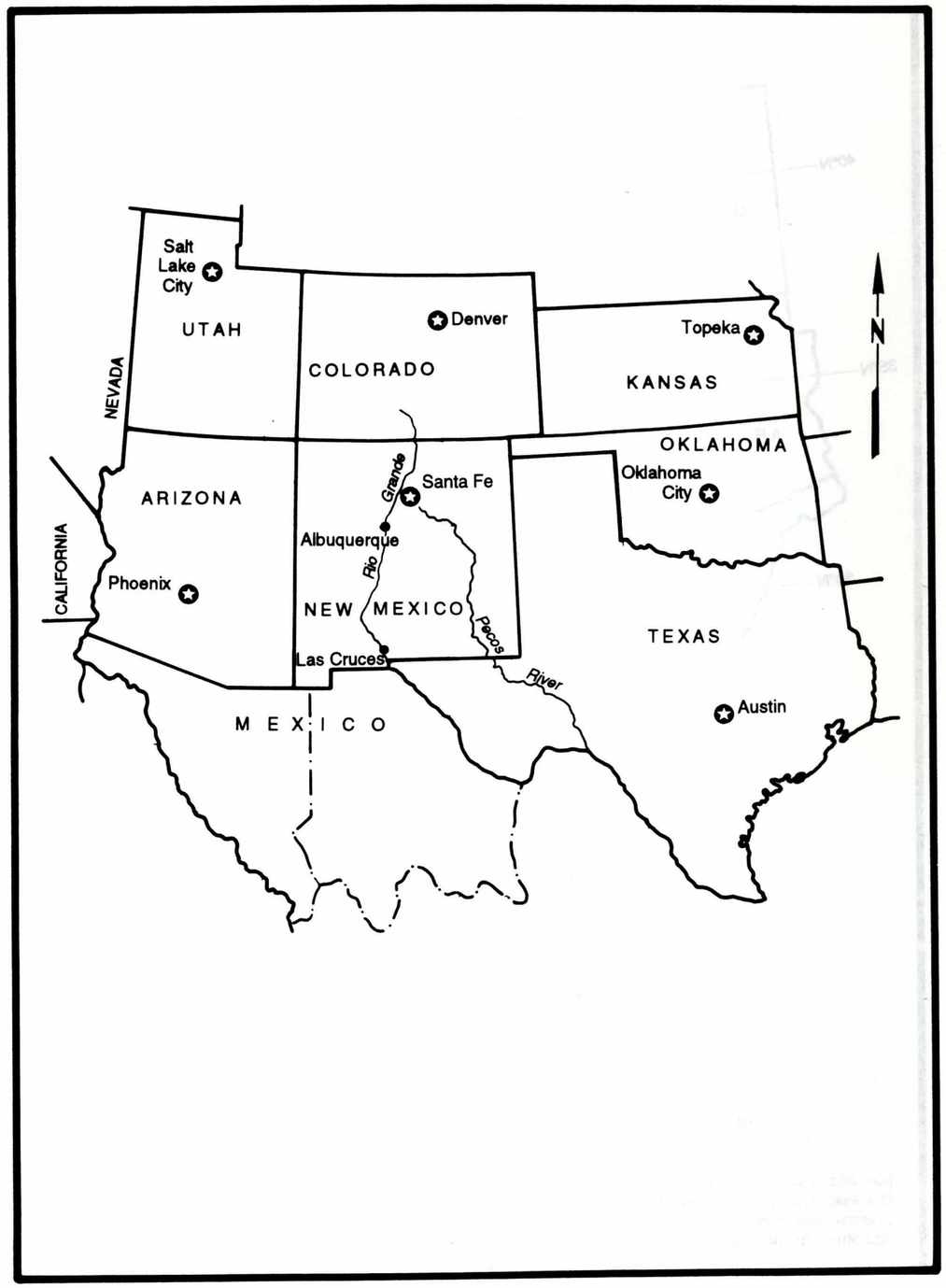
rocketry	World War II
accelerated	data
site	criteria
continental limits	expanse
uninhabited terrain	conducted
jeopardy	observation points

Map 3



From New Mexico in Maps edited by Jerry L. Williams. 1986 Second edition.

Map 2



predominantly	crisscrossed
accessible	adjacent
permanent	disadvantage
requirements	activated
existence	approximately
blockhouse	Hitler
launched	peak production
surrendered	allies
selected	code name
components	spotted
personnel	magnitude
logistics	railroad siding
momentous	assigned
investigate	atmosphere
privilege	static firing thrust stand

Acronyms
WSMR WSPG

Reading 2

respective	prominent
trend	ceased
retail	transact
acceleration	infrastructure
extravagant	inaugurated
transports	accumulated
service record	treacherous
alternative	amenity
retain	vicinity
retaliation	jurisdiction
resolved	harassing
installation	materializing
intracommunity	prestige
reciprocated	continually
dignitaries	sought
acquire	dominated
subcontracting	pursuits
forbidding	regulations
previous	unorthodox
trench	demarcation
eliminating	unauthorized
adventurous	encouraged

Reading 3

sites	artifacts
material remains	inhabitants
cultural continuity	perspective
scientific analysis	tangible
prehistoric	heritage
observation	inference
phenomenon	proposed
hypothesis	archaeologists
data	

Reading 4

indicate	gender
context	rely
classification	conceptual categories
classify	automatically
attributes	ignoring
select	relevant
task	categorization
variable	classification of data
data	reduce
complexity	examine
variation	

Reading 5

commissary	survey
evaluated	hazardous
conform	diagnostic
debris	respirator
contamination	minimize
industrial hygienist	monitor
contextual	stringent

FURTHER READING

COLD WAR–POST WORLD WAR II PERIOD

American High: The Years of Confidence 1945-1960 by William L. O'Neill, The Free Press, 1986, New York

Homeward Bound American Families in the Cold War Era by Elaine Tayler May, Basic Books, 1988, New York.

War and Peace in the Nuclear Age, by John Newhouse, Alfred A. Knopf, 1989, New York.

The Unfinished Journey: America Since World War II by William H. Chafe, Oxford University Press, 1991, New York.

Cold War, A Post-Cold War History by Ralph B. Levering, Harlan Davidson, Inc., 1994, Arlington Heights, Illinois.

DEVELOPMENT OF THE ATOMIC BOMB

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The Making of the Atomic Bomb by Richard Rhodes, Simon & Schuster, 1986, New York.

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TEACHING ARCHAEOLOGICAL CONCEPTS

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LISTING OF ARTIFACTS

ash tray
Barq's soda bottle
bolts
bowl
Bromo Seltzer medicine bottle
brown glass with label remnant
cable
chow-chow condiment glass jar
Coca-Cola bottle
mug "S" handle
Coca-Cola Bottle Bottom—Las Cruces
cold cream jars
colored plate shards
condiment bottles
electrical tape
eye dropper
eye glasses
faucet handle
gas cap
German/English control panel
glass radio tubes
glazed stoneware
green Squib bottle
handled mug
hasp
Howitzer casing
ignition coil
ink bottles
jelly glass
lamp shade
large milk bottle
Listerine bottle
menthol inhaler
mess hall spoon
mess kit
mess kit spoon
military collar button
military shooting badge
nails
no deposit/no return glass beer bottle
Noxema jar
nuts
pepper sauce bottle
pickle bottle
safety razor
salt shaker
Skin Bracer bottle
spark plug
sterile seal injectable medicine bottle
U.S. Quartermaster Corps china
U.S. Quartermaster Taylor Smith china
vinegar bottle
Yucca brand soda bottle
1/2 dram medicine bottle
4/5 quart brown liquor bottle
4/5 quart clear liquor bottle
1 pint brown liquor bottle
1 pint clear liquor bottle
2 dram medicine bottle
4 dram medicine bottle
7-Up bottle

VISITING THE SITE

White Sands Missile Range (WSMR) Headquarters is located about 20 miles from Las Cruces and about 50 miles from Alamogordo on Highway 70. To see at WSMR are a Missile Park with examples of the early test missiles and rockets, as well as a museum. The museum includes permanent exhibits on the history of the range and missile testing, and changing exhibits on such topics as early women who worked at the range and the results of the excavations at the 1945 or 1946 Dump Site. For more information about visiting the museum write or call

USA WSMR
STEWS-CA-PRF/CWF (Museum)
PO Box 400
White Sands Missile Range, NM 88002-5506
(505) 678-8824

For additional information about White Sands Missile Range, contact

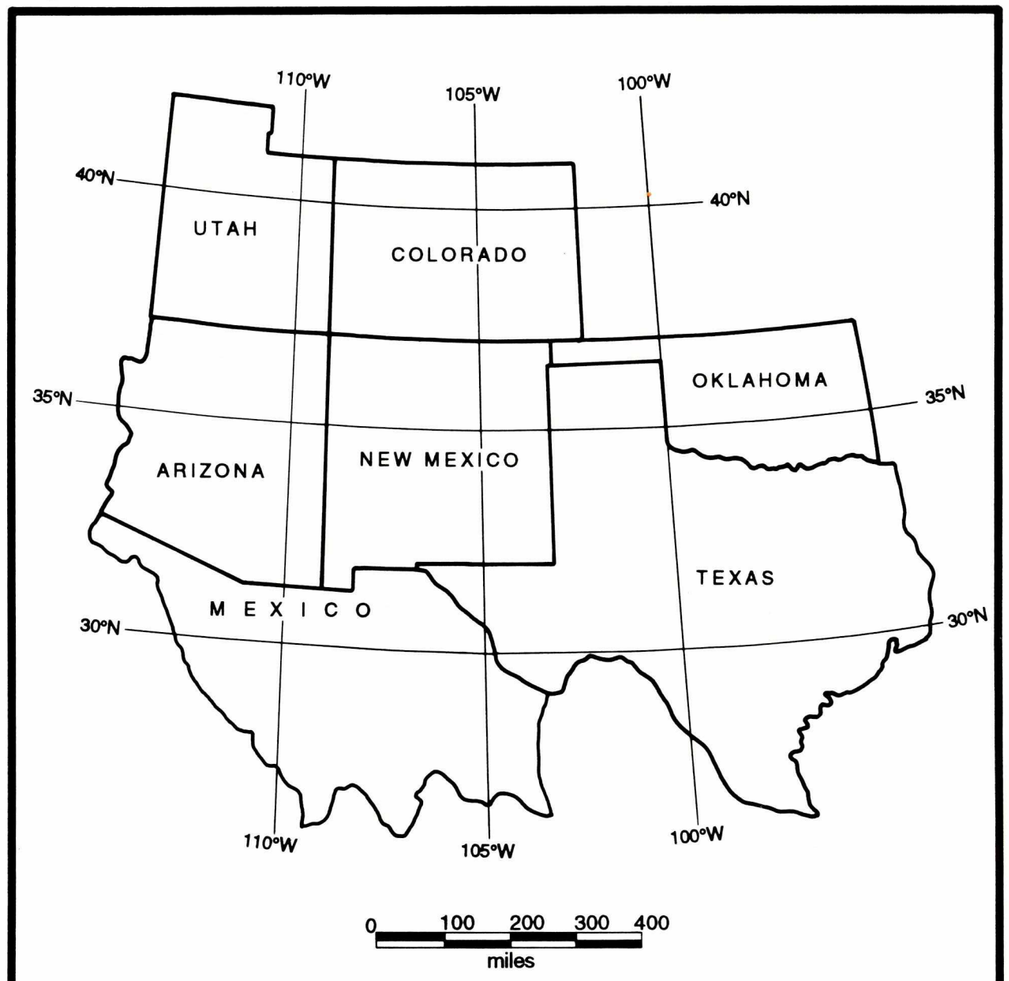
U.S. Army Public Affairs Office
White Sands Missile Range
Building 122
White Sands Missile Range, NM 88002
(505) 678-1134

Most other parts of the range, including the launch complexes, are closed to public visitation. Trinity Site is open two days of the year, the first Saturday of April and the first Saturday of October. For more information on this schedule, contact Public Affairs at the number above.

Publications by Human Systems Research, Inc., pertaining to White Sands Missile Range can be obtained from

Human Systems Research, Inc.
P.O. Box 728
Las Cruces, NM 88005-0728
(505) 524-9456

Map 1



1. New Mexico is located between (approximately)
_____ and _____ degrees _____ (direction) Longitude;
_____ and _____ degrees _____ (direction) Latitude.

2. Using the scale, determine approximately how many miles New Mexico is from N to S _____ (miles);
E to W _____ (miles).

Map adapted from Figure 1. Location of New Mexico, in *Historical Atlas of New Mexico*, by Warren A. Beck and Ynez D. Haase. University of Oklahoma Press, Norman, 1969.
Exercise excerpted from Figure C, in *Blackwater Draw Site*, by Mike Kite. Blackwater Draw National Historical Site and Museum and Eastern New Mexico University Anthropology Department.

Figure 6. Heavy equipment was used to open one of the sample trenches archaeologists used to study the deposits in the first Proving Ground Dump.

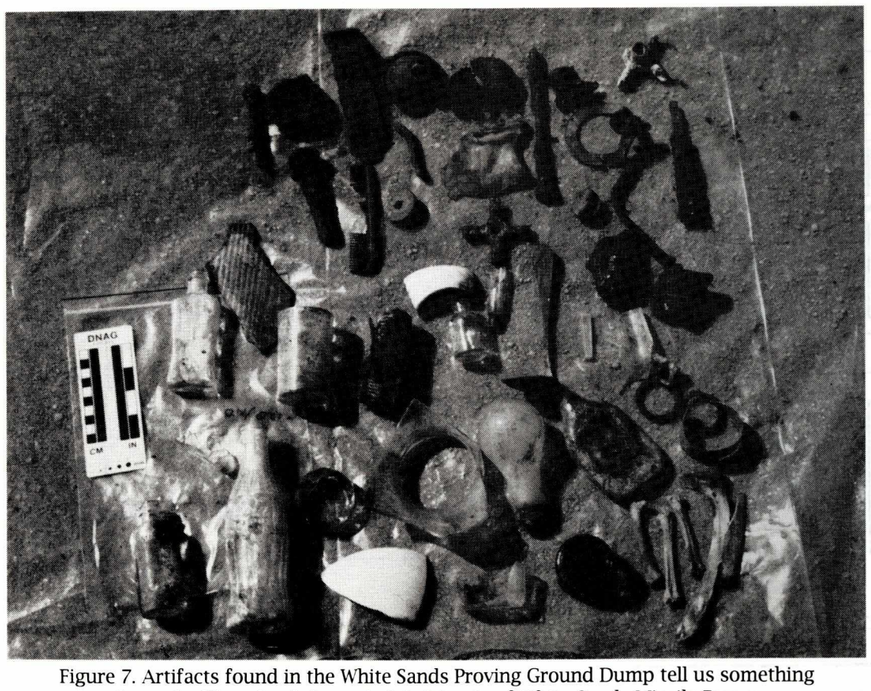


Figure 7. Artifacts found in the White Sands Proving Ground Dump tell us something about the lifestyle of the early inhabitants of White Sands Missile Range.

Reading 1: *Early History of White Sands Missile Range*

by Maj. Gen. Niles J. Fulwyler

The beginnings of what we now call White Sands Missile Range. . .were closely **entwined** with the developing history of **rocketry** which occurred long before **World War II**. . . .

As a result of **accelerated** interest in the program associated with missiles, it became evident that a long range area was required on which we could test these missiles. We needed a place where we could recover the missiles after flight for further examination and collection of **data**. These studies would make available additional information to help in the development of the American missile program; therefore, the War Department looked for a **site** to put a long-range missile range. It established the following **criteria** for the selection of such a site. It said the range should be within the **continental limits** of the United States with a large **expanse** of **uninhabited terrain** where firings could be **conducted** without **jeopardy** to civilian population. It should have a lot of level ground surrounded by hills for possible **observation points**. It should have **predominantly** clear skies. It should not be **crisscrossed** with railroads or airlines or highways. It should be **accessible** for water and power. . . .

One area quickly drew the interest of this group. It was in a little-known area called the Tularosa Basin in southern New Mexico. This area was **adjacent** to Fort Bliss, a **permanent** Army post. It had a good highway connecting the site with a town to the west, Las Cruces. The same highway connected to another town on the east, Alamogordo. There was no railroad or airline crossing the area. The city of Las Cruces was easily accessible. There was no big industry in the area. All of these things made it quite evident early on in the examination of possible sites that of all the sites that they looked at, the one at Tularosa Basin would probably meet their needs the best. One **disadvantage** was that the area selected was only about a hundred miles long and forty miles wide. It was not as long and as large an area as they were hunting for, but it otherwise met all the **requirements**.

The War Department on July 9, 1945, designated the Headquarters of White Sands Proving Ground (WSPG), and it was **activated** at Fort Bliss, Texas, on July 13, 1945; thus, White Sands Proving Ground came into **existence**. The site for the actual firing facilities was located **approximately** six miles farther to the east on an area we now call Nike Avenue. There, construction of the army **blockhouse** was started on July 10, just one day after designation of the headquarters. . . .

The most historic program was the German V-2 program. The German V-2 rocket, which was **Hitler**'s brain-child of World War II, was the grandfather of America's missile program and America's large family of missiles. The German program started in early 1940, and the first V-2 was **launched** only two years later on July 6, 1942. The third missile launched in October 1942 flew 170 miles and unfortunately landed in England. This was the first successful V-2 flight. The Germans made some 3000 of these rockets with a **peak production** at one point of thirty missiles a day. . . .

By the end of World War II, the German rocket base of Peenemünde had **surrendered** to the **Allies**. The top German scientists had moved westward and surrendered to the Americans rather than be captured by the Russians. At the time of surrender, there were approximately 400 top German scientists involved in their program. These individuals were sent to a German town called Landschut for careful screening, and of those screened, approximately one hundred were **selected** to go to the United States. For the matter of selection they put a paperclip on the folder of each man selected, and that is how the **code name** OPERATION PAPERCLIP came into being. In addition to the scientists, we also captured a great deal of the remaining V-2 **components** that had not been destroyed either by bombing or by the Germans themselves.

In mid-August 1945, 300 railroad freight cars carrying V-2 components captured in Germany arrived in New Mexico. The Santa Fe Railroad **spotted** ten cars per day in Las Cruces for the unloading and transporting by military and German **personnel** to the east side of the Organ Mountains. To get an idea of the **magnitude** of the **logistics**, every **railroad siding** from El Paso to Belen, some 210 miles, was full of cars over that period. The Army hired every flatbed truck in Doña Ana County, and this **momentous** task was completed in twenty days.

The Paperclip crew, headed by Dr. Wernher von Braun, arrived in the United States in November 1945, and in January 1946 it was moved to Fort Bliss, Texas. Of the one hundred personnel, twenty of them were **assigned** to White Sands Proving Ground, and they were to help in the design and handling of future guided missiles. The purpose of firing V-2s at White Sands was twofold. One was to gain experience in the design and handling of American future guided missiles, and the other was to **investigate** the upper reaches of the **atmosphere**. The V-2 was converted from its war-time role as a weapon into a flying laboratory, and from 1946 until 1952, sixty-seven V-2s were fired at White Sands. I had the **privilege** of viewing one of the last ones when I was a brand new second lieutenant. The first test firing was from a **static firing thrust stand**: a 100,000-pound thrust station which was designed by the Germans and built on the side of the Organ Mountains behind the post. This firing was followed by the first **accurate** flight of a V-2 on April 16, 1946. . . .

excerpted from *Victory in World War II: The New Mexico Story,* edited by Gerald W. Thomas, Monroe L. Billington, and Roger D. Walker, pp. 36-41. Rio Grande Historical Collections, New Mexico State University Library, Las Cruces. Reprinted with permission of the Rio Grande Historical Collections.

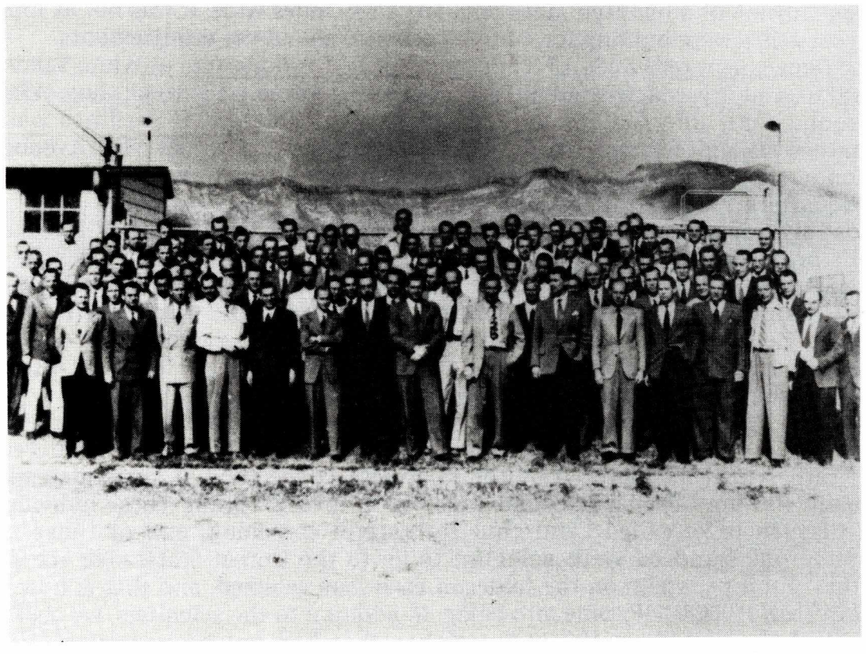


Figure 2. Some of the German Scientists from Operation Paperclip.

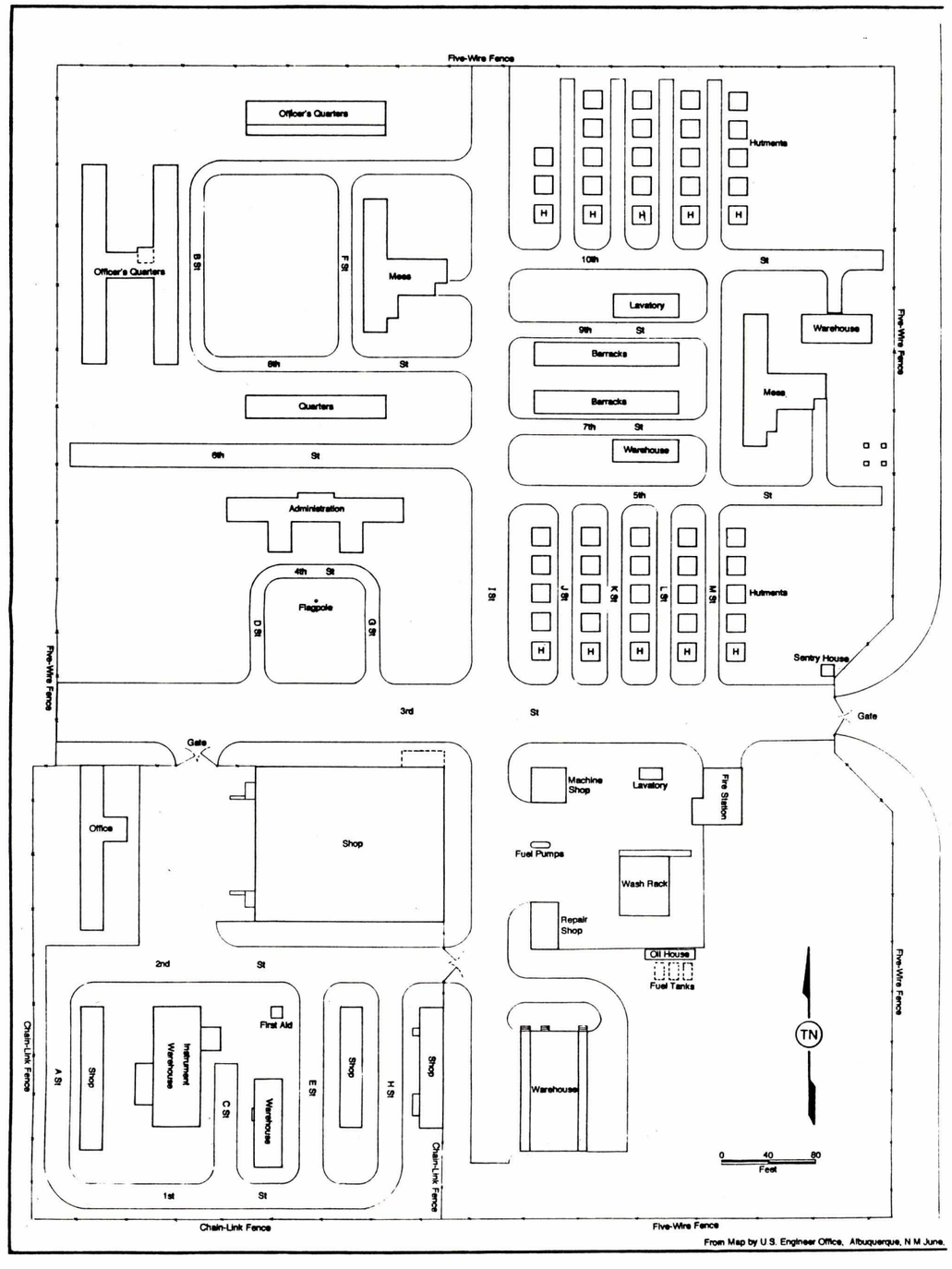


Figure 5. Layout of the base in 1945, drawn by the U.S. Corps of Engineers, Albuquerque Office.

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Figure 4. Aerial view of White Sands Proving Ground in about 1948.

Reading 2: *Relations with Surrounding Communities*

by William B. Boehm

Though the White Sands Proving Ground acquired new businesses and services within its boundaries, the influence of surrounding communities—Las Cruces, El Paso, and Alamogordo—did not vanish. The majority of those who worked on the Post not only resided in these cities, but still continued to patronize many of the business establishments in their home communities. In the period of measurable growth at White Sands, Las Cruces became the **prominent** link to the Proving Ground and started its growth **trend**, which has not yet **ceased**.

Base expansion helped swell the Las Cruces economic community (*Las Cruces Citizen*, 20 January 1949:3; *LCC*, 1 September 1949:1). A physical comparison exists between consecutive years 1947 and 1948, in which significant differences are evident in the composition of the economic fiber of Las Cruces. This can best be described as a transformation from a regional rural economy based on agriculture to a more diversified urban settlement, offering more **retail** goods and services to its citizens. The city took on an expanded, more modern role, to serve the Proving Ground residents when they came to **transact** business in Las Cruces. During this time, the estimated population of Las Cruces grew significantly (from 12,000 to more than 14,000), a sizeable single-year increase (*LCC*, 1947:7; Baldwin 1948:32-66). **Acceleration** of the Cold War had an effect not only on Las Cruces, but also on the Post itself. Given its rate of population growth in 1949 and the military-funded programs that it was committed to begin, WSPG's own population was estimated to reach 5,000 by 1951 (*LCC*, 20 January 1949:3).

Expansion caused growing pains at the base, especially to its **infrastructure**. With a community of a few thousand that accommodated still more from the outside areas every day, a solution to ease traffic flow and congestion became necessary. Rather than expand the recently constructed access road to Highway 70 or add anything too **extravagant**, a bus system was **inaugurated** in May 1948. With service to Alamogordo, Las Cruces, and El Paso, thousands of riders boarded the fleet of **transports** every working day after paying a nominal 15-cent fare. The buses **accumulated** an amazing **service record** free of any accidents in its initial years of operation, even with the presence of bumpy, dangerous roads to El Paso and a **treacherous** two-lane mountain pass en route to Las Cruces (*Wind and Sand*, 15 January 1953:1; *W&S*, 31 December 1953:2; Brown et al. 1959:24). This practical and popular **alternative** proved to be a useful **amenity** throughout the years.

One of the thorniest problems that the Proving Ground experienced involved its relations with Ft. Bliss. The older Army post tried to **retain** control of the areas that WSPG and the ORDCIT (Ordnance-California Institute of Technology) Department used as firing ranges. Ft. Bliss soldiers often moved onto the firing range unannounced from their positions on their base as the Proving Ground fired missiles in their **vicinity**. In **retaliation**, Ft. Bliss closed War Road between WSPG and El Paso in these early years. This, in turn, caused several El Pasoans to move to Las Cruces to be closer to the Post. Any early opportunity El Paso may have had to become a center of WSPG activity vanished. Still, with a great deal of business transacted in El Paso, many Post workers who lived in El Paso continued to drive through Las Cruces, or later, east on Nike Road, which intersected U.S. Highway 54 south of Orogrande (Metz 1984:144).

Biggs Air Force Base in El Paso experienced **jurisdiction** problems, as the Army and Air Force fought over which agency would hold authority over White Sands Proving Ground. Ft. Bliss records also mention that Biggs personnel fired live rounds at Proving Ground personnel who "came too close to the reservation after the Air Force was established" (Starkweather 1990:7). Even though problems with Las Cruces had seemed to be **resolved**, one exception occurred when General George G. Eddy moved the WSPG mailing address from Las Cruces to Orogrande. This threat occurred after the General claimed a Las Cruces newspaper editor was **harassing** the **installation**. Allegedly the newspaperman, Orville Priestly, had come to the defense of the Isaacks family, who claimed they had been "buzzed" by a plane inspecting the wreckage of a wayward missile on their property west of the Organ Mountain range (Starkweather 1990:7). Considering that Orogrande could well have become the Post's central receiving point because of its close railhead location,

this now-unthinkable situation once had a real chance of **materializing**. However, the original Post Office arrangement with Las Cruces soon returned, because Orogrande's post office could not accept registered or certified mail (Starkweather 1990:7).

Intracommunity relations became noticeably stronger in the 1950s. Military-oriented events held in conjunction with Las Cruces and Alamogordo encouraged these bonds. The **prestige** claimed by the surrounding communities linked them with WSPG, a "valuable enterprise" in the estimation of all three cities (Thompson 1954:101). The Proving Ground participated in the first Armed Forces Day parade in downtown Las Cruces in May 1950, which was viewed by more than 5,000 people. The previous year, the Proving Ground participated in Las Cruces' Centennial festivities (*W&S*, 25 May 1950:1; *LCC*, 13 October 1949:1). Other events of this nature included the annual White Sands National Monument Play Day, sponsored by the Alamogordo Chamber of Commerce, which featured a V-2 Rocket display (that thrilled the children in attendance), and an "old-timers" reunion. WSPG Open Houses, held for both the Army and Navy, also encouraged goodwill among the surrounding communities by showing them exactly what the new Proving Ground was doing and the kinds of programs in which it was involved (*W&S*, 13 April 1950:1; *Alamogordo News*, 21 October 1948:1).

The Las Cruces community **reciprocated continually** through goodwill banquets and dinner-dances for WSPG personnel. Hosted by the Mesilla Valley Chamber of Commerce, prominent business leaders and their spouses from Las Cruces attended these functions, along with the **dignitaries** from the Proving Ground. With intracommunity relations emphasized to make the communities' livelihoods prosperous, such talk dwelled exclusively on the positive benefits that the two communities provided each other. Still other civic organizations, such as the Las Cruces Chamber of Commerce, sought to use the "White Sands connection" to further its cause and promote its events (*LCC*, 18 September 1947:1; *LCC*, 21 April 1949:3).

Businesses also **sought** to **acquire** new markets and customers through local advertisements in the Post paper, *Wind and Sand*. Las Cruces retail concerns **dominated** the first group of advertisers; soon, Alamogordo and El Paso businesses joined the conglomerate. El Paso industrial contractors were prominent among these advertisers, undoubtedly hoping to appeal to the military powers with notions of securing construction or **subcontracting** work. Relative to the size of El Paso's industrial advertising, Alamogordo businesses advertised only a few times in the early days of the paper's publishing (*W&S*, 13 April 1950:3, 4).

Local recreational **pursuits** can best be defined by the places that Post personnel traveled to during their off-hours from work; by all accounts, Ciudad Juarez held the title as the most popular destination. Juarez offered the lure of a foreign country, reached by traveling on a **forbidding** road, and which upon arrival provided the liveliest nightlife in the area. With Las Cruces and Alamogordo relatively small settlements at the time, and El Paso having to follow Texas law banning liquor by the drink, Juarez personified a night's entertainment with few **regulations**. Many fine restaurants were open across the Border in addition to many nightclubs, which were frequently advertised in the Post paper (*W&S*, 15 January 1953:2-3; LaChapelle 1996).

Physical evidence of the popularity of the border town in the late 1940s and early 1950s remains to this day. Commanding General Philip G. Blackmore learned that the **previous** Naval Commander, Robert McLaughlin, had allowed Post personnel to check out motor-pool vehicles to use for a weekend. Determined to put a stop to this **unorthodox** practice, General Blackmore ordered a **trench** to be dug around the base. On the pretense of "keeping out rattlesnakes," this **demarcation** was aimed at **eliminating** the **unauthorized** vehicle use by soldiers with off-duty leave time (Starkweather 1990:5; Brink 1996). Other less **adventurous** diversions the administration **encouraged** included trips to Radium Springs or White Sands National Monument, or to auto races at the Las Cruces Speedway in the northern part of the city (*W&S,* 26 March 1953:1; *W&S,* 25 May 1950:8; LaChapelle 1996).

The surrounding communities provided more to the White Sands community as it grew. Extolling the assets of White Sands Proving Ground served each community's own interests, and the WSPG personnel could enjoy more activities and live fuller lives as these communities grew (Thompson 1954:101).

Reading 5: *What a Dump!*

by Cheryl D. Young

In 1994, White Sands Missile Range began to clear a site to build a larger **commissary**. As the crew began digging a plumbing trench, relics of possible historic significance were uncovered. The decades-old landfill had gone undiscovered during the original **survey** (Kirkpatrick 1986), because it was buried under nearly 2 feet of fill. Construction halted and Robert Burton, Archaeologist, **evaluated** the site and considered it eligible for nomination to the National Register of Historic Places. Therefore, the Historic Preservation Division (HPD) in Santa Fe, New Mexico, authorized excavation proceedings (Duran et al. 1997).

Unfortunately, the landfill contained potentially **hazardous** materials, such as lead. This forced excavation to **conform** to Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) regulations. This prevented use of traditional archaeological excavation techniques. Time and budgetary limitations played a part as well, so only a sample of the deposits was taken. Thus, grids, mapping of the site, and a thorough excavation were impossible (Duran et al. 1997).

The procedures were definitely limited. Six trenches were dug with a backhoe perpendicular to the plumbing trench. The areas with "bottles, **diagnostic** metal artifacts, ceramics, and food remains were selected over areas with construction **debris**" (Duran et al. 1997). Picks, shovels, and trowels were used, but the artifacts were merely placed within buckets without the normal sifting process.

> The excavation procedures for the landfill materials were subject to several safety issues. First, all personnel involved with (the) excavation were required to wear full face **respirators**, boots, gloves, and disposable overalls to provide protection from **contamination** with hazardous waste. All personnel involved in the excavations had current certification in hazardous waste. No landfill material was excavated during periods when local wind conditions exceeded 10 mph. Excavated material was handled so as to **minimize** airborne dust, which excluded screening of the fill for artifacts. An **industrial hygienist** from WSMR was present to **monitor** air quality (Duran et al. 1997:37).

These restrictions limited the **contextual** results. Most archaeologists were not trained to work under such **stringent** safety guidelines. Therefore, most of the artifacts were collected by the WSMR fire fighters, which served to assist their training in how to deal with hazardous materials. Many artifacts remained uncollected and those collected were carefully washed before handling. In short, many of the inferences were made with limited data, a sample of artifacts, and materials possibly out of context.

However, this project allowed at least a glimpse at artifacts recovered from a dump for which the location had been lost. The sample of artifacts—pottery, bottles, early office materials—tell more about life on the base than no artifacts at all would, or those scattered with a context in the desert.

Reading 4

Context

The things that people own can tell something about the person. The objects a person has chosen to have can **indicate** the person's age, **gender**, and interests. For example, a baseball bat and a football helmet in someone's bedroom suggest that the owner likes sports. Posters of pets and a collection of stuffed animals could mean the person is an animal lover. The objects (artifacts) can only tell a complete story if they are found together, where their owners left them (in **context**).

Archaeologists **rely** on the objects that people made (artifacts) and where they left them (context) to learn the story of past people. Think of a prehistoric pottery bowl, beautifully painted. It has a very different meaning if it is found at a pre-historic site in a grave than if it is found full of corn in an ancient storage room. Its meaning changes further if it is found in someone's modern living room—the bowl has now lost its original context and all connection with its prehistoric owners. It has become only a thing, no longer a messenger from the past.

Archaeologists preserve the context of artifacts they recover from sites by recording the location of everything they find. The artifact and its context provide more information to the archaeologist than could the artifact alone. When context is lost, information is lost.

excerpted from Shelley J. Smith, Jeanne M. Moe, Kelly A. Letts, and Danielle M. Paterson, *Intrigue of the Past, A Teacher's Activity Guide for Fourth through Seventh Grades*, 1993 (pg. 19). U.S. Department of the Interior, Bureau of Land Management, Washington, D.C.

Typology: The Organization of Scientific Data

A basic element of thinking is **classification**. We place objects and situations into **conceptual categories** in order to make sense of the world so we do not have to respond to each new object or situation as a completely new experience.

We **classify** objects almost **automatically**. This is accomplished by choosing certain details, called **attributes**, to pay attention to while **ignoring** others. We cannot take all details into account at once; therefore, we **select** only a few as being **relevant** to the **task** at hand. For example, if we have a group of blocks alike in every way except for color, then color is going to be the detail used for **categorization**. If size is **variable**, then it, too, could become important for categorizing the objects.

Classification of data plays an important role in any scientific study, including archaeology. Scientists categorize **data** according to various attributes in order to **reduce** their **complexity** and to **examine** the relationships between kinds of data. For example, it is impossible to compare each individual cat with every other member of the cat family. Instead, categories, or types, of cats(e.g., house cat, tiger, lion,or lynx) are defined. Each type includes creatures with certain shared attributes. All house cats are not identical, but all fall within an accepted range of **variation**. Each type can then be compared with the remaining types of cat (tiger, lion, lynx, and so on).

excerpted from *Capture the Past for New Mexico's Future: A Teachers' Manual for Interdisciplinary Studies in New Mexico's Cultural Heritage,* by Linda P. Hart, Karl W. Laumbach, and Lynda A. Sánchez. Human Systems Research, Inc., Report 9629. Unpublished Ms. on file, Tularosa, New Mexico.

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excerpted from *From Barren Desert to Thriving Community,* by William B. Boehm.

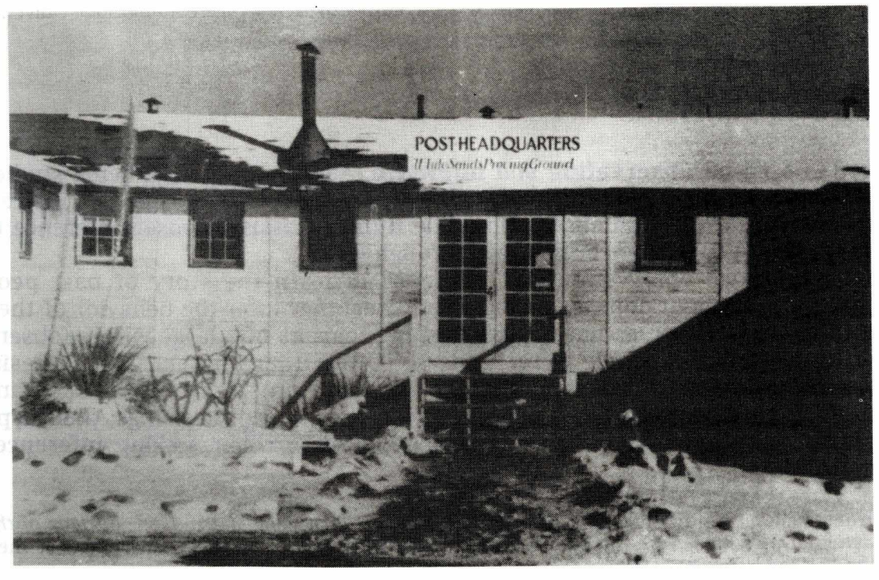

Figure 3. First Post headquarters in 1945 or 1946.

Reading 3

Why Is The Past Important?

Sites and **artifacts** can be messengers from the past. If we know how to read their messages, **material remains** can tell us about the people who made and used them and then left them behind. Although the owners of the artifacts and the **inhabitants** of the sites may have lived hundreds or even thousands of years ago, they undoubtedly had many of the same needs and concerns, hopes and fears, joys and sorrows that we have today.

The messengers from the past belong to everyone. Everyone has a right to know how the world came to be and to know his or her place in the world. Material remains and their context play a universal role "...in providing **cultural continuity** and **perspective**, and hence in linking past, present and future within the experience of any given human generation" (Lipe 1984:2).

The link to the past is provided through **scientific analysis** as well as through traditional values placed on archaeological sites and artifacts. For example, Colonial Williamsburg in Virginia provides a **tangible** link to the colonial history of America and it is valued for that reason. By examining its historic buildings and objects, Colonial Williamsburg might also provide scientific information about the lives of the historic inhabitants. Similarly, some **prehistoric** sites throughout the United States may represent the **heritage** of American Indians and are valued accordingly. These sites are also capable of providing scientific information about the prehistory of the region.

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Observation and Inference

Science is based on **observation** and **inference**. Any **phenomenon** being studied must first be observed, whether it be from a satellite or through a microscope. An inference is a reason **proposed** to explain an observation. The **hypothesis** is a chosen inference that the scientist will attempt to confirm or disprove through testing.

Archaeologists use observation and inference to learn the story of past people. By making observations about objects (artifacts and sites) they infer the behavior of the people who used the objects. When archaeologists find the remains of a large village (observation), they could infer that the people were farmers. To test that inference (hypothesis), they would look for evidence of farming, such as farming implements (like hoes), and food remains from crops (corn cobs and squash seeds). If they find these things, their hypothesis is verified. **Archaeologists** construct careful hypotheses when making inferences from archaeological **data.**

excerpted from Shelley J. Smith, Jeanne M. Moe, Kelly A. Letts, and Danielle M. Paterson, *Intrigue of the Past, A Teacher's Activity Guide for Fourth through Seventh Grades*, 1993 (pg. 14, 8). U.S. Department of the Interior, Bureau of Land Management, Washington, D.C.

THE BLIND MEN AND THE _____

Six blind men of Indostan
To learning much inclined,
Went to see an animal
(though all of them were blind),
That each by observation
Might satisfy his mind.

The first approached the _____
And happening to fall
Against his broad and sturdy side,
At once began to bawl,
"God bless me, but the _____
Is nothing but a wall!"

The second, feeling of the tusk,
Cried, "Ho! What have we here
So very round and smooth and sharp?
To me 'tis mighty clear
This wonder of an _____
Is very like a spear!"

The third approached the animal,
And happening to take
The squirming trunk within his hands,
Thus boldly up and spake.
"I see," said he, "the _____
Is very like a snake!"

The fourth reached out an eager hand,
And felt about the knee.
"What most this wondrous beast is like
Is mighty plain," said he.
"'Tis clear enough the _____
Is very like a tree."

The fifth, who chanced to touch the ear,
Said, "Even the blindest man
Can tell what this resembles most;
Deny the fact who can.
This marvel of an _____
Is very like a fan!"

The sixth no sooner had begun
About the beast to grope,
Than, seizing on the swinging tail
That fell within his scope,
"I see," said he, "the _____
Is very like a rope!"

And so these men of Indostan
Disputed loud and long.
Each in his own opinion
Exceeding stiff and strong,
Though each was partly in the right,
And all were in the wrong!

Adapted from "The Blind Men and the Elephant," by John Godfrey Saxe.

canteen, mess kit, and silverware

horseshoe

mess kit

3 ink bottles and Waterford pen

stove damper

Waterford pen

light bulb

eye glasses

2 ash trays

Fitch's hair tonic bottle

2 small medicine bottles

hair tonic bottle

small medicine bottle

Vitalis hair tonic bottle

3 medicine bottles and
an inhaler (for congestion)

2 medicine bottles

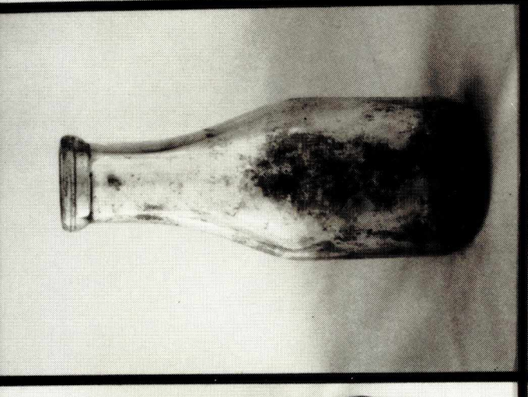
medicine bottle

3 sizes of blue
Noxema bottles

beer can

cereal bowl, 2 mugs, and silverware

cereal bowl



dining silverware

2 mugs

ink bottle

canteen

ink bottle

camping silverware

hot pepper sauce bottle

quart milk bottle

variety of beer and
alcohol bottles and cans

coffee cup from
quartermaster corps

quart and pint milk bottles

hair tonic bottle

assortment of medicine
bottles and 2 droppers

can top

assortment of
hair tonic bottles

Listerine bottle

small drinking glass

salt or pepper shaker

hair tonic bottle

2 liquor bottles

mayonnaise jar

medicine bottle

crown cap for soda bottle

assorted bottles (vinegar, pepper sauce, and condiment), jars (mustard and mayonnaise), salt or pepper shaker, and small drinking glass

Pennzoil can

assorted car parts (starter coil, Pennzoil can, gas cap, spark plug, and 2 oil can lids)

U.S. Army collar button and coast artillery pins

oil can lid

spark plug

gas cap

cable connection

dental pick

inhaler (for congestion)

condiment bottle

Barq's root beer bottle

Coca cola bottle

vinegar bottle

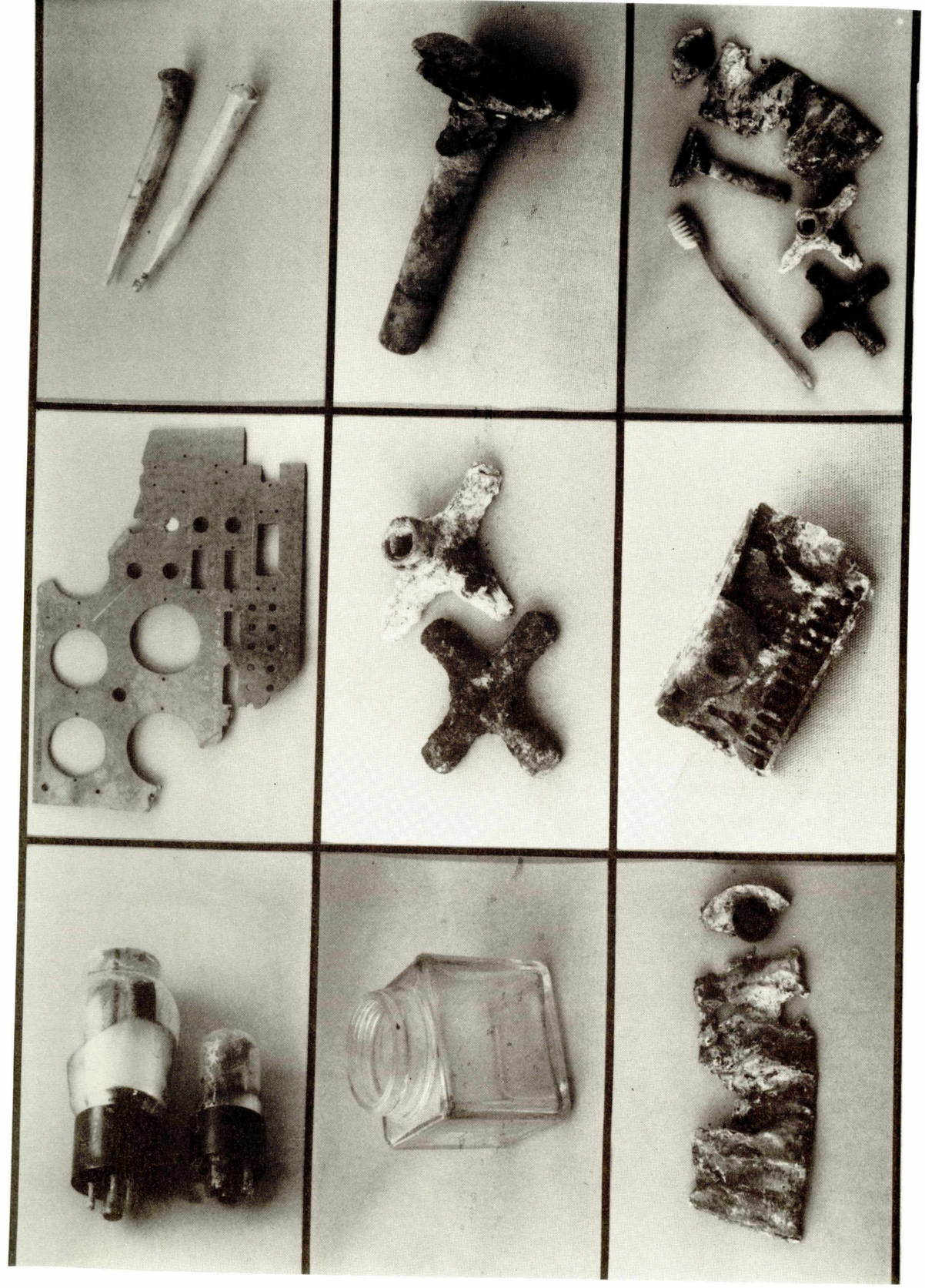
brown beer bottle

assorted soda bottles

mustard jar

pint milk bottle

7-up bottle



2 eye droppers

instrumentation panel
with German lettering

2 vacuum tubes

razor

2 faucet handles

square medicine bottle

razor, tooth brush, Barbasol tube,
and faucet handles

electric trimmer part

lead Barbasol tube