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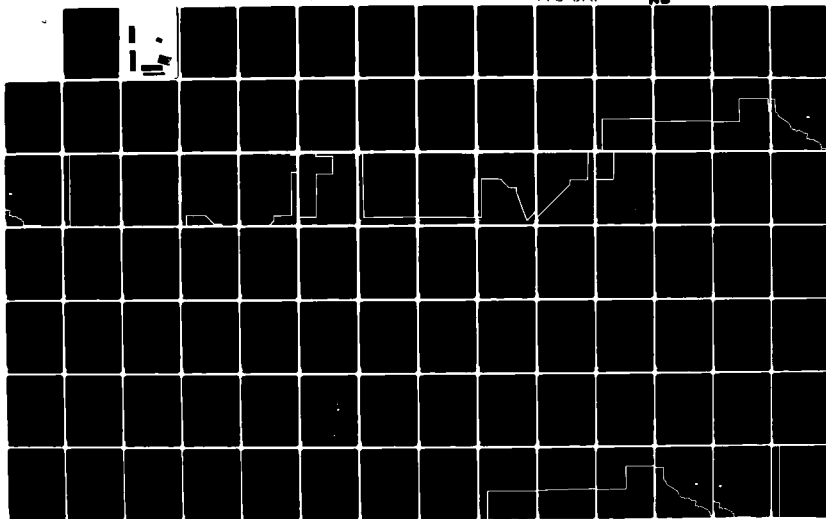
AN ARCHEOLOGICAL OVERVIEW AND MANAGEMENT PLAN FOR THE
DUGWAY PROVING GROUND(U) STEARNS-ROGER SERVICES INC
DENVER CO J GRADY ET AL. 29 MAR 84 CX-0001-2-0048

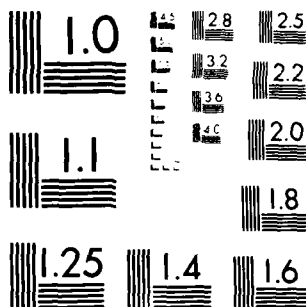
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Final
Report No. 2

March 1984

**An Archeological Overview and
Management Plan for the
Dugway Proving Ground**

Under Contract CX-0001-2-0048
with the

**National Park Service
U.S. Department of the Interior**

Denver, Colorado 80225

for the
U.S. Army Materiel Development and
Readiness Command

by

Stearns-Roger Services, Inc.

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Prepared under the Supervision of

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James Grady, Principal Investigator

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JUN 20 1984
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REPORT DOCUMENTATION PAGE		1. REPORT NO.	2.	3. Recipient's Accession No. AD A142 361
4. Title and Subtitle An Archeological Overview and Management Plan for Dugway Proving Ground, Utah		5. Report Date March 29, 1984		
7. Author(s) J. Grady, S.F. Mehls, B. J. LeFree, J.L. Dawson, D.E. Plume		8. Performing Organization Rept. No. 2		
9. Performing Organization Name and Address Stearns-Roger Services Inc. 4500 Cherry Creek Drive North Denver, CO 80217		10. Project/Task/Work Unit No. 26917 X17000		
		11. Contract(C) or Grant(G) No. (C) CX-0001-2-0048 (G)		
12. Sponsoring Organization Name and Address U.S. Dept. of Interior National Park Service Rocky Mountain Regional Office 655 Parfet Street Denver, CO 80225		13. Type of Report & Period Covered Final Report		
14.				
15. Supplementary Notes This report was prepared as part of the DARCOM Historical/Archeological Survey and inter-agency technical services program to develop facility-specific archeological overviews and management plans for the U.S. Army Materiel Development and Readiness Command (DARCOM)				
16. Abstract (Limit: 200 words) The Dugway Proving Ground (DPG) located in Tooele County, Utah, is an installation of the U.S. Army's Materiel Development and Readiness Command (DARCOM). As stewards of approximately 840,909 acres (324,853 hectares) at DPG the U.S. Army has responsibility for the Management of any cultural resources located there. Approximately 220 sites are known to exist on DPG, but local geomorphology and cultural history suggest that additional cultural resources are likely to be found in undisturbed portions of the DPG. Those sites possessing physical integrity will have high research value. In compliance with Draft Army Regulation (AR 420.XX) and in consideration of future general disturbance activities, the following recommendations are made: (1) conduct a field survey of all undisturbed areas on the installation to identify unknown cultural resource locations, (2) establish monitoring program in those areas on the installation where construction and subsurface disturbances are planned, (3) evaluate and nominate known cultural properties for inclusion in the National Register of Historic Places (NRHP), (4) take action to preserve properties eligible for inclusion in the NRHP. These recommendations, if implemented, together with historic architectural information would then serve as the basis for developing an installation Historic Preservation Plan.				
17. Document Analysis a. Descriptors Archeological Management Army Installation Management Environmental Assessment b. Identifiers/Open-Ended Terms Cultural Resource Management Utah Paleoenvironments Utah Prehistory Goshuite Ethnography Utah History c. COSAT Field/Group				
18. Availability Statement For public release without appended site location data.		19. Security Class (This Report)		21. No. of Pages xi + 130
		20. Security Class (This Page)		22. Price

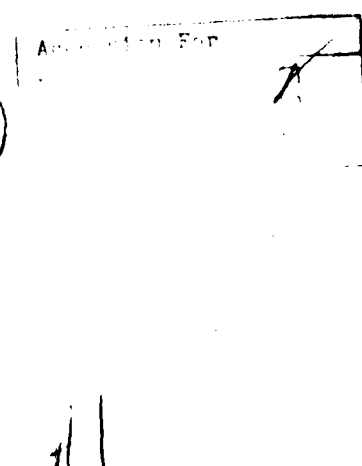
MANAGEMENT SUMMARY

The Dugway Proving Ground (DPG) located in Tooele County, Utah, is an installation of the U.S. Army's Darcom Command. As steward of approximately 840,909 acres (340,316 hectares) at DPG the U.S. Army has responsibility for the management of any cultural resources located there.

Several sites are currently known to exist on the Proving Ground but local geomorphology and culture history suggest that additional cultural resources are likely to be found in the undisturbed portions of the Proving Ground. Those sites possessing physical integrity will have high research value. In compliance with Draft Army Regulation 420.XX and with consideration of future ground disturbance activities the following recommendations are made:

- to conduct an archival and historical review of the literature plus an intense on-the-ground-survey (inventory) of 4 percent of the surface area of the Proving Ground.
- to take action to record, document, and preserve the sites currently known to exist on the DPG.
- to establish a monitoring program in those areas of the DPG where construction and subsurface disturbances will take place.

These recommendations, if implemented, together with historical architectural information would then serve to develop a facility Historic Preservation Plan (HPP).



PREPARERS AND QUALIFICATIONS

Dr. J. Grady, Principal Investigator, has 21 years' experience in archeology, has participated in eight excavations, and has over 30 years' experience in aerial photography and aerial photographic interpretation. His doctoral dissertation, published by the Bureau of Land Management (1980), dealt with highland/lowland adaptability of prehistoric peoples in the Piceance Basin portion of the Colorado Plateau in northwestern Colorado. His research interests include the solution of large-scale (areal) archeological problems using ecological modeling, statistical sampling, and sampling strategies and modeling, remote sensing and aerial photographic interpretation, and the development and use of statistical techniques capable of integrating prehistoric spatial distributions into reconstructions of viable economic patterns. He was responsible for the Prehistorical Overview, Section 2.2.1, Archeological Research Directions, Section 2.3, Chapters 3.0, 4.0, and 5.0, and the Management Summary.

Ms. B. J. LeFree has had extensive archeological and compliance experience in Colorado as Head of Compliance for both the State Archeologist and the Colorado State Historic Preservation Officer. She also was a staff archeologist for the Advisory Council on Historic Preservation. Ms. LeFree has considerable experience with many Native American people, particularly those at the Pueblo of Santa Clara, where she worked with several potters in writing her book, Santa Clara Pottery Today. Ms. LeFree was laboratory supervisor for Denver University and was responsible for analyzing lithic and pottery artifacts, writing site descriptions, developing statements of significance for eligible properties, and writing reports. She currently is employed at Stearns-Roger as the Cultural Resource Manager and Archeologist. She wrote the Ethnohistory, Section 2.2.2., and was responsible for developing the Recommended Archeological Management Plan, Chapter 6.0.

Dr. S.F. Mehls, Stearns-Roger staff historian and designated Historical Investigator for this project, has extensive academic and professional experience in the history of the American West. He has more than three years' full-time experience as a historian for cultural resources projects. Dr. Mehls has published extensively, including books, articles, book reviews, and government documents, and has given numerous oral presentations. While employed by the Bureau of Land Management, he received two individual special achievement awards for the quality and timeliness of his historical cultural resources work. He was responsible for writing the Historical Overview, Section 2.2.3. He also contributed to Sections 2.3, Research Directions, and 3.2, Historic and Recent Land Use Patterns.

Mr. J.L. Dawson is an ecologist specializing in terrestrial ecology and botany. He has produced baseline descriptions and environmental assessments for numerous industrial projects, including oil shale and synfuel developments, power plants, mines, and transmission and pipeline corridors. His responsibilities have included review of relevant literature, design and performance of necessary field studies, description of baseline conditions, and analysis of impacts. He has had broad geographic experience with work on projects in many of the western states and in North Dakota and West Virginia. He was responsible for compiling the data for the Physical Environmental Overview, Section 2.1.

Mr. D.E. Plume, staff geologist for Stearns-Roger, has for the past 12 years been involved in field and laboratory work for preparation of archeological and geological studies throughout North America. In addition, he has contributed to several studies on the environmental effects of high-level nuclear waste storage, hazardous waste management legislation, and computer applications of numerical simulation. Mr. Plume was responsible for compiling the data for the geology and paleoenvironment portions of the Physical Environmental Overview, Section 2.1.

ACKNOWLEDGEMENTS

This project was funded by the Department of the Army Materiel Development and Readiness Command (DARCOM) and administered by the National Park Service (NPS).

We wish to extend our appreciation to Hannah M. Zeidlik, U.S. Army Center of Military History, Marguerite Brigida, Smithsonian Institution, and Martin K. Gordon, Historical Section at the Corps of Engineers, Washington, D.C., for documents and photographs for Dugway Proving Ground, Utah.

We are especially grateful for the assistance and cooperation of Victor Pratt, Environmental Quality Coordinator for Dugway, for scheduling our trip; Tom Kincaid, Ecologist, for maps, drawings, management plans, and environmental reports; Dave Gauthier, Chief Environmental and Ecology Branch; Dave Madsen, State Archeologist, and his staff, for site forms pertinent to the study region; Rich Fike, Bureau of Land Management (BLM) Archeologist, and Doug Dodge, Salt Lake City District BLM Archeologist, for maps, unpublished reports, and site forms.

Our special appreciation is extended to Jack Rudy, Contract Officer's Representative, and Joe Bolin, Contract Officer, NPS Rocky Mountain Region, who accompanied us to the installations in Utah. We also extend our appreciation to Yvonne Stewart and John Thomas, Washington, NPS.

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LIST OF ACRONYMS

Advisory Council on Historic Preservation	ACHP
Before Present	BP
Bureau of Indian Affairs	BIA
Bureau of Land Management	BLM
Chemical, Biological, and Radiological warfare	CBR warfare
Chemical Warfare Service	CWS
Civilian Conservation Corps	CCC
Council of Environmental Quality	CEQ
Defense Property Disposal Office	DPDO
Dugway Proving Ground	DPG
Federal Register	FR
Historic Preservation Plan	HPP
Indian Reorganization Act	IRA
Intermountain Antiquities Computer System	IMACS
Memorandum of Agreement	MOA
National Environmental Policy Act	NEPA
National Historic Preservation Act	NHPA
National Register of Historic Places	NRHP
Salt Lake & Los Angeles Railroad	SL&LA
State Historic Preservation Officer	SHPO
U.S. Army Materiel Development and Readiness Command	DARCOM
U.S. Army Test and Evaluation Command	TECOM
Western Pacific Railroad	WP

FOREWARD

Stearns-Roger has developed a regionally-based prehistoric, ethnographic, and historic overview for the Dugway Proving Ground (DPG). This overview contains a realistic research design that will complement the contracted 1 percent random survey. An hierarchical model also is provided which identifies problem domains, research topics, and specific research questions. The Proving Ground contains the data necessary to resolve some of these questions.

The synthetic overview and research design presented here, while specifically applicable to DPG, is flexible enough to accommodate any new information as it becomes available.

Stearns-Roger Services, Inc.

James Grady
Principal Investigator

SECTION 1

CHAPTER 1.0 INTRODUCTION

1.1 PURPOSE AND NEED

This archeological study was conducted for the Dugway Proving Ground (DPG) to develop a comprehensive cultural resource management plan. This plan should be addressed in the installation Master Plan for compliance with the following federal statutes and orders regarding cultural resources:

- Antiquities Act of 1906
- Historic Sites Act of 1935
- Reservoir Salvage Act of 1960
- National Historic Preservation Act of 1966
- National Environmental Policy Act of 1969
- Executive Order 11593 of 1971
- Archeological and Historic Preservation Act of 1974
- Archaeological Resources Protection Act of 1979

1.1.1 Federal Mandates

The federal government recognized that important archeological resources are valuable, non-renewable aspects of our cultural heritage. A myriad of federal laws, regulations, executive orders, and guidelines have been enacted to consider our cultural heritage in the federal planning process.

Federal agency archeological responsibilities began with passage of the Antiquities Act of 1906 (PL 59-209; 16 USC 431-433), which enabled the federal government to set aside and protect "historic landmarks, historic, and prehistoric structures and other objects of historic or scientific interest."

The Historic Sites Act of 1935 (PL 74-292; 16 USC 461-471) established a policy to protect nationally significant properties and expanded the role of the Department of the Interior in identifying and protecting "historic and archeological sites, buildings, and objects."

The Reservoir Salvage Act of 1960 (PL 86-523; 74 Stat. 220; 16 USC 469-469c) provided for the protection of data of "exceptional historical or archeological significance" which would be impacted by reservoir construction.

It was not until 1966, with passage of the National Historic Preservation Act (NHPA), (16 USC Sec. 470f, as amended 90 Stat. 1320), that all federal agencies were mandated to consider the effects of their projects and programs on cultural properties listed on the National Register of Historic Places (NRHP). Further amendments (PL 91-243, 93-54, 94-422, 94-458, 96-199, 76-244, 96-515) require the following of all federal agencies:

1. Inventory, evaluate, and (where appropriate) nominate to the NRHP all archeological properties under agency ownership or control (Sec. 110(a)(2)).

2. Prior to the approval of any ground-disturbing activity, consider the project's effect on any property listed on the NRHP or any eligible property, and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on the proposed project (Sec. 106).
3. Complete an appropriate data recovery program on an eligible or listed archeological property before it is damaged or destroyed (Sec. 110(b)), as reported by the House Committee on Interior and Insular Affairs (96th Congress, 2nd Session, House Report No. 96-1457, p. 36-37).

In January 1967, to obtain the mandatory participation of the states in the NRHP program, the Secretary of the Interior sent letters to the governors requesting each to designate a representative responsible for preparing surveys, receiving grants, and working with the Department of the Interior in developing the program. The role of the states and the duties of the State Historic Preservation Officer (SHPO) were first published in the Federal Register (FR), February 1969.

The National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190; 83 Stat. 852; 42 USC 4321) requires that all aspects of the environment, including important historic properties, be considered during planning of any major federal action, through the preparation and review of environmental impact statements. Also, the Federal Land Policy and Management Act of 1976 (FLPMA)(P.L. 94-579, 90 Stat. 2743) declares that it is public policy to manage public lands in a manner that will protect historic resources (Section 102(a)(8)).

Executive Order 11593, "Protection and Enhancement of the Cultural Environment," was signed by President Nixon in 1971. The Order authorized federal agencies, with the advice of the Secretary of the Interior and in cooperation with the SHPO, to locate, inventory, and nominate to the Secretary of the Interior all sites, buildings, districts, and objects under their jurisdiction or control that appear to qualify for listing on the NRHP. The Order afforded protection to those properties eligible for and listed on the NRHP.

The Archeological and Historic Preservation Act of 1974 (PL 93-291; 88 Stat. 174; 16 USC 469) requires that notice of any federal project adversely affecting a significant archeological property be provided to the Secretary of the Interior; either the Secretary or the notifying agency may require a cultural resource data recovery program, if appropriate, to preserve valuable information.

The Archaeological Resources Protection Act of 1979 (PL 96-95; 93 Stat. 721; 16 USC 470aa) supersedes the Antiquities Act of 1906 (93 Stat. 225, 16 USC 431-32) and establishes provisions that allow the Secretary of the Army to issue excavation permits for archeological resources on U.S. Army Materiel Development and Readiness Command (DARCOM) lands (Sec. 4). The Act also establishes stringent fines and extended prison sentences for anyone removing artifacts from public lands without a permit.

The ACHP regulations, Protection of Historic and Cultural Properties NHPA 36 CFR 800, set forth procedures for compliance with Section 106.

Regulations from the Department of the Interior establish procedures for determining site eligibility for the NRHP (36 CFR 60, 36 CFR 63), standards for data recovery (proposed 36 CFR 66), and procedures for implementing the Archaeological Resources Protection Act (Department of Interior, 43 CFR Part 7; Department of Defense, 32 CFR Part 229).

Guidance from the U.S. Department of the Army establish procedures and standards for the preservation of historic properties (32 CFR 650.181-650.193; Technical Manual 5-801-1; Technical Note 78-17; Army Regulation 420.XX), (Knudsen et al. 1983:2-14).

It is the intent of DARCOM to comply with these policies and integrate into their Master Plan procedures regarding preservation of archeological and historical properties. Data have been collected and synthesized for integration into the Master Plan. Recommendations for identification and preservation of those properties eligible to the NRHP will assist the DARCOM installation in their compliance responsibilities.

1.1.2 Native American Indian Legislation

In addition to federal legislation requiring agencies to consider cultural properties in their planning process, legislation also requires consideration of Native American Indian sacred and cultural values. NEPA requires that sacred areas of Native Americans be identified for potential impact; NHPA also addresses the need to identify Native American cultural resources. The American Indian Religious Freedom Act of 1978 (Public Law 95-341, 92 Stat. 469) legalizes a special status for sacred places, artifacts, animals, and plants of Native American peoples. This act guarantees American Indian access to sacred sites, including cemeteries, required in their religion. This Act also guarantees Native Americans the freedom to use sacred resources and natural species in practicing their religion.

Council on Environmental Quality (CEQ) guidelines clarify the role of Native Americans in the NEPA process. Section 40 CFR 1501.7 allows affected Indian tribes' participation in the early planning process to formulate issues and participate in research. The lead agency shall request the comments of affected Indian Tribes to review and comment on draft Environmental Impact Statements (40 CFR 1503.1).

Because Utah Army installations are adjacent to present Indian reservations, and research has identified early tribal territories to be within the boundaries of the installation, Native American values have been addressed extensively in Section 2.2.2.

To comply with the Native Religious Freedom Act, two members of the Gosiute Tribe were contacted. Burt Wash, Chairman of the Gosiute Skull Valley Reservation, was contacted, and a meeting was arranged at Gransville, Utah. Neither Mr. Wash nor a tribal representative arrived. Mr. Dan Murphy, Chairman, Deep Creek Gosiute Reservation, was contacted by mail. Stearns-Roger has not received a response to our request to enlist his aid in addressing Gosiute Native American concerns.

1.2 THE DUGWAY PROVING GROUND

The present site of DPG was officially obtained by Executive Order of President Franklin D. Roosevelt on February 6, 1942. Major Burns was

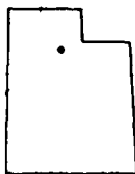
designated Commanding Officer of U.S. Army Dugway Proving Ground, Utah by authority of the War Department on February 18, 1942. Construction was started immediately by the U.S. Army Corps of Engineers and activation was announced by the Commanding Officer on March 1, 1942 (Pinkham et al. 1979).

DPG is a subordinate command of the U.S. Army Test and Evaluation Command (TECOM). DPG was originally selected for the testing and evaluation of chemical weapons systems primarily because of its seclusion and scarcity of wildlife. DPG covers 840,909 acres (340,316 hectares), and includes mountains and valleys and a large, flat, sparsely vegetated area that extends westward into the southern reaches of the barren salt flats of the Great Salt Lake Desert (Department of the Army 1981). The approximate center of DPG lies at 40°10' latitude and 113°14' longitude (Figure 1-1).

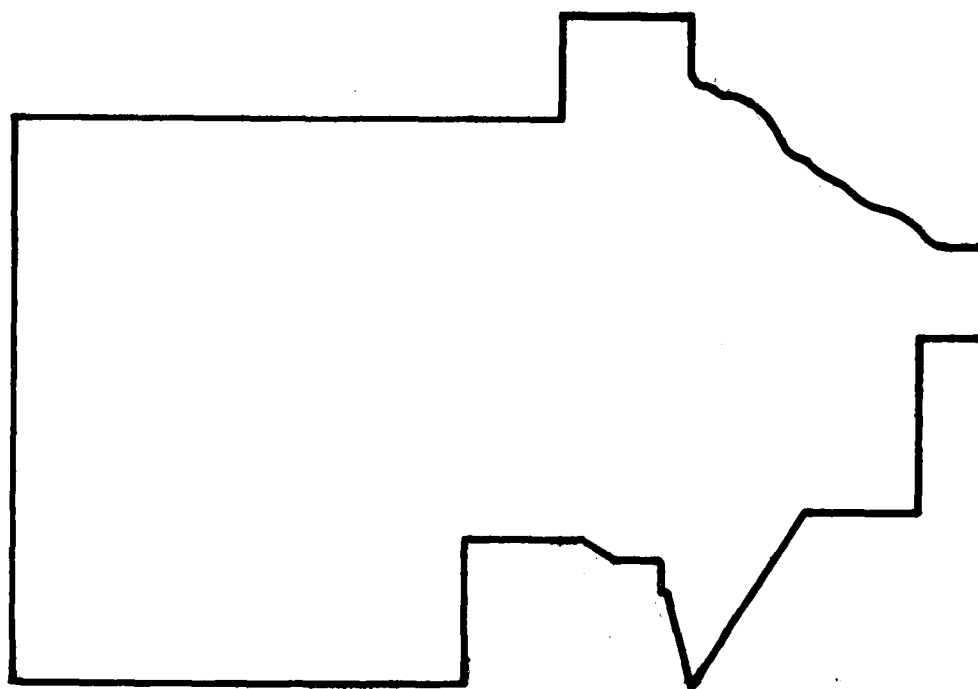
Summary of Buildings and Total Land Acreage

<u>Construction Category</u>	<u>Building Area</u>	
	<u>(Sq. ft.)</u>	<u>(Sq. m)</u>
Operational and Training Facilities	62,946	5,848
Maintenance and Production Facilities	157,891	14,668
Research, Development and Test Facilities	163,438	15,183
Supply Facilities	176,858	16,430
Hospital and Medical Facilities	43,660	4,056
Administrative Facilities	357,204	33,184
Housing and Community Facilities	1,105,363	102,688
Utilities and Grounds Improvements	37,620	3,495
TOTAL BUILDINGS AREA	2,104,980	195,552
<u>Total Land</u>	<u>Acreage</u>	
		<u>Hectares</u>
Public Domain Withdrawal	777,504.5	314,656.1
Land Held in Fee	19,829.7	8,025.1
Temporary License or Permit	38,183.8	15,453.0
In-Leased	5,391.3	2,181.9
TOTAL LAND AREA	840,909.3	340,316.1

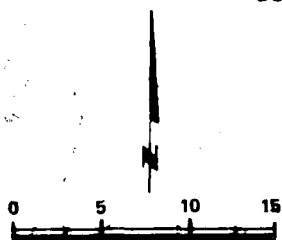
There are only two urban areas in the vicinity: Tooele, with a 1975 population of 13,800 and Grantsville, with a 1975 population of 3500, both in Tooele Valley. Small communities are Stockton, Clover, St. John, Ophir, Vernon and Callao, about 1.2 (2 km) from the southwest corner of DPG. The total 1970 census for the combined population of these small communities was approximately 1100 persons. The remaining population resides on widely scattered ranches. The average density is 15 people per square km in Tooele Valley, one to two people per square km in Rush Valley, and less than one person per square km in the remainder of the vicinity (excluding the town of Dugway [English Village] with a population of 1149).



UTAH MAP LOCATION
OF DUGWAY



DUGWAY PROVING GROUND



SCALE (MILES)

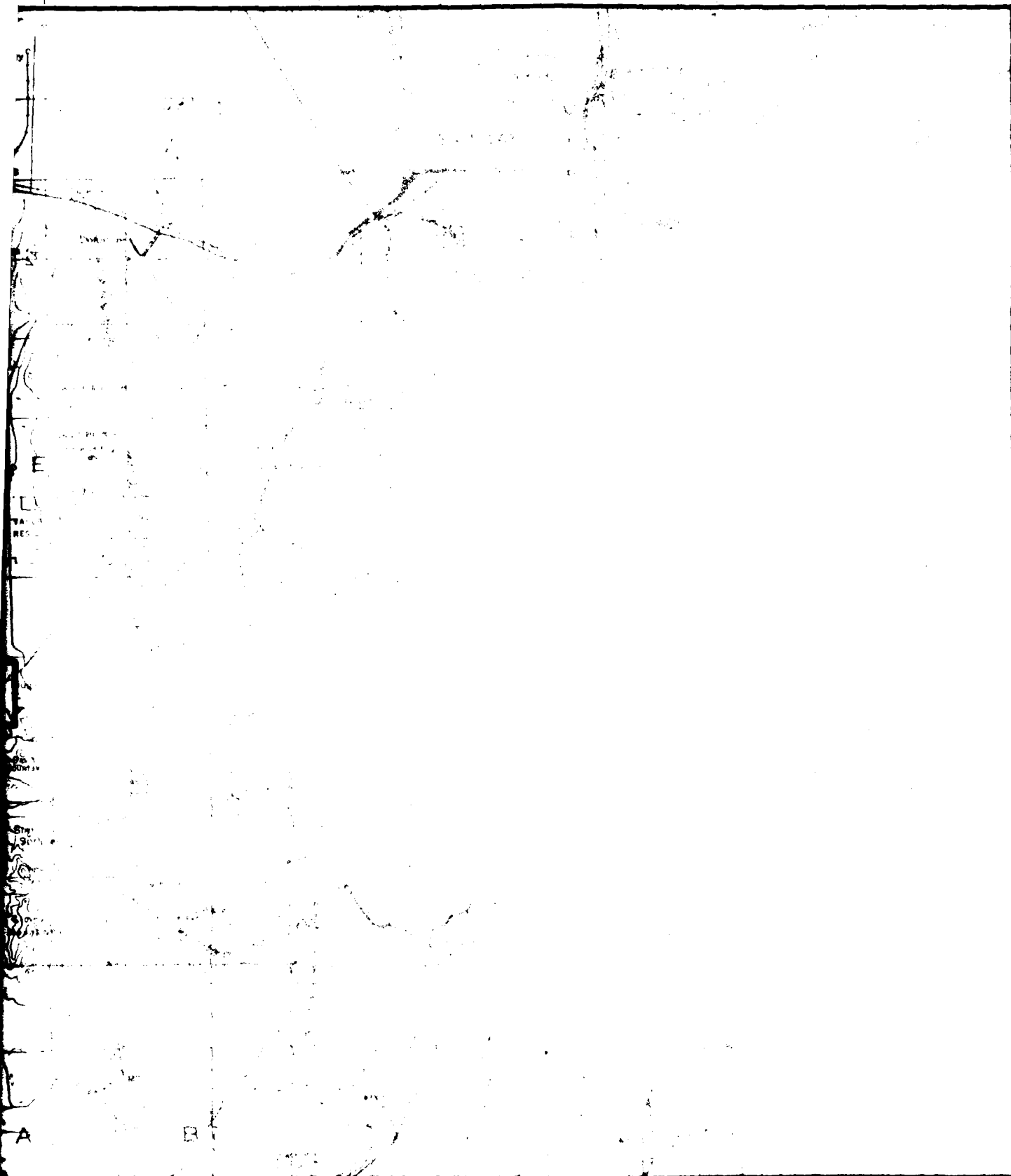


Figure 1-1. GENERAL VICINITY MAP OF
DUGWAY PROVING GROUND

Paved roads connect DPG with Interstate 80 at Timpie Junction, 37 miles (60 km) to the north, and Tooele, Utah, via Johnson Pass 46 miles (74 km) northeast.

As of July 1979, approximately 1200 people worked at DPG. Approximately 80 percent were civilian employees.

Built-up areas contribute a very small portion of the total reservation area, the remainder being dedicated to field testing, impact area, or for maneuver space. The seven cantonment areas are located functionally in the east central portion of the reservation (Figure 1-2):

- Avery Technical Center/Ditto Technical Center/Michael AAF Complex form the test operational headquarters and technical center complex for DPG. The chemical, biological, and meteorological laboratories, and the Air Terminal are also part of the complex.
- Baker Area houses the Environmental and Life Science Laboratory, and plays a role in the overall installation mission.
- Carr Facility accommodates the ammunition processing and testing area, and contains secure areas for storage of hazardous chemical materials and for ammunition.
- The English Village/Fries Park area is the residential community for DPG, and contains family housing, community facilities, and all non-technical administration and installation support activities.

1.3 SUMMARY OF PREVIOUS ARCHEOLOGICAL WORK CONDUCTED ON THE DUGWAY PROVING GROUND

A review of cultural resource files in the offices of the Utah State Archeologist and the Salt Lake District Bureau of Land Management (BLM), and the NRHP has produced the following information on prior archeological investigations at DPG.

The earliest recorded work was performed by Lt. K. Schmitt in the early 1940s. Schmitt located some 200 surface sites, primarily in the dune areas, on the Proving Ground. The collections of Schmitt now are the property of the Smithsonian Museum.

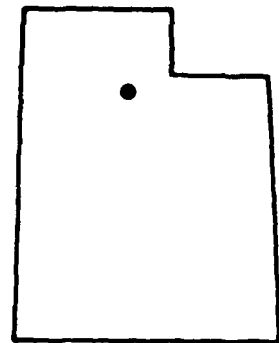
No other surveys have been conducted on the base. However, the BLM has conducted a series of small surveys immediately south and adjacent to the Proving Ground.

1.4 THE SOCIOCULTURAL CONTEXT OF THE ARCHEOLOGICAL RESOURCES ON THE DUGWAY PROVING GROUND

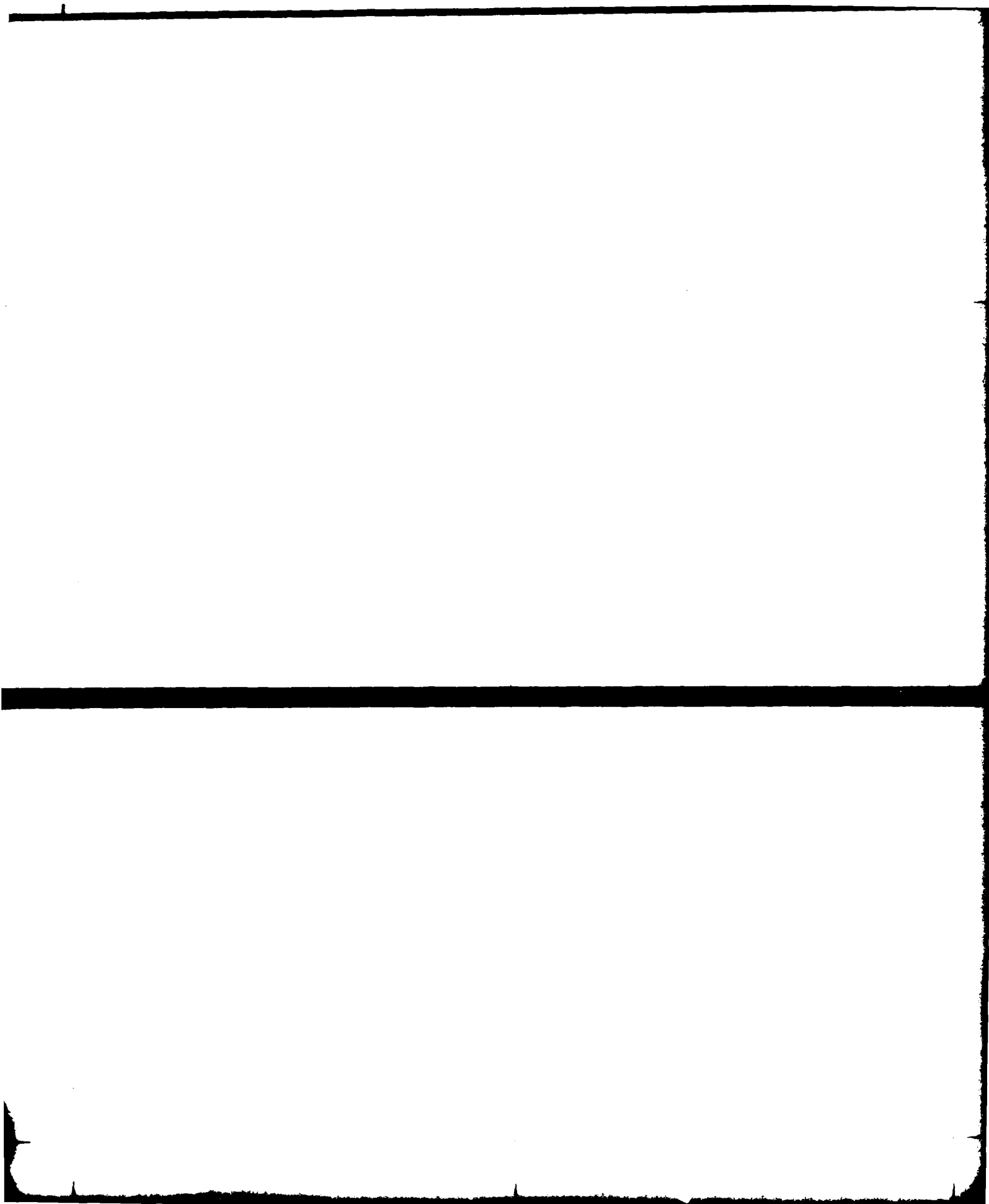
The DPG has the potential to be a major archeological laboratory for the Great Basin. The range of environmental zones present and the variety of materials recorded to date on or near the Proving Ground make it a natural locale for scientific investigation. Army control of the land has prevented large-scale site looting, so common in other regions, which further enhances Dugway's potential archeological and scientific value.

DUGWAY PROVING GROUND

Figure 1-2 MASTER FACILITY MAP



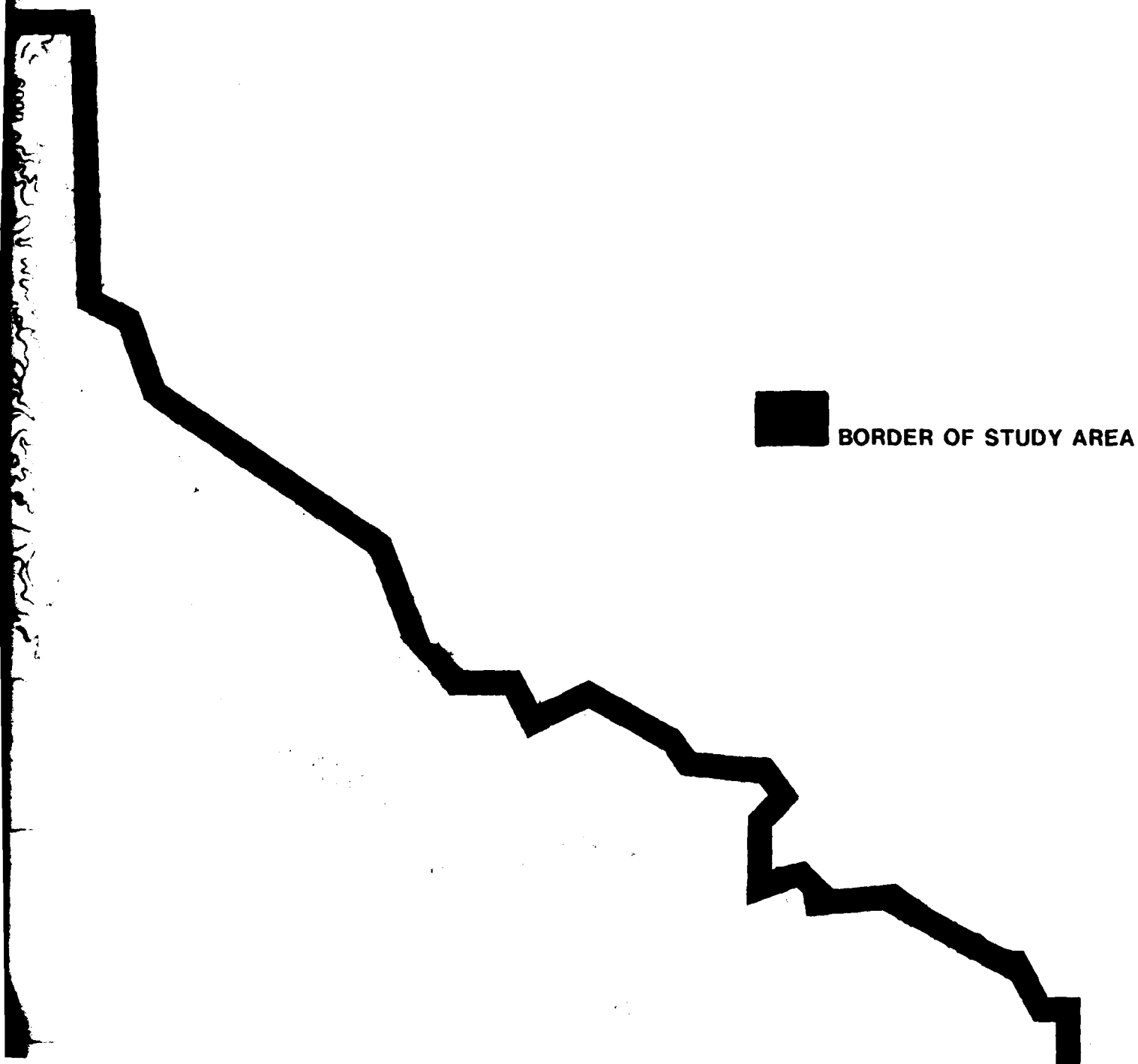
UTAH MAP LOCATOR
SALT LAKE CITY



Figure



Figure 1-2 MASTER FACILITY MAP OF DUGWAY PROVING GROUND



UGWAY PROVING GROUND



BORDER OF STUDY AREA

6

2

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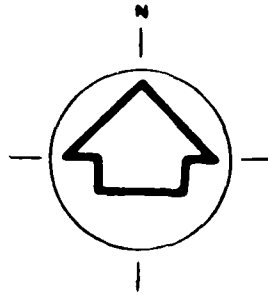
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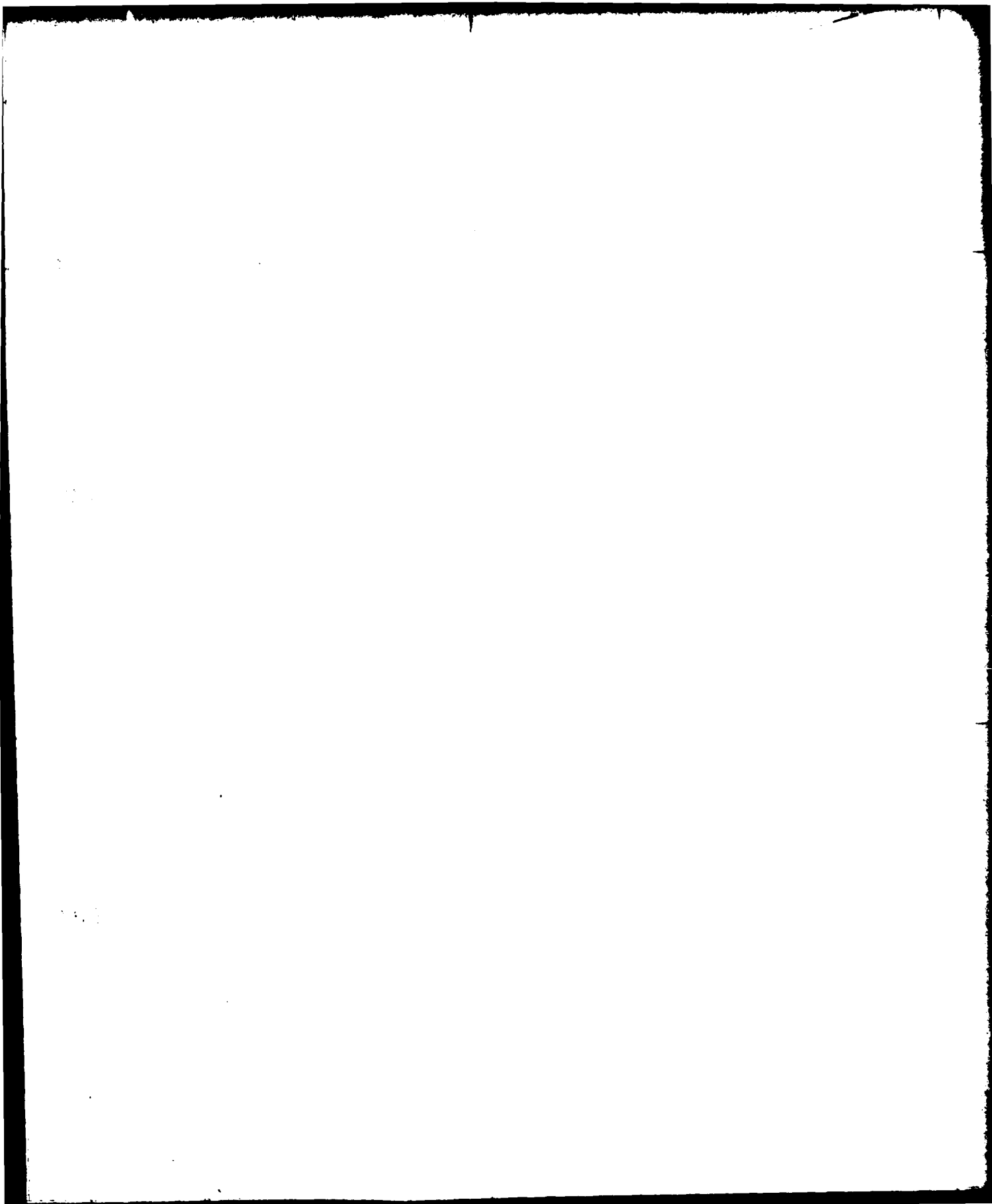
English Village

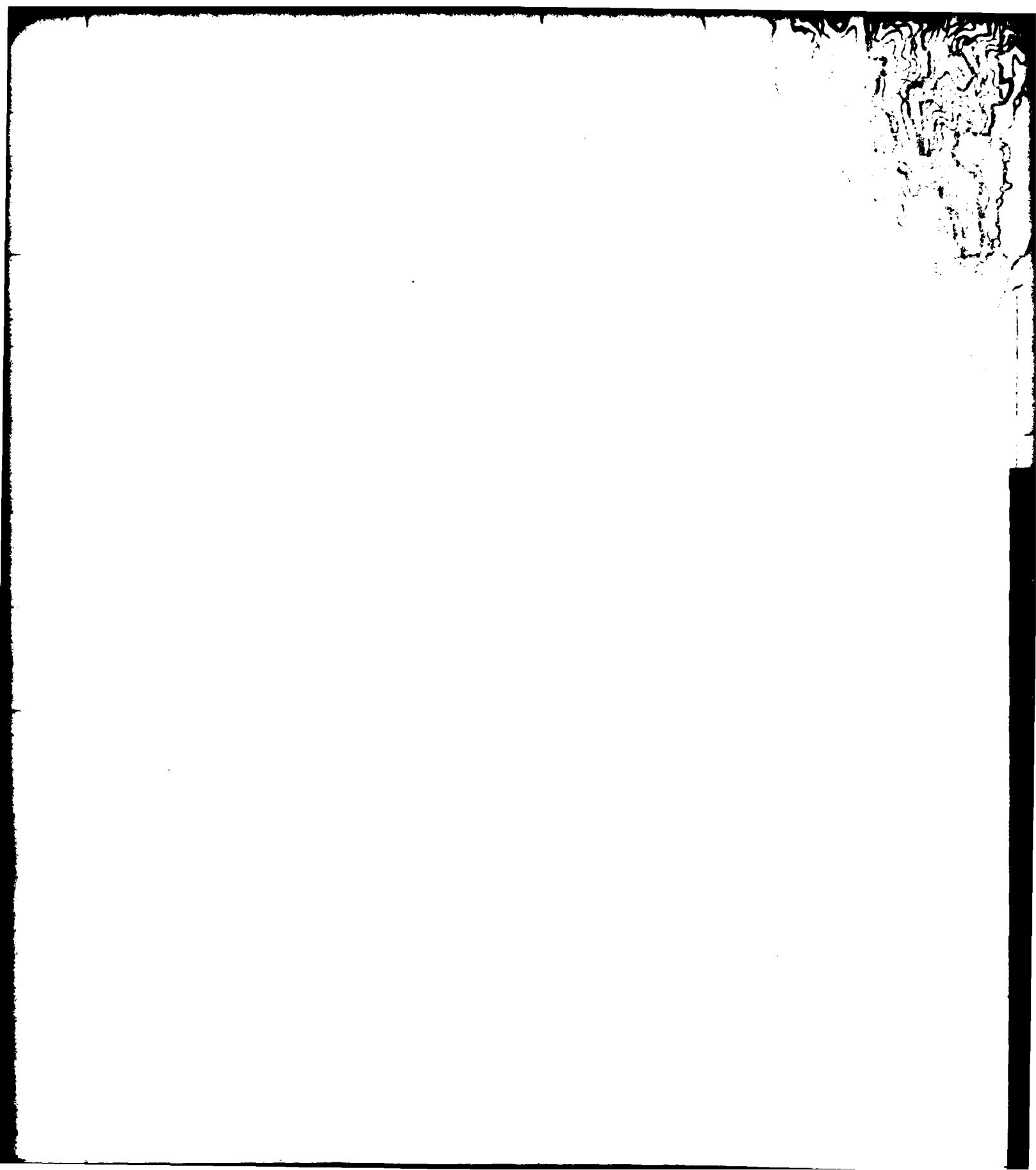
Fries Park

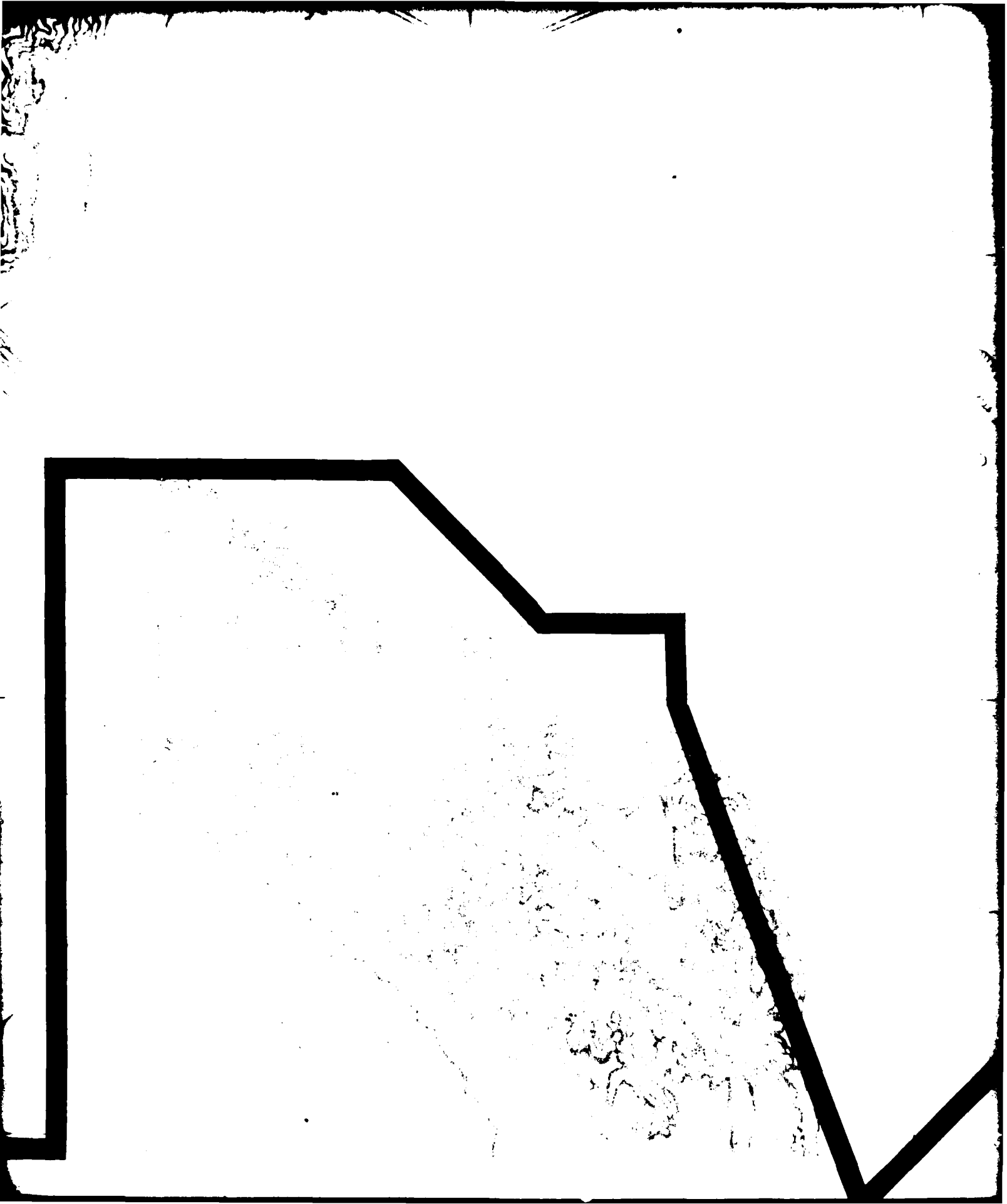
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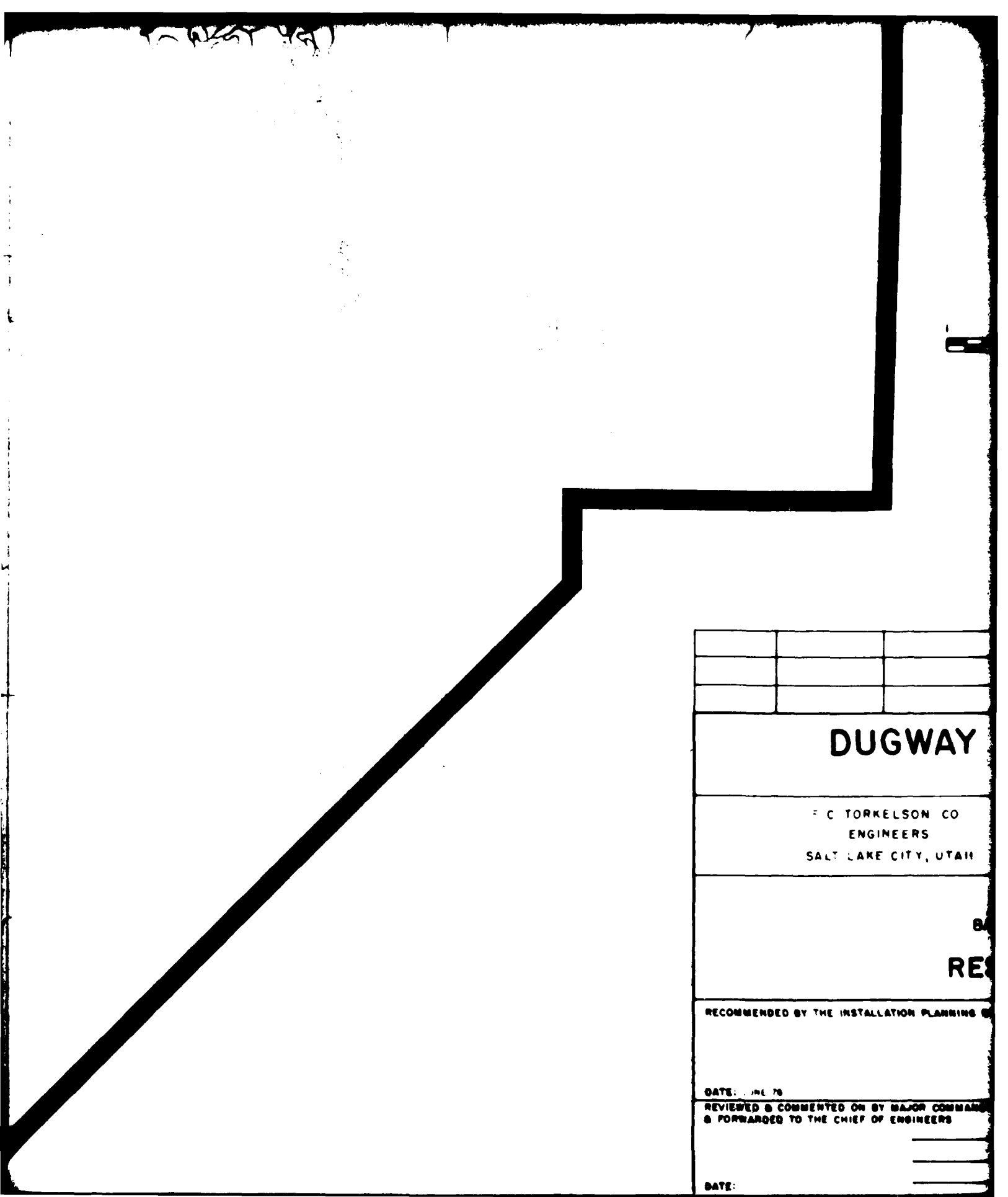
SCALE IN MILES







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DUGWAY

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ENGINEERS
SALT LAKE CITY, UTAH

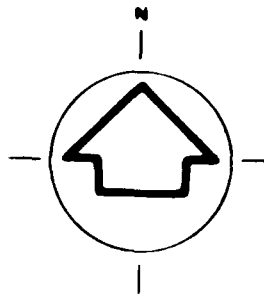
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RECOMMENDED BY THE INSTALLATION PLANNING &

DATE: JUNE 70

REVIEWED & COMMENTED ON BY MAJOR COMMAND
& FORWARDED TO THE CHIEF OF ENGINEERS

DATE:



SCALE IN MILES

<h1>DUGWAY PROVING GROUND</h1> <h2>DUGWAY, UTAH</h2>			
F C TORKELSON CO. ENGINEERS SALT LAKE CITY, UTAH		U.S. ARMY ENGINEER DISTRICT, SACRAMENTO CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA	
MASTER PLAN BASIC INFORMATION MAPS <h1>RESERVATION MAP</h1>			
RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL			
		 ADALBERT E TOEPEL, JR. COLONEL, F A COMMANDING	
DATE: JUNE 76 REVIEWED & COMMENTED ON BY MAJOR COMMANDER & FORWARDED TO THE CHIEF OF ENGINEERS		DATE JUNE 76	DRAWING NO. 18-02-19
DATE:		SHEET NO. 2 of 6.	FILE NO. 181-13-48

SECTION 2

CHAPTER 2.0 OVERVIEW OF THE CULTURAL AND RELEVANT NATURAL HISTORY OF THE DUGWAY PROVING GROUND

2.1 THE PHYSICAL ENVIRONMENT

2.1.1 Earth Resources

Topography. Dugway Proving Ground (DPG) is located in west central Utah, within the Great Basin Physiographic Province, and the Basin and Range Geologic Province. This is a region characterized by narrow, fault block mountain ranges, alternating with broad alluvial valleys. The facility occupies 840,909 acres (340,316 hectares) at the southeastern extremity of the Great Salt Lake Desert, surrounded on the west, south, and east by an alternating series of mountain ridges and valleys. On the west is the Deep Creek Range, and on the east by the Onaqui, Sheeprock, and Simpson Mountains, reaching elevations of 8000 to 9000 ft. (2438 to 2743 m). The Cedar Mountains, with elevations to 7000 ft. (2134 m), form the northeastern boundary of the facility. To the south, from west to east, is Snake Valley, the Fish Springs Range (8500 ft., 2592 m), Fish Springs Flat, the Thomas and Dugway Ranges (7000 ft., 2134 m), Dugway Valley, and the Slow Elk Hills (5800 ft., 1768 m). The Great Salt Lake Desert extends to the north and northwest from the Proving Grounds.

Much of the facility lies on the level floor of the Great Salt Lake Desert with elevations generally between 4200 to 4300 ft. (1280 to 1311 m). Along the eastern boundary, elevations slope upward toward the bordering mountain ranges, abruptly on the flanks of the Cedar Mountains. The southeast portion of the facility lies at the mouth of Dugway Valley, which slopes gently upward toward the south. Rising out of this valley are several isolated formations, including Camels Back Ridge (5500 ft., 1676 m) and Simpson Buttes (5400 ft., 1646 m) in the southeast corner, and steep Granite Peak (7068 ft., 2154 m) on the west side of the valley. A system of low dunes, mostly vegetated, is found on the leeward side of the Great Salt Lake Desert. Within the Proving Grounds, the low dunes are found along the base of the Cedar Mountains, and on the floor of Dugway Valley, especially near Camels Back Ridge.

DPG is in the region of interior drainage, and playas cover the western half of the facility and smaller areas in Dugway Valley. The climate is too arid and the valley terrain too flat for drainages to remain well-defined once they leave the mountains. The primary drainages are Government Creek, extending from the Sheeprock and Simpson Mountains into the east part of the facility, Pismire Wash, extending north from the Thomas Range to southeast of Granite Peak, and Fish Springs Wash, extending from Fish Springs Flat into the Great Salt Lake Desert southwest of Granite Peak. The Old River Bed in Dugway Valley is a fossil drainage which connected two parts of Lake Bonneville during the Pleistocene. During the recession of Lake Bonneville, the drainage carried water north from the Sevier Desert Basin (Stephens and Sumison 1978).

Geology. The study area is approximately 50 miles (80.5 km) west of the Wasatch Fold and Fault Belt of the Overthrust Geologic Province, which forms the eastern boundary of the Basin and Range Geologic Province. This Province is characterized by large enechelon fault blocks controlled by

"down-on-the-west" normal faults trending approximately north-south. Movement along the faults has been extensive since the late Miocene epoch, with hundreds to thousands of feet of displacement in places. This has allowed for large interior draining basins to form between fault blocks, with extensive alluvial and lacustrine deposits formed within (Hintze 1975).

The DPG is located in one of these large interior draining basins (Great Salt Lake Desert Basin), bounded on the north and east by the Cedar Mountain and Stansbury Mountain fault blocks, on the south by the Dugway and Fish Springs Range fault blocks, and on the west by the Deep Creek Range fault block. Displacement along the control faults has been extensive, exposing rocks ranging in age from Pre-Cambrian and Cambrian (approximately 600 million years ago) to Tertiary and Quaternary. Interspersed within these rocks are igneous (volcanic) rocks of geologically recent age (Tertiary) intruded into the fault block mountains simultaneously with fault displacement (Eardley 1955).

The alluvial and lacustrine sediments found between the fault block mountains were deposited as pediment slopes from drainage courses flowing off the continuously elevated fault block mountains, and as flat lying lake bed deposits in the large intermountain Lake Bonneville of the late Tertiary Period. These deposits are horizontal or nearly horizontal, of great thickness, and little affected by the Miocene faulting. The deposits generally contain deep salt or fresh water aquifers. Surface springs commonly are found near the mountain fronts or within the mountain ranges rather than within the alluvial valleys or lake bed deposits, with the exception of springs found near inter-basinal faults. This occurs because the watertable deepens toward the basin axis (Moore and Sorensen 1979).

The development of the sediments filling the intermountain basins spanned the Pliocene-Pleistocene epochs, with the most significant deposition occurring during the great Pleistocene Pluvial (lake forming) periods. These lake forming episodes are attributable to the simultaneous glaciation of the Rocky Mountain Cordillerian and Canadian Shield areas, during which time temperatures were as much as 13°F (7°C) lower than present, and precipitation may have been somewhat greater than at present (Miller 1982). The result of these changes in climate produced the fossil Lake Bonneville, evidence of which is shown by the multiple shoreline terraces in and around the mountains of the Great Salt Lake Desert. These terraces, which may be only remnants of many lake forming episodes, consist of four distinct deposits: the Bonneville Terrace at an elevation of approximately 5175 ft. (1577 m), the Provo Terrace at an elevation of approximately 4815 ft. (1468 m), the Stansbury Terrace at an elevation of approximately 4525 ft. (1377 m), and the present Great Salt Lake Stand at an approximate elevation of 4200 ft. (1280 m).

Tentative dating and estimations place the formation of the Bonneville Terrace during or prior to the Illinoian glacial advance or during the earliest Wisconsin glacial advance (called the Iowan advance), the Provo Terrace formation during the very last advance of the Wisconsin, called the Mankato-Cochrane, 12,000 years Before Present (BP), the Stansbury Terrace formation during the Tazewell or Cary advances of the Wisconsin glaciation, and the Great Salt Lake Stand formation during the Holocene (Jennings 1957, Flint 1971).

The economic geology of the DPG generally is limited to minor mineralization, alkali mineral deposits, and some sand and gravel deposits. Vapor phase and pegmatite mineralization is found in the vicinity of the Granite Peak and Dugway Mountains. Minor to moderate hydrothermal mineralization is found along faults in the Cedar, Stansbury, and Dugway Mountain ranges.

Soils. The soils of DPG are described by Pinkham et al. (1979), based on information in Wilson et al. (1975). Eleven major soil groups were mapped in seven associations by Pinkham et al. (1979). These can be divided into three groups based on environment and characteristics. One of the associations consists of dark colored soils in the higher elevations of the Cedar Mountains, associated with a sub-humid climate. These soils are deep to very deep, medium acid to mildly alkaline, and occur on 5 to 80 percent slopes. The second group consists of three associations of light colored soils of desert mountains, terraces, alluvial fans, and valley slopes. These include mountain soils, shoreline deposits, and lakebed deposits. These soils are deep, neutral to moderately alkaline, and occur on 0 to 30 percent slopes. A third group consists of the sodic and saline soils of valley bottoms and floodplains, formed in Lake Bonneville lacustrine deposits, and include the playas of the Great Salt Lake Desert. These soils are deep, moderately to strongly alkaline, and occur on 0 to 30 percent slopes. Playa soils are very poorly drained and hold water for extended periods. Valley soils are moderately drained and soils of mountains and alluvial fans are very well drained.

Portions of the site have soils which are arable or potentially arable with drainage (Pinkham et al. 1979, Wilson et al. 1975). However, these areas have not been cultivated, since precipitation is inadequate for dry-land farming and water supplies are inadequate for irrigation.

2.1.2 Water Resources

Information on surface and ground water resources of the DPG area is available in Gates and Kruer (1981), Stephens and Sumison (1978), Bolke and Sumison (1978), Hood and Rush (1965), and Hood and Waddell (1968). Other than several small reservoirs, sewage lagoons, and a few small springs, there are no perennial water sources on DPG. Water flow in Government Creek, Pismire Wash, Fish Springs Wash, the Old River Bed, and in smaller unnamed drainages usually occurs only for a short time following heavy rains or after snowmelt in the higher elevations. Flow into the Great Salt Lake Desert is minimal, due to low stream gradients, high evaporation rates, and discontinuous channels. Playas in Dugway Valley and the Great Salt Lake Desert may hold water for extended time periods, due to the low permeability of the soil. A low spot at the mouth of the Old River Bed holds water in wet years (Pinkham et al. 1979). Orr, Cane, and Bitter Springs in the central Cedar Mountains each have a flow of less than 1 gallon/minute (3.8 liters/min). A larger spring with a flow of 10 gallons/minute (38 liters/min) occurs in the Granite Peak Mountains (Stephens and Sumison 1978). The five springs of the Wilson Hot Springs Group occur just inside the southern boundary near Fish Springs National Wildlife Refuge and have a

combined flow of about 100 gallons/minute (380 liters/min) (Bolke and Sumison, 1978). Approximately 2500 acres (1012 hectares) are marshy in this area of the installation, but the water is unpotable and has no animal life (Pinkham et al. 1979).

Several larger groups of springs occur outside DPG but adjacent to its boundaries. These include Simpson, Indian, Coyote, and Winter springs in the Simpson Mountains, a large group of springs at Fish Springs National Wildlife Refuge, and Redden, Big, and Willow springs near Callao to the southwest of the facility. The Fish Springs group discharge about 26,000 acre ft. ($32.1 \times 10^6 \text{ m}^3$) per year. The water is slightly saline to brine, is used primarily for waterfowl management (Bolke and Sumison 1978), and forms about 12 square miles (20 sq. km) of marshes (Madsen 1979). Spring discharge from the upper Government Creek drainage, Simpson Mountains, and Sheeprock Mountains is about 5000 acre ft. ($6.2 \times 10^6 \text{ m}^3$) per year (Stephens and Sumison 1978), and from Redden Spring is about 800 acre ft. ($1 \times 10^6 \text{ m}^3$) per year (Gates and Krueger 1981). Trout Creek, one of several small perennial streams on the east side of the Deep Creek Range, has a flow of 3100 acre ft. ($3.8 \times 10^6 \text{ m}^3$) per year (Hood and Rush 1965).

2.1.3 Modern Climate

The climate of DPG is arid to semi-arid and continental, characterized by hot dry summers, cool springs and falls, and moderately cold winters. Information on climate is obtained from Pinkham et al (1979), Stephens and Sumison (1978), Bolke and Sumison (1978), Brown (1960), and Hood and Rush (1965).

Most precipitation occurs during the winter and spring; the wettest months are December, April, and May. Average annual precipitation varies from less than 6 in. (15 cm) in the Great Salt Lake Desert to 10 to 12 in. (25 to 30 cm) on Granite Peak and in the Cedar Mountains. The Deep Creek Mountains to the west and the Stansbury Mountains to the east receive more than 30 in. (76 cm) annually at the higher elevations. Precipitation at the Dugway weather station averages 6.9 in. (17.5 cm) annually. The annual average snowfall at the weather station is 17.6 in. (44.7 cm), occurring mostly during January, February, and March. The mountains receive considerably more precipitation.

Summer precipitation tends to occur as thunderstorms, which are more common over the mountains and can cause erosion and flash flooding. From early fall until late spring, the area is affected by the continental winter storm track, with an average of 5 to 7 frontal passages per month.

Dugway experiences extreme seasonal temperature changes. Average temperatures at the weather station range from 27.7°F (-2.4°C) in January to 78.5°F (25.8°C) in July, compared to an average annual temperature of 51.5°F (10.8°C). Extreme temperatures have ranged from -16.6°F to 109.4°F (-27°C to 43°C). Diurnal temperature ranges also are large, averaging about 20°F (11°C) in winter and 29°F (16°C) in summer. The dry conditions, clear skies, sparse vegetation, and light winds lead to extensive nocturnal surface cooling, resulting in strong temperature inversions near the ground.

Evaporation rates are high due to low precipitation and humidity and high summer temperatures. Measured evaporation rates at Saltair at Great Salt Lake are 57 in. (145 cm) from a free water surface (Stevens and Sumison

1978), and 60 in. (152 cm) or more at Fish Springs (Hood and Rush 1965), greatly exceeding the annual precipitation. Relative humidity averages 50 percent year-round.

Winds tend to be light, and generally southeasterly at night and northwesterly in the daytime over the plains. Winds in the mountains depend on local conditions. Strong winds up to 93 mph (150 kph) are associated with large-scale weather disturbances.

Visibility generally is excellent because of low humidity and distance from downwind air pollution sources. Periods of air stagnation may occur in winter between storm systems, as a result of deep pockets of trapped cold air and dominating high pressure, creating strong subsidence inversions. During these periods, fog and air pollution buildup, primarily from the Salt Lake City area, may be common.

2.1.4 Plant Resources

DPG primarily is in the northern desert shrub biome (Fautin 1946) with smaller areas of pinon-juniper woodland. Eight vegetation types have been identified on the site (Vest 1962, Pinkham et al. 1979), in addition to unvegetated salt flats which cover about one-fourth of the area. The distribution pattern of plant communities is primarily derived from gradients of soil salinity and other characteristics resulting from the depositional history of Lake Bonneville sediments. The pattern of concentric rings of vegetation from the valley center is typical of valleys in the intermountain region (Cronquist et al. 1972). Other factors creating vegetation patterns are large areas of sand dunes, and variations in soil texture, elevation, and topography.

The pickleweed, shadscale-gray molly, shadscale-gray molly-greasewood, greasewood, and shadscale-budsage communities are salt desert communities of the valleys (Branson et al. 1967). The pickleweed community occurs in a 2 to 5 mile (3.2 to 8.0 km) wide belt adjacent to bare salt flats, and consists of bare salt flats dotted with low vegetated hummocks. Pickleweed is the dominant species and Nuttall saltbush and stunted greasewood also occur. The shadscale-gray molly type is dominated by low shadscale and gray molly, shrubs 6 to 14 in. (15-36 cm) high with large areas of exposed bare soil between them. Practically the only other species occurring are Nuttall saltbush and spring annuals. The shadscale-gray molly-greasewood community is similar, with the addition of greasewood shrubs up to 3 ft. high (0.9 m), and occupation of flat plains. The greasewood type is a taller shrub community, up to 4 to 5 ft. (1.2 to 1.5 m) tall, found where runoff accumulates or subirrigation occurs on the valley floor. The only associated species are inkweed and a few annuals. Gentle valley slopes are occupied by the shadscale-budsage type, dominated by low-growing shadscale and budsage shrubs. The most common associated plants are two grasses, cheatgrass and squirreltail.

The remaining three communities occur on non-saline soils of dunes and mountains and exhibit greater cover, diversity, and productivity. The dune vegetation community is the most diverse of the valley floor communities. It is dominated by tall shrubs, especially greasewood, and by horsebrush, four-winged saltbush, rabbitbrush, hopsage, and Indian ricegrass. The dune

borders are dominated by smaller shrubs and grasses, including budsage, rabbitbrush, shadscale, spin gillia, and alkali sacaton. A number of other species of grasses, forbs, and shrubs also occur. The mixed shrub type occupies the foothills and lower mountain slopes, and seems to be a variant of the sagebrush-grass community found throughout the intermountain area (Cronquist et al. 1972). Dominant shrubs are big sagebrush, hopsage, and horsebrush on deeper soils, and budsage and shadscale on shallower soils. Common grasses are cheatgrass, Indian ricegrass, and Galleta. The higher mountains have dense stands of Utah juniper, with some pinon pine. Junipers also occur with numerous shrub species on sand dunes in the foothills.

The marsh area at Fish Springs National Wildlife Refuge has been described by Bolen (1964). Vegetation of marshy areas on DPG probably consists of saltgrass, with alkali sacaton and pickleweed. Marshes on the refuge include Baltic rush, bulrush, and cattail.

Lists of food plants used by the former Indian populations of the region are available from archeological studies (Coulam and Barnett 1980, Hogan 1980, Jennings 1978, Harper and Alder 1970) and ethnobotanical studies of the Gosiute and Shoshone (Chamberlin 1909, 1911, and Steward 1970). Although several species are edible, most food plant resources in the region are of scattered occurrence, and no major collecting areas were noted by Steward (1970) within DPG. In general, the best food resources for gatherers are at higher elevations, or near streams or wetlands, which occupy only a very small part of the facility. Much of the northern desert shrub and salt desert vegetation types of the valleys have no important food plant resources (Steward 1970).

Food resources present in the area include seeds of grasses, shrubby chenopods and other plants, roots and tubers, berries, and herbaceous plants eaten as greens. Shadscale and pickleweed are abundant in the area, and together with species of *Chenopodium* and *Atriplex* in more localized areas, provide large quantities of edible seeds. Little else occurs in the salt desert communities which cover most of Dugway. Food plants occurring in the mixed brush and juniper brush areas include arrowleaf balsamroot seeds and greens, sego lily and wild onion, roots and seeds of false tarragon, Tumble mustard, and common sunflower. Big sagebrush and Utah juniper also were abundant, and their seeds or berries were eaten occasionally. Seeds of many grass species were available, but significant supplies probably could only be gathered in moist years and in good locations. Numerous other species were used as tools, medicine, or fuel by aboriginal people, but none of the species used are unique to this area.

2.1.5 Animal Resources

About 50 species of mammals, 217 species of birds, 14 species of reptiles, and one amphibian species have been reported for DPG (Pinkham et al. 1979). The animals occurring are mostly those typical of the northern desert shrub type (Fautin 1946). The mountains, which cover about 10 percent of the installation, are in general the best wildlife habitat and exhibit more diversity and productivity than the sparsely vegetated valleys.

Large mammals include mule deer, which occur in the mountains, and pronghorn antelope, with a herd of about 30 on the west side of the installation. Large mammals apparently have been scarce in this part of

Utah throughout the historic period and were little used by the Gosiutes (Chamberlin 1911). The most common species are smaller animals, such as blacktailed jackrabbit, antelope ground squirrel, and kangaroo rats, gophers, and other rodents. Rodent species composition varies between plant communities (Vest 1962), but carnivores and omnivores range more widely. They include coyote, kit fox, and badger in the valleys, and also longtailed weasel, bobcat, and spotted skunk in more broken terrain. About 150 wild horses range on the site during part of the year.

Of the bird species, 53 are permanent residents, 70 are summer residents, 11 are winter residents, and the remainder are migrants, or accidental. Ducks and geese are abundant at Fish Springs National Wildlife Refuge and also use small reservoirs, sewage lagoons, and playas when flooded in Dugway Valley. Other typical birds include mourning dove, chukar, and common raven.

Eight species of lizards and six species of snakes are known to occur. The spadefoot toad is the only amphibian and it breeds in temporary ponds. No fish species occur.

Numerous species of invertebrates have been recorded, including over 1300 species of insects, 36 mollusk species, and 150 species of ticks, spiders, scorpions, and related species. Insects eaten as food by the Gosiute included crickets, locusts, and cicadas (Chamberlin 1911).

2.1.6 Paleoenvironment

Rankings place the Lake Bonneville Group formations in a range of fair to moderate importance paleontologically, and the Oquirrh and Great Blue Limestone formations in a range of poor to moderate importance paleontologically for sensitive formations (Madsen 1980).

Paleontology. The Lake Bonneville Group formations have been ranked as paleontologically sensitive formations by the State of Utah. The current ranking is as follows:

1. For invertebrate fossils, the Lake Bonneville Group ranks 31 in a field of 35 formations.
2. For fossil plants, the Lake Bonneville Group ranks 14 in a field of 15 formations.
3. For fossil vertebrates, the Provo Formations of the Lake Bonneville Group ranks 15, and the Alpine Formation of the Lake Bonneville Group ranks 19 in a field of 50 formations.

The Oquirrh and Great Blue Limestone Formations found in the northeastern part of the study areas have been ranked as paleontologically sensitive formations. The current ranking is as follows:

1. For invertebrate fossils, the Great Blue Limestone has been ranked 23 and the Oquirrh Formation has been ranked 25 out of a field of 35 formations.

2. For trace fossil sensitivity, the Oquirrh Formation has been ranked 6 out of a field of 15 formations.
3. For vertebrate fossils, the Great Blue Limestone has been ranked 50 out of a field of 50 formations.

Prehistoric Environmental Change. The natural environment of the intermountain area has changed greatly in the past 10,000 to 15,000 years, with the major change occurring near the Pleistocene-Holocene boundary, and additional less pronounced changes and fluctuations during the Holocene. Environmental changes in the eastern Great Basin (Bonneville Basin) during the late Pleistocene and Holocene recently have been reviewed by Curry and James (1982). A schedule of significant environmental changes determined in this and previous studies is presented in Table 2-1.

Most of the installation was covered by the waters of Pleistocene Lake Bonneville at its greatest extent (elevation 5175 ft., 1577 m), except the Cedar Mountains, Granite Peak Mountains, Camel's Back Ridge, and Simpson Buttes. Even at the Provo level of 4815 ft. (1468 m), maintained from about 14,000 to 12,500 BP (Before Present), the lake waters only withdrew down the mountain slopes, leaving most of today's valley and desert floors still covered. The lake shrank rapidly during the early Holocene, and may have been almost completely dry during the hottest, driest parts of the altithermal between 7000 to 6500 and 6000 to 5500 BP. The Great Salt Lake Desert in the western and northern parts of DPG generally is only 25 to 80 ft. (7.6 to 24.4 m) above the present level of the Great Salt Lake and was one of the last parts of Lake Bonneville to dry. The Desert reflooded during cool moist periods, such as around 3200 BP (Madsen 1979). Even today, low parts of the Great Salt Lake Desert may hold water for extended periods of time. During the recession of Lake Bonneville, the Old River Bed carried water from the Sevier Desert Basin into the basin of the Great Salt Lake Desert.

The climate of the late Pleistocene has been the subject of much study and speculation, with various authors suggesting various combinations of reduced temperatures and increased precipitation to account for the existence of large lakes and other environmental changes. Recent reviews by Van Devander and Spaulding (1979) and Mifflin and Wheat (1979) suggest a climate not radically dissimilar from the present, with moderately cooler temperatures and increased precipitation. Mifflin and Wheat (1979) suggest an average precipitation increase of 68 percent in Nevada during the pluvial periods. This amount of increase would have resulted in the presence of juniper woodlands on the areas of the site above the lake waters, with pine forests possibly occurring in the higher parts. However, dispersal of conifer seeds to island mountain ranges may have been slow, and the predominant vegetation communities were likely sagebrush-grass and juniper woodland.

Decreasing precipitation and warmer temperatures during the early Holocene caused rapid vegetation change. Vegetation was essentially modern by about 8500 BP (Curry and James 1982, Harper and Alder 1970, Bright 1966). Also during the late Pleistocene and early Holocene, the extinction of the Pleistocene megafauna occurred, including horse, onager, muskox, mammoth, bison, camel, mountain goat, and other species (Grayson 1982).

Table 2-1. A SUMMARY OF THE ENVIRONMENTAL HISTORY OF THE AREA OF THE DUGWAY PROVING GROUND

Curry & James 1982 Northeastern Great Basin Review & Summary of Available Literature		Harper & Alder 1970 Hogup Cave Plants Pollen, Vertebrates		Bright 1966 Swan-Lake Pollen	
Date (a)	Date	Date	Date		
2000 BP - Present	500 BP - Present	More arid, currently as dry as any time in last 8500 years.	1700 BP - Present	Warm and dry. Modern conditions.	
3500 BP -	1500 BP - 500 BP	Thickening of vegetation, increase of grass on uplands. Increase of large mammals.	3100 BP - 1700 BP	Cooler and moister, lower treelines, increase in trees and decrease in sagebrush.	
5000 BP - 3500 BP	Near modern? Data somewhat ambiguous.		8400 BP - 3100 BP	Warm, semi-arid climate. Vegetation much like present.	
7500 BP - 5000 BP	Warmer and/or drier than present (reduced moisture effectiveness) with two very dry periods 7000- 6500 BP and 6000-5500 BP). Great Salt Lake lower than present, possibly dry at peak except for marshes where streams enter.	More moist than present, sagebrush more abundant. As dry as present. Open water west of cave gone by end of period. Sage- brush declines.	12,000 BP - 8400 BP	Gradual shift from cool, moist climate to warm, dry climate. Conifer forest of lodgepole pine and timber pine replaced in lower elevations by sagebrush steppe about 10,300 BP. By end of period vegetation essentially modern.	
12,500 BP - 7500 BP	Warming and drying, great decrease in glaciers and lacustral systems, great rise in elevation of vegetation zones, with reversal of overall patterns from 11,000 to 10,000 BP. Extinction of Pleistocene megafauna.	Already dry and desert- like, but more moist than later periods. Dominant species sagebrush and shadscale.	8350 BP - 7800 BP		

(a) Before Present (BP)

Lengthy periods of both warmer and drier conditions than present, and of cooler and wetter conditions, have occurred in the past 8500 years (Table 2-1), resulting in slight to moderate changes in composition of vegetation and wildlife communities.

Historic Environmental Change. The natural environment of DPG has undergone changes since Euro-American settlement of the region. The most dramatic changes have resulted from the construction and operation of Army facilities, and include elimination of natural vegetation and wildlife habitat in built-up areas, and introduction of both native and exotic species in disturbed and irrigated areas.

Other changes have resulted from livestock grazing and burning of range by livestock operators. Much of the range in the Great Basin was fully stocked with livestock by the 1880s and severe range depletion was apparent by 1900 (Young et al. 1981). Salt Desert areas such as Dugway primarily were used as sheep winter range. Lack of water may have precluded use of parts of DPG. Grazing effects in the Salt Desert include reduction of abundance of palatable species such as winterfat and gray molly, and an increase in abundance and area of less palatable species, such as shadscale (Stewart et al. 1940, Cottam 1961). Winterfat has greatly increased since elimination of grazing in 1949 (Pinkham et al. 1979). Effects of grazing in the sagebrush-grass zone included a great increase in big sagebrush cover, and a substantial decrease in perennial grasses (Tisdale and Hironaka 1981). Introduced annual weeds have invaded and become very important in Great Basin ecology (Young et al. 1972).

Several large mammals have been eliminated or reduced in the region in the past several hundred years, including wolf, grizzly bear, elk, pronghorn antelope, and bison. Of these, only pronghorn probably was important at Dugway and probably was never abundant. Mule deer have increased greatly in the region during historic times (Grayson 1982).

2.2 THE CULTURAL ENVIRONMENT

2.2.1 Prehistory

Four stages encompass the prehistory of the Dugway study area. These include the Lithic or Paleo-Indian, Archaic, Formative, and Post-Formative stages. In this study, stage is defined as a level of cultural development.

Lithic or Paleo-Indian Stage. The earliest definable stage to appear in the Great Basin was the Lithic or Paleo-Indian Stage. Willey and Phillips (1958) offered the following description of the Lithic or synonymous Paleo-Indian Stage:

This stage was conceived of as embracing two major categories of stone technology: (1) Unspecialized and largely unformulated core and flake industries, with percussion the dominant and perhaps only technique employed, and (2) industries exhibiting more advanced "blade" techniques of stone working, with specialized fluted and unfluted lanceolate points the most characteristic artifact types.

The archeology of this stage attempts to answer questions concerning the antiquity of human settlement in the New World and the nature of the adaptations made by those immigrants in a pristine Post-Glacial environment.

Jennings (1978) identified two different sets of traditions within the Lithic stage within the Great Basin, the Paleo-Indian Tradition and the Chopper-Scraper Tradition. The term tradition as used here refers to a persistence through time of a life style, artifact style or some other definable entity. The first is the well known and well documented Paleo-Indian tradition consisting of the Llano, Folsom, and Plano complexes (Jennings 1978:17). These are associated with large extinct fauna in the cases of the Llano and Folsom, however, the Plano depended on large and more modern fauna as described below. The second, the Chopper-Scraper or pre-projectile point tradition is less well defined than the Paleo-Indian tradition and is also described below.

Paleo-Indian Tradition. The Paleo-Indian tradition is comprised of the Llano, Folsom, and Plano complexes. These complexes have both diagnostic, stylistic criteria, such as point types, and chronological implications, since they occur in succession and are well dated. The term complex refers to the variety of tools and other materials that comprise the entity under consideration. The term period refers to the time frame occupied by the complex. Consequently, Clovis Complex can be used to differentiate among other archeological entities, and Clovis Period can be used to place it in time. The terms Llano and Clovis often are used interchangeably, particularly since the diagnostic spear point of the Llano complex is the fluted Clovis point.

Pre-Clovis Period. A number of sites and localities have been excavated and dated prior to the Clovis Period. These sites and localities are being subsumed under the general heading of the Pre-Clovis Period. The term Pre-Clovis as a unique period was first used by Humphrey and Stanford (1979) in a publication of the Anthropological Society of Washington. Despite the comparatively large number of Pre-Clovis sites located and excavated over the years, none have won universal acceptance for their antiquity. The controversy centers on either the nature of the archeological evidence, the geological context, or the efficacy of the dating methods used. However, some of these sites are probably genuine.

One site near the study area has been attributed to the Pre-Clovis period. It consisted of two small caves and a surface lithic site located on a high Bonneville terrace south of Salt Lake City. The terrace, once felt to be 40,000 years old, now is estimated to be 18,000 years old. There is no substantiating evidence to prove the surface finds are equal in age to the supporting geological structure (Clark 1975 a&b).

Clovis Complex (Llano Complex). The Clovis complex is the earliest human culture accepted by North American archeologists. Sites attributed to the Clovis complex are dated to approximately 11,000 BP (9200 BC). Clovis hunters specialized in mammoth hunting; Clovis kill sites are known from Arizona, Colorado, New Mexico, Oklahoma, Wyoming, and Idaho. In Utah, a Clovis fluted point has been reported from the Acord Lake region (Tripp 1966). Similar finds occur throughout the Great Basin (Aikins 1978:147, Fig. 42).

Folsom Complex. The Folsom complex followed Clovis in time. Folsom hunters specialized in taking the now extinct longhorned bison, Bison antiquus. As many as a dozen of these huge creatures were killed at one time during a typical hunt. Folsom materials have been found in Utah at Silverhorn (Gunnerson 1962), Cederview (Lindsey 1976), Moab (Hunt and Tanner 1960), Green River (Tripp 1967) and Sweet Alice Springs, Utah (Sharrock and Keane 1962). During the preliminary research on this project, a Folsom fluted point was found in the Smithsonian collections that Lt. Karl Schmitt discovered in "vicinity of DPG in Dugway Valley 15 miles south of Skull Valley Indian Reservation, Tooele County, Utah, ca. one mile west of village" (Smithsonian Catalogue #386226).

Plano Complex. In general the complex may be subdivided into a number of sub-complexes, each with its own diagnostic characteristics. Plano people as a whole specialized in the hunting of large animals, particularly the extinct bison, Bison occidentalis. The fact that they were able to kill large numbers of these animals, as many as 200 in a single kill, indicates that Plano population density had reached a fairly high level. Specialized butchering areas, i.e. front quarters, hind quarters, etc., found at these mass kill sites are indicative of a high degree of specialization and social complexity.

Plano complex materials are found occasionally in the Great Basin, but as James (1980:6) points out, "...although fluted (Clovis and Folsom materials described earlier) and other lanceolate points are present in the Great Basin, evidences of cultural remains in association with extinct fauna is generally lacking."

Chopper-Scraper Tradition. In marked contrast to the well defined and widely accepted Paleo-Indian tradition, the Chopper-Scraper or "pre-projectile point" tradition is poorly defined and not widely accepted. The "choppers" tend to be edge-chipped pebbles or nodules and the "scrapers" usually are bifacally worked nodules or pebbles that Jennings (1978:17) finds reminiscent of the bifacally worked handaxes of the European Paleolithic period. Because materials attributed to the Chopper-Scraper tradition tend to be found on old land forms such as beaches or terraces near ancient lakes, and along streams, arguments for their considerable age have been advanced. On the otherhand, the fact that most specimens are surface finds, mitigates against chronological control and therefore acceptable antiquity. The Chopper-Scraper tradition is a controversial problem that has yet to be resolved.

San Dieguito and the Western Pluvial Lakes Tradition. Following the Clovis period are a series of complexes characterized by large shouldered and stemmed lanceolate projectile points, leaf-shaped knives, crescents, flake scrapers and domed scraper-planes (Aikins 1978:147). In southern California this material is best known from the Harris site in San Diego, the type site of the San Dieguito complex. In 1967, Warren defined the San Dieguito complex as a "generalized hunting tradition" dating to 10,000 BP (8000 BC) (7900 and 6500 BC at the Harris site). Irwin-Williams (1968) noted that San Dieguito materials "...commonly occur near playa edges, and may have been deposited during a period of relatively greater effective moisture."

Similarly at the Fort Rock Caves, Fort Rock Valley, Oregon, (Bedwell 1970, 1973) recovered lanceolate projectile points, which resembled those assigned to the San Dieguito complex, and date between 11,000 and 8000 BP (9000 and 6000 BC). Associated with these points were knives, scrapers, mano and metate fragments, basketry, and sagebrush bark sandals. Stone crescents were also common to the northern Great Basin at this time.

Bedwell (1973) saw a great deal of similarity in artifact assemblages found on sites adjacent to pluvial lakes such as those in the Fort Rock Valley, and he proposed these assemblages be grouped together under what he termed the Western Pluvial Lakes tradition. This tradition was directed toward the exploitation of lacustrine and marsh environments and lasted until ca. 8000 BP (6000 BC) at which time pluvial lakes began to disappear.

Cave sites are of particular importance because of their inherent ability to preserve both environmental and cultural data. Smith Creek Cave (Bryan 1978) is located 30 miles (62.6 km) north of Baker, Nevada, 1.8 miles (3 km) west of the Utah state line, and 88 miles (140.8 km) southwest of Dugway, Utah. A gray ash deposit found at the cave contained a number of hearths with charcoal suitable for radiocarbon dating (C_{14}). Dates derived from this layer range between 10,000 BP and 12,000 BP (8000 BC and 10,000 BC). Below the gray ash layer, in the northwest sector, at the rear of the cave, recovered bone fragments of late Pleistocene fauna produced a bone collagen data of $28,650 \pm 750$ BP (26,700 BC). The bones exhibited green stick fractures (spiral) indicating they could have been human-caused. Since no stone tools were recovered, the case for antiquity of this site is unproven.

Danger Cave (Jennings 1957) on the western edge of the Great Salt Lake desert is the best known of all the Great Basin sites. It is located just north of Interstate 80 at Wendover, Utah, and is 76 miles (103 km) northwest of Dugway, Utah. Excluding the Folsom material, Aikens (1978:147) considers that the earliest material from Danger Cave might be attributable to a complex similar to the San Dieguito. Therefore, the possibility exists that a Paleo-Indian occupation of Danger Cave was followed by something similar to a Western Pluvial Lakes Tradition occupation as a transitional stage leading into the Archaic Stage. Caves should be treated with great care and any cave site located on the Proving Ground could have the potential to provide critical data on the antiquity of man in the New World and the transition between the Paleo-Indian Stage and the Archaic Stage.

The Archaic Stage. The Archaic Stage is viewed as an adaptive response to the warming trend that occurred at the end of the Pleistocene period, and the replacement of Pleistocene megafauna with modern faunal types. With the loss of megafauna and the shift to modern environmental conditions, greater dependence was placed on smaller and more varied faunal species. Because of this shift to a more varied economy or subsistence base, Archaic lifeways are often described as employing a broad spectrum exploitation strategy. Willey and Phillips (1958:107) defined the Archaic stage as "... the stage of migratory hunting and gathering cultures continuing into environmental conditions approximately those of the present."

Archaic societies intensively exploited their local environments. These groups depended heavily on plant resources and seeds. Shellfish were collected where available and fishing was important. No species of mammal

was overlooked. As the ecological niches were systematically exploited for their resources and as the food base was broadened, there was an increase in tool diversity and specialization.

Archaic communities were comprised of small groups of related people living a semi-sedentary lifestyle. Termed "restricted wandering" (Beardsley 1956), this lifestyle was based on seasonal movement from one exploitable resource to another. This type of mobility tended to limit group size as well as inhibit the kinds of cultural development associated with a sedentary lifestyle. Restricted wandering limited the quantity of cultural items that could reasonably be acquired or transported. This may have been compensated for by storing tools on site and returning to the same sites or locales each year.

Based on his work at Danger Cave, Jennings (1957) proposed the concept of the Desert Culture as the local interpretation of the Archaic Stage. This culture was characterized by a specialized artifact inventory specifically adapted to survival in the arid and semi-arid conditions of the Desert West. Milling stones indicative of plant and seed preparation are major characteristics of the Desert Culture as is a wide variety of implements made from wood, bark, and fiber, including baskets, netting, mats, and sandals.

Jennings' (1957) concept of a single Desert Culture has received much criticism in recent years. Other researchers have countered that the Desert Culture concept stressed only the desert way of life and failed to recognize the importance of other environmental niches, particularly the lacustrine environment of the Great Basin (Baumhoff and Heizer 1965, Butler 1978, Heizer and Krieger 1956, Heizer and Harper 1970, and Warren and Ranere 1968).

Over the years, Jennings (1974) has modified his Desert Culture concept bringing it more in line with these trends. It is now accepted that the prehistoric occupants of the Great Basin exploited a wide variety of plants and animals found in different environmental settings on a seasonal basis. Consequently, artifact inventories found in differing environmental settings tend to represent specific adaptations to specific local conditions.

Use of multiple environments on a seasonal basis requires a high degree of mobility in order to exploit ephemeral food resources. This pattern of activity was first outlined by Julian Steward (1970) in his descriptions of exploitation pattern of the current Native American occupants of the Great Basin. Archeologically, Steward's model of seasonal exploitation has been tested in the Reese Valley of Nevada by Thomas (1972, 1973), and by Grady (1980) in the Piceance Basin of northwestern Colorado. In the Reese Valley, Thomas clearly demonstrated a pattern of riverine zone exploitation coupled with use of the distant, but complementary, pinyon-juniper zone. Grady's work also outlined a pattern of seasonal resource exploitation in which the resources were distributed by marked altitudinal differences, and the major integrating factor between the uplands and lowlands was the annual movement of the Basin's mule deer herd. Both patterns were typical of the Desert Archaic Culture.

Hadsen (1982:213-216) has divided and characterized the Archaic period of the Great Basin into the following three sub-periods: Early Archaic, Middle Archaic, and Late Archaic.

Early Archaic (8500-5500 BP) (6500-3500 BC).

Occupation - restricted to lake edge sites - no evidence of upland sites at this point in time (tentative conclusion).

Preferred location - cave/rock shelters overlooking the lake and adjacent to freshwater springs. Open dune areas near lakes also utilized.

Diagnostics - Elko, Pinto and Humbolt series point types, Basketry and flat willow staves present.

Demographics - Population increasing (numbers of people and numbers of groups increasing).

Subsistence - Almost exclusively related to lake edge resources.

Middle Archaic (5500-3500 BP) (3500-1500 BC).

Occupation - Upland areas begin to be occupied as result of population increase and diminishing lake resources. Greater movement, shifting from resource to resource.

Diagnostics - Gypsum points plus movement of Elko, Pinto and Humbolt point styles into the central and western areas of the Great Basin.

Subsistence - Mountain sheep preferred, deer and rabbit common.

Late Archaic (3500-2000 BP) (1500-0 BC).

Occupation - Lake edge marshes, halophytic-dominated saltflats and fresh water springs flooded due to rising lake levels. Abandonment of lake edge sites, and shift to upland areas.

Diagnostics - Rose Spring projectile points, indicating introduction of the bow and arrow.

Demographics - Population decline of unknown magnitude.

Subsistence - Possible use of Pinyon nuts for first time.

One of the major problems facing archeologists in Utah deals with the nature of the Archaic Stage-Formative Stage interface. Aikens (1970) and Jennings (1957, 1974) argue that the adaptive strategies of the archaic period remain consistent over a period of 10,000 years in spite of changing environmental conditions and that the Archaic stage developed into the agriculturally oriented Formative stage. Madsen and Berry (1975:391-405) on the other hand, have reexamined the evidence from Hogup Cave (Aikens 1970) and developed and refined hypotheses raised first by Steward (1937) that argue for an hiatus between the Archaic and the Formative. This hiatus has been attributed to changes in climate conditions in that flooding forced abandonment of the lake edge and marsh environments, thus providing a gap in occupation between the archaic occupation of the area and the succeeding Formative occupation. While the issue has yet to be resolved (cf. Aikens 1976:543-545 for a counter argument) the evidence for an hiatus at present seems to be overwhelming at least in the Salt Lake Area.

The Formative Stage. Whether or not there was an interruption in cultural development, the Archaic Stage did give way to the Formative. Willey and Phillips (1958) defined this stage to include, "the presence of agriculture

or any other subsistence economy of comparable effectiveness and by the successful integration of such an economy into well established sendentary village life." .

The Fremont Culture is the cultural entity equated with the Formative Stage in Utah. This culture was characterized by the cultivation of maize, a sendentary or semi-sendentary lifestyle, the presence of pithouses and masonry dwellings, a distinctive rock art style, and the presence of ceramic graywares. Despite the homogeneity implied by the above definition, the Fremont should be treated as a theme with many variations. John Marwitt (1970) published his seminal work on Median Village in which he developed a detailed overview of Fremont regional variations. Although criticized, it remains the commonly accepted scheme (cf. Madsen 1980).

Marwitt discussed five regional variants, but only the Sevier variant has any significance in the Dugway study area (Figure 2-1). Marwitt's variant is quoted as follows:

Sevier Fremont

Dating - AD 780(?) to 1260.

Named For - The Sevier River of central Utah.

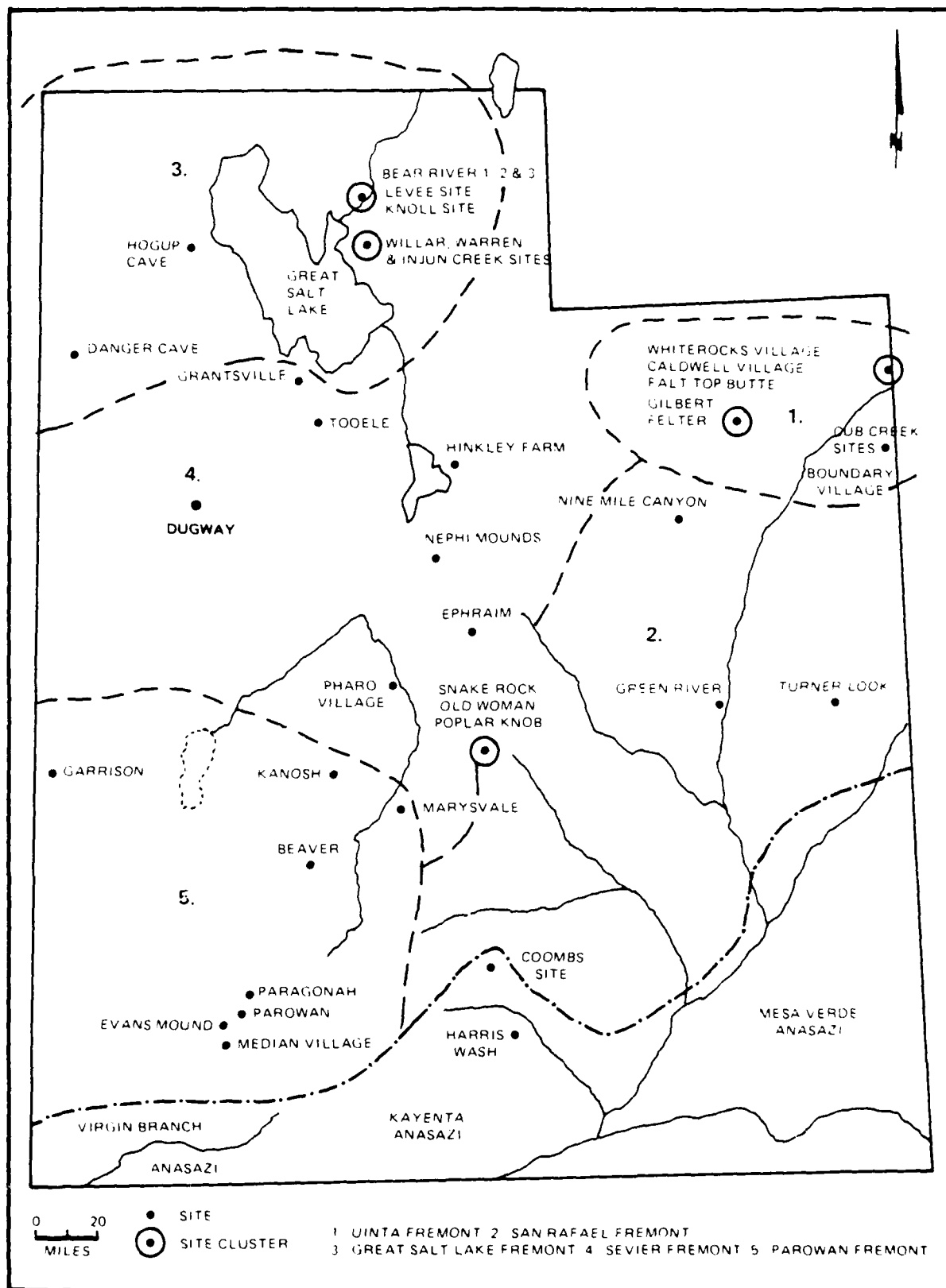
Excavated Sites - Grantsville (Steward 1933b), Tooele and Ephraim (Gillin 1941), Hinckley Farm (Green 1961), Nephi Mounds (Sharrock and Marwitt 1967), Pharo Village (Marwitt 1968), Old Woman and Poplar Knob (Taylor 1957), and Snake Rock (Aikens 1967).

Diagnostic Attributes:

Domestic Architecture - Quadrilateral and circular pit dwellings often with ventilators or crawlway entrances, but without deflectors (except at Snake Rock, where the deflectors are stone slabs); pit dwellings constructed within a larger primary pit.

Ceramics - Sevier Gray is the dominant plain grayware type, but Snake Valley Gray is present in proportions as high as 15 to 20 percent; Great Salt Lake Gray (at Hinckley Farm, Tooele, and Grantsville) and Turner Gray, Emery Variety (at Snake Rock, Old Woman, and Poplar Knob) also occur. Ivie Creek Black-on-white is the only indigenous painted ware, with a distribution in the southern and eastern portions of the area; Snake Valley Black-on-gray is fairly common, but is probably intrusive from Parowan Fremont. Surface manipulation of grayware (except corrugation and except on Snake Valley Gray) is common. Designs painted on grayware with fugitive-red pigment are rare but may be diagnostic.

Flaked Stone - Slim triangular unstemmed points, broad triangular basal-notched points, and medium to large side-notched points predominate. Other diagnostics are large leaf-shaped blades, drills made from reworked side-notched points, and large "turtle back" scrapers.



(MARWITT 1970 137)

Ground Stone - No diagnostic artifacts, but a heterogeneity of ground stone artifacts is characteristic of Sevier Fremont. Manos and metates exhibit great variety; "Utah type" metates are particularly well made.

Miscellaneous - Bone, antler, and unfired clay artifacts are not diagnostic.

Sevier Fremont sites tend to be small villages situated on alluvial fans near canyon mouths and near dependable water sources at canyon mouths. The villages consist of a few pit houses and associated coarse adobe dwellings. In terms of material cultures, the Sevier is fairly conservative. However, the frequency of painted pottery increases through time and pit houses tend to be dug deeper with more vertical sides through time. The Sevier Fremont is the least consistent, typologically, of all of Marwitt's variants (Marwitt 1970:141).

The Post-Formative Stage. The Post-Formative Stage which followed the Fremont in Utah is characterized by the appearance and spread of Numic speaking peoples throughout the region. The term Numic refers to a branch of the Uto-Aztec linguistic family. Ethnographically, this branch includes the various Shoshone groups such as the Western Shoshone, Ute, and Southern Paiute. These people occupied the area from ca. AD 1200 until their displacement by Anglos in the middle of the nineteenth century.

The Numic speakers' homeland originally was in the southwest portion of the Great Basin. Starting ca. 1000 AD, they spread northward and eastward into Utah and on the Colorado Plateau (Lamb 1958, Miller 1966, Fowler 1972, and Wright 1978). According to Madsen and Berry (1975), they were contemporaries with the preceding Fremont people and through resource competition, may have contributed to the Fremont demise. Stuart (1981) feels that early Numic occupation was restricted to lake edges and was followed by a shift to the adjacent upland areas.

Based on the ethnographic record, particularly reports of Steward (1970), the Numic speakers of the area followed an annual round of economic activities as they shifted from the exploitation of a given resource to another resource on a seasonal basis. During the course of the annual round, group size varied from nuclear families (a self-supporting economic unit) to large groups. There was also a concomitant shift in tool inventories and political structures. The technology, social organization, and ideology of the pertinent Numic speaking groups in the study area are contained in Section 2.2.2 of this report.

Despite the richness of the ethnographic record, little is known about Numic archeology. We are still in that strange position described by Steward (1937:121) and quoted by James (1980:48): "The writer has examined many caves known to have been used by Shoshoni but he failed to find any identifiable Shosoni (sic) objects. The scarcity of objects at most Shoshoni sites is striking."

2.2.2 Gosiute and Western Shoshoni Ethnography

This overview provides a study of lifeways of the Western Shoshoni with primary emphasis on the Gosiute. The Gosiute's aboriginal territory

encompassed the area of present day DPG. Both Western Shoshoni and Gosiute lifeways and material culture were similar.

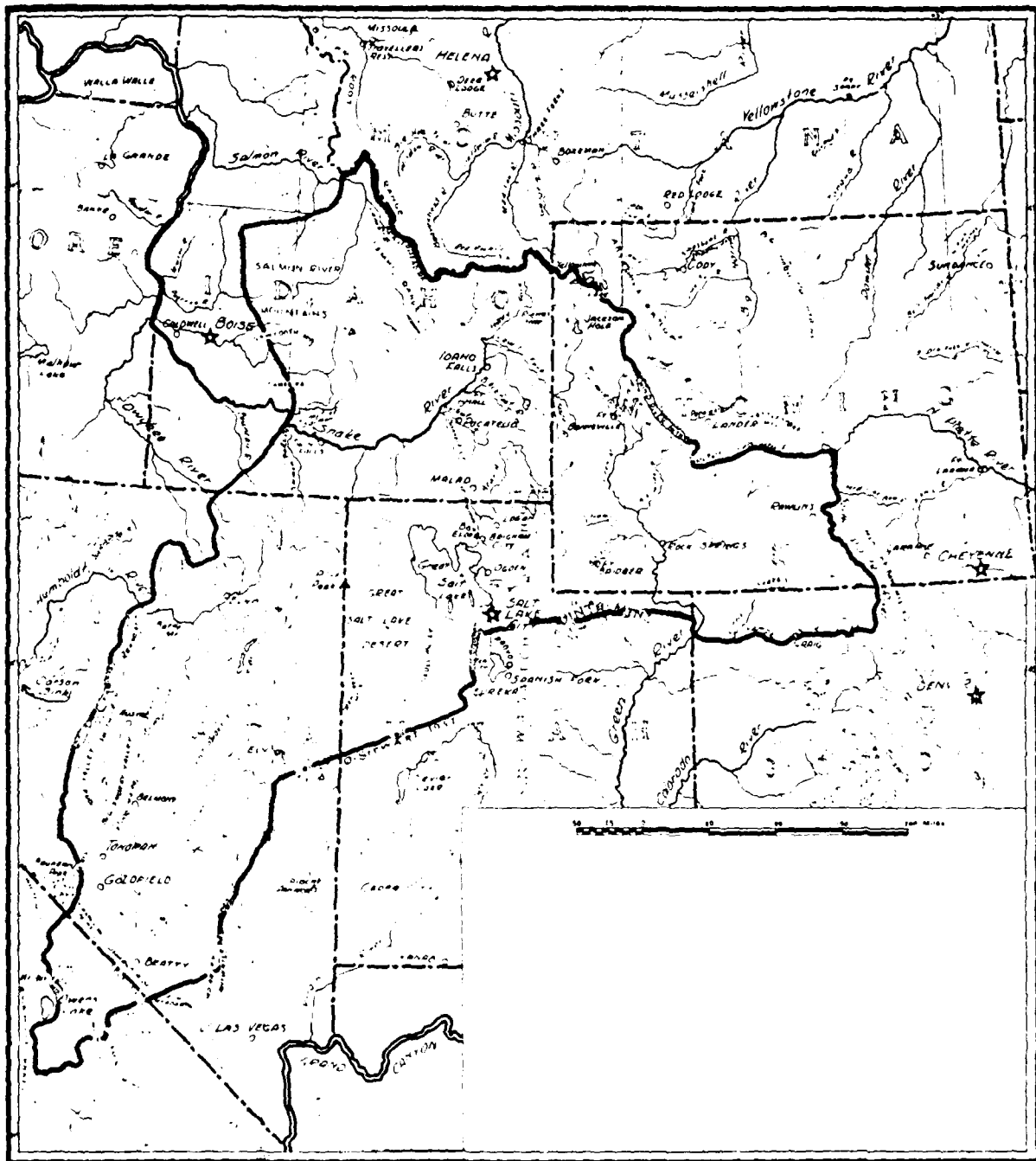
In aboriginal and early white contact periods, the Gosiute occupied the most arid and desolate area of the Great Basin. The Gosiute population was concentrated at small camps in a crescent around the Great Salt Lake Desert, yet they rarely wandered onto the Salt Desert. The largest population was centered in Deep Creek Valley. Others resided in Rush, Skull, and Tooele Valleys, the eastern most extent of their aboriginal territory. Aboriginal territory of the Gosiute and Western Shoshoni is shown in Figure 2-2. The treaty of 1863 defined the territory of the Gosiute as follows:

Article 5: It is understood that the boundaries of the country claimed and occupied by the Goship (sic) tribe, as defined and described by said bands are as follows: On the north by the middle of the Great Desert; on the west by Steptoe Valley; on the south by Tooele or Green Mountains; and on the east by Great Salt Lake, Tuilla and Rush Valleys (Reagan 1934b:47).

Reliance on ethnographic models in understanding and interpreting archeological remains and aboriginal lifeways is fundamental in studies of Great Basin prehistory. Julian Steward's cultural-ecological model, based on his Great Basin research, depicts small groups living in a food poor environment, dispersed for much of the year in a patterned-seasonal round of activities, and assembling into larger non-political groups in times of food abundance. The Steward model can be applied to both the Gosiute and Western Shoshoni (Steward 1970:1). Material culture, settlement and subsistence patterns, lifeways and non-Indian influence will be examined from historical accounts as it may pertain to the archeology of the study area, to potential sites, and the management plan for the installation.

The Great Salt Desert was the least favorable area of habitation of the Great Basin. The higher sections adjoining the Desert are more conducive to the survival of flora and fauna, and it was in these areas the Gosiute acquired most of their resources. Due to the extreme aridity of the area, it is estimated by Steward (1970:134) that the population could not have been more than 1 person to 30 to 40 square miles (7770 to 10,360 hectares) prior to European contact. Many early accounts of trappers and explorers described the Gosiute as impoverished and starving, living on snakes and lizards and digging for roots in a state barely above an animal. Due to these accounts these people became known as the "Digger Indians."

Linguistic Family. All Great Basin groups spoke languages belonging to the Shoshonean branch of the major Uto-Aztecan linguistic family. The term Numic is used to refer specifically to the Basin Shoshonean groups (Spencer and Jennings 1977:180). The Uto-Aztecan language family includes not only the culturally impoverished Gosiute but the empire-building Aztecs of Mexico. Linguistically, the Shoshonean speaking Hopi of Arizona are related to the Numic, as are the Pima and Papago in Arizona and other groups in California. Glottochronologists put the separation of the Aztec and Numic speakers about 4000 to 5000 years ago. The Numic language is further separated into three divisions, Western, Central, and Southern. Fowler and



(STEWART 1966 215)

Figure 2-2. BOUNDARY OF WESTERN SHOSHONI AND GOSIUTE INDIAN TERRITORY

Fowler (1971b:97) include the Gosiute in the Central Numic linguistic division with the Comanche, Weber Ute, Ruby Valley, and White River Shoshoni (Figure 2-3).

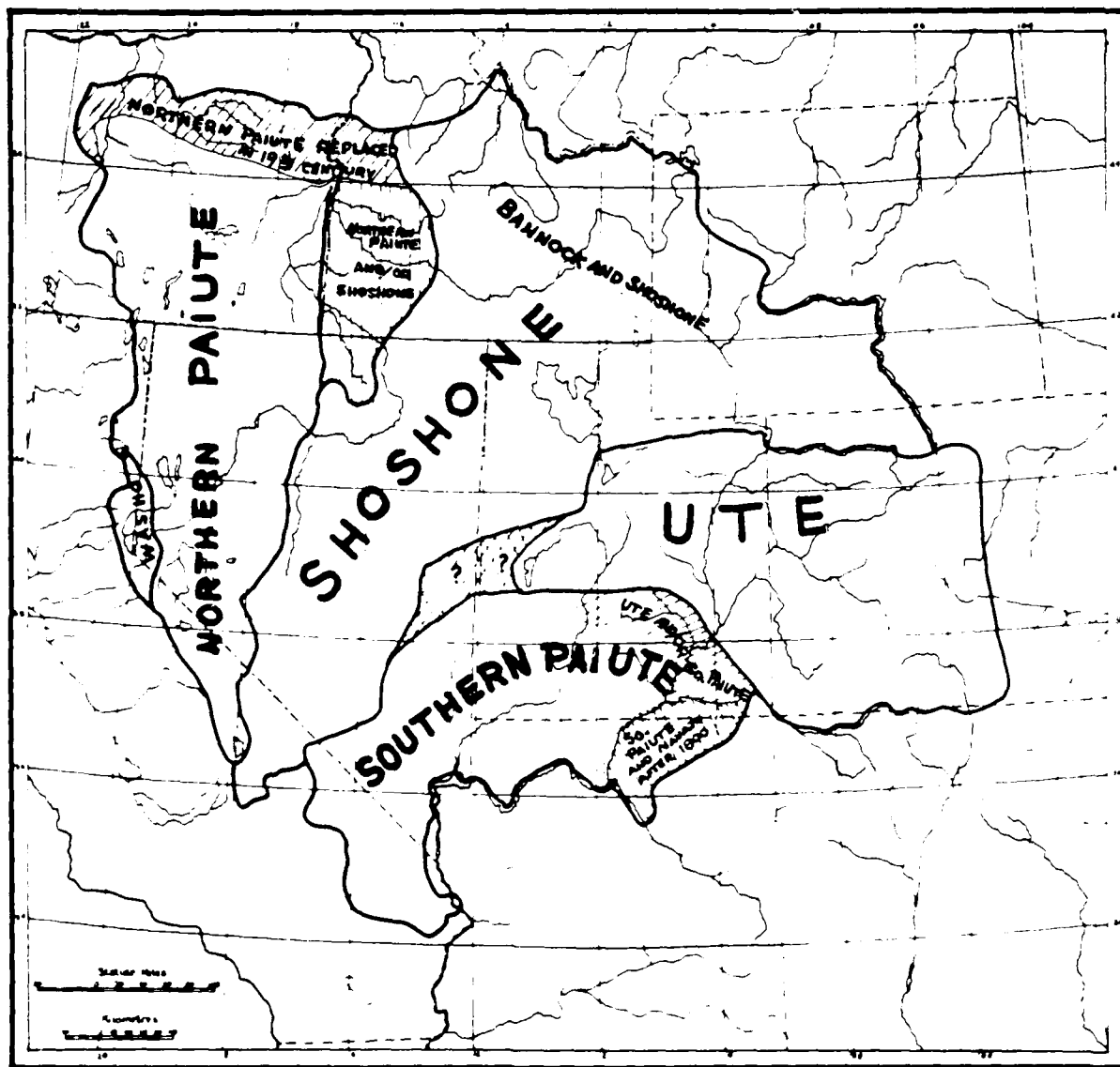
Subsistence. Human ecology in the Great Basin requires consideration of natural features, environment, and the culture devices with which the environment is exploited. Important features of the natural environment were topography, climate, seasonal distribution of plants and animals, and, especially, the occurrence of water. Cultural behavior patterns were based on consideration of factors such as population density and distribution, division of labor, the methods of food procurement, territory exploited, and time required for economic pursuits, as well as village size, distribution, and permanency.

Economic pursuits were divided on the basis of sex. The nuclear family was a self-supporting economic unit, consisting of mother, father, and siblings. The native flora and fauna supplied material for household goods, weapons, dwellings, and food. Women gathered nuts and seeds. Men hunted large game, manufactured chipped stone tools, wove rabbit fur blankets, and constructed houses. The Gosiute enjoyed only a bare subsistence existence. There was no excess time in their economic pursuits to produce surplus materials for trading or to support specializations such as political or religious organization and hierarchies.

Plants, roots, berries, nuts, seeds, and greens were more important in the diet of the Gosiute than animal foods. Gathering activities can be divided into 4 seasonal rounds (Steward 1970:20). In the spring they left their winter villages often to a distance of 30 to 40 miles (48 to 64 km) to gather sprouts and greens along streams. In the summer, edible roots were dug and berries gathered. Early in the fall pine nuts ripened. Pine nuts, an important source of energy, were gathered by women. If pine nut crops were in abundance, families were able to remain together during the winter. In the Deep Creek Mountains, on the Nevada, Utah Border, south of the Great Salt Lake, semi-permanent villages were constructed near pine nut groves so nuts could be cached or carried a short distance to the villages. There was no claim of ownership for the pine nut groves. Families shared on a use and need basis. Favorite picking areas were around Vernon, south of Tooele Valley in the Stansbury Mountains, Deep Creek, and the Kern Mountains, southwest of the desert. Because of the occasional nature of pine nut crops, they were probably only one in a series of important seed-food plants that were harvested and stored in subterranean caches for winter use.

A total dependency on any one crop would have a disastrous effect on these people. However, they apparently exercised minimal control over their food supplies since Steward (1970:138) states that wild seeds were sown in the spring after sage brush had been burned off and the seed crop was harvested in the fall. This practice, however, should not be construed as cultivation of domesticated plants.

Almost every animal, including various insects, were utilized for food. They subsisted on insects, rodents, lizards, snakes, fish, and rabbits. Rabbits, relatively abundant in the Great Basin, were the most important animal food in the Gosiute diet. Men, women, and children participated in the communal rabbit drives under the direction of a Shaman, a leader with culturally defined supernatural/religious powers. Rabbits were driven into



(STEWART 1966 207)

Figure 2-3. LINGUISTIC BOUNDARIES

nets placed in a semi-circle many hundreds of yards in diameter, where they were clubbed. Drives were conducted in the fall and winter, when the fur and meat was at prime. Gophers, an abundant source of food, were trapped or flooded out of their holes.

Communal antelope drives were held infrequently, and only when animal populations increased to warrant the effort. The drives were among the few economic activities not restricted to family groups. Antelope, due to their speed, were not easily taken by lone hunters. Large groups of men on foot could surround and drive antelopes into corrals. All Gosiute antelope drives were conducted by a Shaman who was said to have received special supernatural power that would capture the animals souls, rendering them docile and stupid (Steward 1970:34). Other large game was present, but were not numerous enough to be the main portion of the Gosiute diet. Deer, mountain sheep, bear, and elk were hunted in the mountains. Coyotes, abundant in the area, figured prominently in folklore, and, therefore, were not killed.

Several different methods were employed to hunt large animals. Ambushes were prepared along animal trails by digging a pit and hiding behind a wall of brush until the game passed. Steward (1970:138) and Malouf (1951:15) state deer surrounds were led by an expert hunter. Deer, also, were stalked and driven over cliffs in the mountains. Fire brands were used to drive animals into an enclosure. Poisoned arrows caused the animals to weaken but did not kill them.

Mormon crickets (a grasshopper-like insect) and grasshoppers were another important dietary staple. Trenches, 30 to 40 ft. (9 to 12 m) long and 1 ft. deep (0.3 m), were dug and lined with grass. Everyone participated in driving the crickets into the flaming grass. The parched insects were ground on metates and the paste stored. Insect wings and legs have been identified in coprolites from Danger Cave, indicating utilization of insects for centuries to satisfy human protein needs.

In an arid environment like the central Great Basin, water is a critical and scarce resource. To those with an intense knowledge of their environment, supplies of water were available in addition to the springs and streams. The ability to identify those water sources was important to the survival of central desert peoples. Egan (1963:52) described the Gosiute locating water at the base of sand dunes and in cracks and caves in limestone formations. He stated "a person might ride or walk within six feet (1.8 m) of it (water) and still think it was miles (km), and hot ones, to the nearest water." Camps in dune fields and desert locals were not as waterless as has been reported.

Material Culture. Gosiute material culture has been described as simple and reflective of their economic poverty. Function was the primary ingredient of their material items. Mobility and lack of transportation also may be a consideration for the scarcity of material items.

Malouf (1951:31) states they inhabited caves, rock shelters, and constructed brush and conical structures of juniper poles thatched with bark and branches. These structures appear to have been the more permanent winter dwellings used in the foothills and mountains. A fire pit was sometimes located in the center with a smokehole at the top.

Household goods consisted of mano and metates used for grinding seeds, insects, meat, berries, and pine nuts. Spoons were made of antler or wood. Dippers were rare, but were made like basketry dipped in pitch, or of sheep

horn (Malouf 1951:35). Basketry was a well developed art. Squawbush and willow were used for manufacturing both twined and coiled baskets. Price (1952:24) lists various types of baskets used by the Gosiute including conical carrying baskets, winnowing baskets, water baskets pitched on interior and exterior, and seed baskets. Cradle boards, cedar bark skirts, cedar bark aprons, fishing baskets, rabbit nets, and mats were other woven items.

Rabbit skin robes and capes, woven from continuous strips of rabbit fur, were worn by everyone. Two piece moccasins were worn occasionally, although, usually they went barefoot. Men cut their hair short in front above the eyes, women cut theirs at random, and the cuttings were used for making nets. Bodies occasionally were painted to reduce sun glare, for supernatural protection, and as protection from insects. Both boys' and girls' ears were pierced (Malouf 1951:48).

Belongings were carried great distances in a pack strap which was passed from the forehead to the back (Malouf 1951:41). Pressure on the head was relieved with cedar bark.

An important item in Shoshone material culture were devices for making and preserving fire. A drill and wooden platform with 2 to 4 holes bored in it, covered with dry cedar or sage brush for tinder, was used. The apparatus, wrapped in skin, was stored in a basket or bag. Bow drills were not used (Malouf 1951:69).

Three kinds of bows were made, the self bow, sinew-backed wood, and sinew-backed horn. Sheep horn bows were known to have been used by the Deep Creek Gosiute. Arrows were tipped with stone, bone, or wood according to function. A 2-prong unfeathered arrow was used for hunting fish. All other arrows were feathered. The poison used on arrows for hunting game was made from the decayed blood of deer, rattlesnake poison, or certain herbs (Malouf 1951:44, Steward (1970:134). Arrows were carried in a quiver made from the whole skin of either fox, wildcat, or fawn.

Nets, snares, and traps were used in hunting sage grouse, water fowl and jack rabbit. Rabbit nets were made from vegetal fiber twisted into cordage and woven into nets from 150 to 200 yards (137 to 183 m) long and 30 in. (0.8 m) high with a mesh of 2 in. (5 cm) or smaller. They were family owned and manufactured by men. Nets have been identified archeologically at Hogup and other caves in Utah (Aiken 1970:125).

Lithic tools included side-notched projectile points, and other multi-functional chipped tools such as scrapers, drills, knives, and burins (Malouf 1951:46).

Pottery has been described for the Gosiute by Malouf (1951:40), Defa (1979:16), and Price (1952:35). Malouf (1951:40) states pottery was rapidly replaced by Euro-American utensils. Fragments of buff colored, coarse silica tempered pottery have been found in the Deep Creek region.

Socio-Political Organization. Socio-political organization among the Gosiute and Western Shoshoni was conditioned, to a definable extent, by their environmental setting. Hunting and gathering devices were simple. Lack of transportation limited population density and dictated bare subsistence living, which largely determined the size, nature, and permanency of the population. Among the Western Shoshoni and Gosiute, it was economically impossible for families to remain in one place for any length of time. Due

to these limiting factors, the most important socio-political unit was the nuclear family and the small winter villages, whose size depended largely on pine nut crop. The kinship system was simple. Descent was determined in both paternal and maternal lines.

There is some evidence (Steward 1970:135) of several somewhat distinctive local subdivisions whose members associated more frequently. These local subdivisions were not based on a sense of band solidarity. These local groups, where there was an adequate food and water supply, found it more convenient to associate with their immediate neighbors for antelope drives, dances, and other communal activities. The Gosiutes had no hereditary chiefs since the society was highly individualistic. Little authority was recognized beyond the head of the family except for the Shaman's leadership in communal hunts and curing illnesses.

Rights of Passage. Shoshoni life was centered around the nuclear family. Events such as birth, puberty, and death were surrounded by extensive beliefs. The belief system, rather than being ideological, was practical dealing with health and economic security.

During pregnancy, certain food taboos existed for both the man and wife. A special structure was built at the time of delivery and for confinement after birth. Both the man and woman were bathed after the birth and both observed food restrictions. The child was bathed immediately after birth and placed in a cradle board. Malouf (1951:61) noted that twins were thought to be a sign of adultery and if one died, the other may have been killed.

Puberty rites for girls at the first menses included isolation in a special enclosure and instructions on proper female behavior were given by female family members. Girls also were required to eat a restrictive diet (Malouf 1951:62). Although no specific puberty ceremonies were held for boys, there were special rites for the first kill, including special bathing rites, painting the body red, and distributing the kill to family members.

Marriage rules were simple, with cross cousin (a sibling of the mother's brother or the father's sister) or pseudo cross cousin marriages preferred. Marriages were informal. Men who wanted wives often abducted either married or unmarried women. Steward (1970) indicates that both polyandry and polygyny occurred and polygyny usually was sororal. Divorce was as simple as marriage.

According to Malouf (1951:64), the treatment of the corpse varied at different localities. Families gathered near the home of the dead for the burial ceremony. Some removed and buried the corpse, abandoning the shelter. Others set the death shelter afire with the body inside. Property was destroyed or distributed among relatives. Valuable property including rabbit nets and bows and arrows, was not destroyed. Mourning practices were individualistic. Some cut their hair to demonstrate grieving (James 1980:204). Both sexes of the spouse or partner were allowed remarriage within a month of the death.

Religious Beliefs and Social Events. Religious and spiritual concerns were interrelated with subsistent activities. However, gathering activities and acquisition of small game, the most important economic pursuit, had no

special religious treatment. The rabbit and antelope drives and hunting of elk were led by a Shaman, who practiced the appropriate supernatural beliefs to insure a successful hunt.

Malouf (1951:79) describes curing Shaman who received powers in dreams inherited from parents. If the child had the same dream as the parent, he could inherit the same power. Both men and women of any age could be a Shaman. Spirits were known to communicate with the supplicant at certain caves and rock outcrops which often had pictographs painted on the rocks or cave walls.

Gosiute folklore was simple and religious hierarchy was lacking. Gosiute mythology gave orderliness to their universe by explaining social behavior and natural phenomena. These oral traditions were passed from generation to generation. While there was no origin myth, habits and characteristics of spirits were explained by mythology. Coyotes, a central character in their myths, played the role of both a hero and villain in enforcing desirable behavior.

Malouf (1951:150) describes a Circle Dance for all the Shoshoni celebrating a successful pine nut harvest in the fall. The dance lasted for five days and no pine nuts were consumed until completion of the dance. Steward (1970:139) describes a round dance held in the spring to ensure a good seed crop. It was held for five days.

Even with the rigorous battle for subsistence, the Shoshoni engaged in many games, including shinny, hoops and darts, hand games, and ball games (Malouf 1951:45). Sports such as foot races, wrestling, juggling, and gambling were social engagements held during communal events.

Historic Contacts and Development of the Reservation. Long before actual contact, European influences were felt by Western Shoshoni and Gosiute. With the Spanish *entrada* in 1540 and the spread of the horse to the northern Ute and Navajo, along with the promotion of slavery, the defenseless foot Indians became the target for slave raids by the mounted Ute. The slave trade flourished until 1850 when the Mormons, under Brigham Young, suppressed it (Fowler and Fowler 1971:103).

Fur trappers made the first white intrusion into the Gosiute territory. In 1827, Jedediah Smith led a small group of mountain men from California to cross the Great Salt Lake Desert to reach a trapper's rendezvous northeast of Salt Lake City (Poll et al. 1978). The journey took the three men to the east side of Deep Creek Mountain in Gosiute territory eastward across the salt plain to the Cedar Mountains. During these travels the men noted that they had seen Indians, undoubtedly Gosiute. By 1830 the trapper's interest in the Great Basin declined. In the 1840s, other Euro-Americans were skirting the Great Basin as explorers and California immigrants. They had little effect on the Gosiute.

In 1849, two years after the Mormon arrival (1847), the Gosiute felt the pressures and modifying influences of white civilization in the Great Basin. In September 1850, Utah was created as a United States Territory and Brigham Young was its first governor and superintendent of Indian Affairs (Malouf 1951:84). The Utah Territory included the present state of Utah, Nevada, and parts of California and Wyoming. Funds that were appropriated by Congress for Indian affairs in the territory were expended on pacifying Shoshoni in Idaho and Wyoming as well as the Utes. The Gosiute were ignored as they didn't present a problem to the Mormons.

Mormons began developing ranches in the Deep Creek area by 1852. These settlers acted as apostles to the Gosiute. Along with religious teaching, the Indians were instructed in farming techniques. As the Indians saw their land being appropriated for agriculture and livestock grazing and a decrease in game animals and foraging areas, they began to raid white settlements for food. Mormons set aside land in the Deep Creek Valley to be used by the Gosiute for farming. Due to the insistence of an Indian agent and the Mormons, some Gosiute tried farming. They were promised farm implements by the Indian agent, but they never arrived. Mormon support for the experiment ended in 1880.

White civilization began to greatly alter the Indian way of life as it overran Gosiute territory. A private mail route opened through the Deep Creek region in 1854 and was rerouted through Rush Valley. Camp Floyd was established in Cedar Valley and the Overland Mail and Pony Express established 20 stations (see Section 2.2.3).

Because the Gosiute was forced to steal or starve, they began to attack mail company stations in 1860 for food and supplies (Malouf 1951). The Utes who had been displaced began to marry the Gosiute desert people. The Utes were armed and mounted and furnished much of the leadership for the small raiding parties.

In an unsuccessful attempt to prevent the raiding, the U.S. Government supplied provisions to the mail company and the company supplied an additional \$12,000 for distribution to the Indians. The Third and part of the Second California Infantry were sent to Utah by May of 1862. They annihilated 300 Shoshoni in Idaho and then turned to contain the Gosiute in Utah. Casualties were high and the Indians subsequently were subdued.

A treaty was concluded in 1863 which was essentially a peace treaty made between the Gosiute and Western Shoshoni and the U.S. Government. It stipulated that military posts, telegraph, railroad, and stage lines, as well as mineral exploration, mining, and timbering could be established on Indian lands. It also set aside the boundaries of the Gosiute, previously described (Reagan 1934b:47). The treaty offered payment and supplies to the Indians for their land. Malouf (1951:123) states that goods were passed out at Skull Valley, but the amount was so trivial that few Indians came to collect their award.

Between 1875 and 1914 the Gosiutes were largely ignored by the federal government, even though many of the Indian Agents had requested aid for the impoverished Gosiutes. Finally, by Executive Order, two reservations were established. In January 1912, President Taft set aside 80 acres (32 hectares) in Skull Valley for exclusive use of the Gosiute. Five years later it was enlarged to 17,920 acres (7252 hectares) by President Woodrow Wilson. The Deep Creek Gosiute Reserve in Tooele County and eastern Nevada were established in 1914, when President Taft allocated 34,560 acres (13,986 hectares) in Utah (Figure 2-4). In 1890 the Western Shoshoni were moved to a reserve established in north central Nevada and extending into Idaho at Duck Valley.

Since the establishment of the Gosiute Reservation and during the 1930s and 1940s, Bureau of Indian Affairs' (BIA) policy was to attract other Indians to the Deep Creek Reserve. An Act in 1938 authorized additional lands to the Gosiute and other Indians that the Secretary of the Interior may locate there. The dissolution of Skull Valley Reservation and the relocation of these people was considered in 1938 and like efforts continued into the 1940s.

The Wheeler-Howard Act, Indian Reorganization Act (IRA), passed Congress in 1934. The Deep Creek Gosiute was organized under this Act with a constitution approved on November 25, 1940, and a corporate charter ratified March 29, 1941. It also marked the organization of the first tribal council. Attempts to organize Skull Valley under IRA were not successful, a proposed constitution was not voted on. However, Skull Valley has an elected tribal council recognized by the BIA (Bureau of Indian Affairs 1976).

The Skull Valley people chose not to relocate. Even though the two groups are identified as the "Confederate Tribes of the Gosiute," the Skull Valley group is not affiliated politically with the Deep Creek group. Prior to 1912, fee-patented homesteads were acquired by non-Indians, primarily the Hatch Brothers Company in the Skull Valley area. In 1949 the Hatches proposed to exchange these lands for Skull Valley Indian Tribal lands to consolidate both holdings. The exchange, completed in 1963, transferred 1800 acres (728 hectares) of Hatch land to Skull Valley. Skull Valley transferred 1978.65 acres (801 hectares) to the Hatch holdings. The entire reservation was fenced in the middle 1930s and auto gates were installed at the north and south boundaries by the Civilian Conservation Corps. Signs identifying the reservation were installed in the 1970s.

World War II had an effect on the Gosiute as several young men entered the military service, others left the reservation to work in the potash fields in the Great Salt Lake Desert and other war-related activities. The military constructed three more installations on their ancient homeland, DPG, Tooele Army Depot, and Wendover Bombing Range.

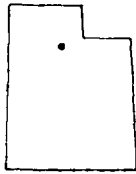
In 1946 the Indian Claims Commission provided the basis for research into the use and occupancy of American Indian lands. The Gosiute Tribe established aboriginal title to approximately 5,952,000 acres (2,408,774 hectares) in east central Nevada and western and northern Utah. Funds of \$7,300,000 were appropriated for the value of land taken and minerals removed (Bureau of Indian Affairs 1976).

The total estimated population for the Deep Creek Gosiute in 1976 was about 300, of which 126 reside on the reservation. In 1975, the Skull Valley tribal membership was 72; however, few members reside on the reservation. Figure 2-4 identifies present boundaries for the Deep Creek and Skull Valley Gosiute reservations in relation to DPG.

2.2.3 History

The area that the U.S. Army selected for DPG was chosen because of its isolation on the fringes of Utah settlement. Before the Army took the land from the Public Domain it had been the scene of occasional spillovers of activities concentrated in neighboring areas. This sporadic use was best typified by stockraisers of the late nineteenth and early twentieth centuries but this pattern's origins can be traced to the earliest Euro-American intrusions into the area during the 1820s fur trade. These same mountain men also established another use model; the Great Salt Lake Desert and surrounding areas provided inhospitable but easily traversed travel routes.

Euro-American fur trappers and traders entered the Great Salt Lake Desert in 1826 to find new fur lands. That year, James Clyman skirted the southern shores of the Great Salt Lake and entered what became Tooele County



UTAH

SKULL VALLEY
INDIAN RESERVATION



DEEP CREEK
INDIAN RESERVATION



DUGWAY PROVING GROUND



SCALE (MILES)

RESERVATION

Figure 2-4. PRESENT BOUNDARIES OF DEEP CREEK
AND SKULL VALLEY GOSIUTE RESERVATIONS

(Mercer 1961:1-2; Clyman 1960). The entire area that was to become the state of Utah was under Mexican sovereignty, although it was beyond the effective control of the government at Mexico City. The U.S. Army easily captured the entire Southwest in 1846 during the Mexican War. As part of the Treaty of Guadalupe-Hidalgo (1848) that ended the war, the United States received title to future Utah (Hollon 1966:51-58).

A year after Clyman's visit, Jedediah Smith made the first recorded crossing of the desert, searching for new fur trapping grounds and a route to the Mexican settlements in California (Morgan 1953:211-215). Smith's trip was the first recorded trek of Euro-Americans across what is now DPG. According to his journals, the area was hostile to travelers (Morgan 1953:211-215). Despite these reports, others followed Smith's route and during the 1840s the fringes of the Great Salt Lake Desert were becoming an established route to California.

John Bidwell led the first large group of immigrants across the area in 1841. In 1846, at least three separate multi-family groups made the overland passage to California -- the Clyman-Hastings Party, the Russell-Bryant Party, and the Donner Party (DeVoto, 1943:122-147, 463-497). Two years later Americans discovered gold at Sutter's Mill in California, and in 1849, the gold rush began. Many followed the overland routes, including the trails across and near the desert (Paul 1963:12-19).

The Mexican War and the California gold rush focused national attention on the Southwest. As part of this interest, the federal government, through the offices of the U.S. Army Corps of Topographical Engineers, sent explorers west searching for accurate data on climate, flora, and fauna, and delineating routes suitable for wagon travel to the Pacific Coast. The earliest and most famous of these explorers was Captain John C. Fremont, who explored the West from Missouri to California from 1843 through 1845. Fremont's expedition across the Great Salt Lake Desert made accurate maps of the area available and determined the need for further exploration and study (Goetzmann 1966:313-314). In 1849, Captain Howard Stansbury, also of the Corps of Topographical Engineers, made a year-long study of the inland sea and its surroundings, including edges of the desert. He gave his name to a range of mountains in Tooele County (Goetzmann 1959:297-301). Stansbury and his party were not forced to face the hardships of the wilderness to the degree Fremont had because two years before his survey, the Mormons had settled Salt Lake City (Figure 2-5).

The Mormons' presence not only eased the way for federal explorers and other travelers but also caused considerable military activity in the area between 1857 and 1861. During 1853 and 1854, Congress sponsored surveys for a Pacific Railroad. One of the surveys, under the command of John W. Gunnison, made its way across Colorado and into Utah. Gunnison was killed by the Paiute Indians along the Sevier River, and was replaced by Lt. E.G. Beckwith. After the expedition returned, Beckwith filed an unfavorable report about the route (Goetzmann 1959:285-86, 310), which might have been the end of Army exploration in Utah if it had not been for the Mormon War of 1857-58.

The Mormons, persecuted from Ohio to Missouri to Illinois before their migration to the Great Basin, decided they would never be forced to move again. During the 1856 U.S. presidential campaign, Republican candidate John C. Fremont ran on a platform that called for abolition of the "Twin

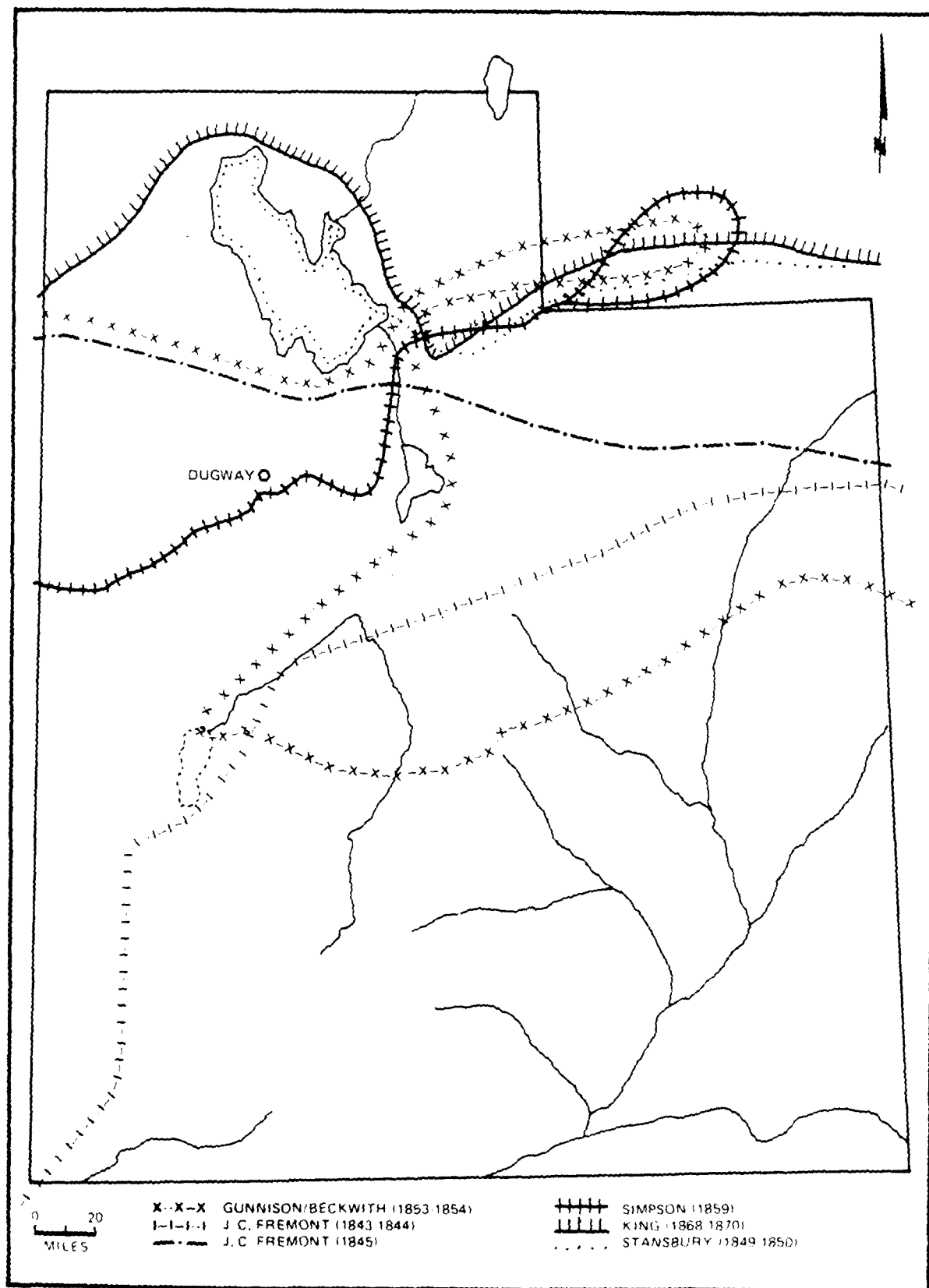


Figure 2-5. MAJOR EXPLORATION OF UTAH

Evils," polygamy and slavery. By 1857, public opinion was so inflamed, President James Buchanan agreed to send the U.S. Army to Utah to suppress the Mormon "rebellion" (Billington 1982:538-543), beginning the Mormon War.

The war ended without bloodshed in 1858 and federal officials decided to keep an Army of occupation in Utah to preserve the peace. General Albert S. Johnson established Camp Floyd in the Cedar Valley west of Utah Lake. He encountered supply problems and in 1858, Captain J.H. Simpson of the Topographical Engineers received orders to locate a route useable for wagon traffic from Utah to California. Simpson surveyed a road south from Salt Lake City to Camp Floyd and then west-southwest across the southern edges of the Great Salt Lake Desert. Simpson's new route was adopted by the Central Overland California Stage Company and became the standard highway across western Utah to California until completion of the Pacific Railroad in 1869 (Goetzmann 1959:399-403, Fike and Headley 1979:1-5).

The outbreak of the Civil War in 1861 not only led to the abandonment of Camp Floyd but also ended federal exploration until 1868, when the last major expedition entered the Great Basin and explored what is now DPG. Federal exploration of Utah was supplemented after 1847 by Mormon church sponsored activities. Once the Mormons settled at Salt Lake City, they began to seek suitable areas for settlement in the Great Basin. The Mormons attempted to create a self-sufficient economy in Utah based on agriculture (Stegner 1942:25-31). Environmental conditions, as interpreted by Brigham Young who took over presidency of the church after Smith's death in 1844, demanded orderly communal settlement of the land if agricultural success was to be achieved.

Mormon explorers and settlers sought out areas with available fertile land, a water supply that could be diverted for irrigation, and easily accessible timber stands for fuel and building materials. Dugway lacked water and sufficiently fertile soil as compared to other parts of the region, such as Rush or Tooele Valleys (Mercer 1961:19-27).

Population increases and growing scarcity of land after 1885 forced Utah settlers to re-evaluate the Great Salt Lake Desert. While forage density was low, the vast area could support stock, especially sheep, during winter when temperatures were moderate and water supplies more plentiful. As the territory's sheep population increased throughout the late nineteenth century, more sheepmen used parts of the desert for winter range and summered their flocks in the pastures and meadows available in the mountains, often as far away as the Wasatches and Uintas. This land use pattern continued through the first three decades of the twentieth century. Ranchers did not claim or purchase vast tracts of desert land, but rather were content to homestead small tracts around water supplies and borrow the range from the public domain, as their counterparts did throughout the Intermountain West (Mercer 1961:340-354).

Successful stock raising on the desert relied in part on an adequate transportation network. Because of its position on the eastern edge of the Great Basin, Utah enjoyed stage and rail service. Simpson's route south from Salt Lake City to Camp Floyd and then west, avoided most of the desert crossing and rerouted traffic along the southern boundary of what became DPG. Earlier Mormon settlers and travelers to California had used a route through the Tooele and Rush Valleys and then west. These people built pathways through the mountains known as "dugways," a name applied to a range of mountains and later used by the U.S. Army (Arrington and Alexander 1964:34).

The existence of permanent American settlements in California's gold fields required dependable transportation of passengers and freight. In response, the firm of Russell, Majors, and Waddell began to serve California, via Utah. Originally, stage lines followed a trail across the desert, but with Simpson's improved route, the Central Overland California Stage Company route was changed and a series of stage stations built at approximately 8 mile (13 km) intervals around the southeastern and southern boundaries of present DPG. These stations resulted in a string of Anglo-American outposts through the heart of Gosiute Indian lands (Figure 2-6). The Gosiutes first accepted the intruders but soon began stealing livestock kept at the waystations. The height of this activity came between 1860 and 1863. In 1863, the U.S. Army inflicted heavy casualties on the natives and by the end of the year a treaty had been negotiated (Bureau of Land Management 1980:np; Fike & Headley 1979:1-5, 71).

During this period of Indian conflicts, Russell, Majors, and Waddell introduced the Pony Express in 1860. This concept attempted to speed mail delivery from Independence, Missouri, to California using horses and fearless riders who would face all dangers to deliver the mail. The route used nearly the same road and stations as the stage line across the Great Basin. The Pony Express failed financially and was forced out of business by completion of the Transcontinental Telegraph in 1861 that paralleled its route. The Pony Express lost so much money that Russell, Majors, and Waddell were forced to sell their stagecoach line, as well. Wells Fargo and Company eventually bought the line (Carter 1960). Wells Fargo continued service along the route but found their trade greatly diminished after 1869 and completion of the transcontinental railroad (Union Pacific - Central Pacific) at Promontory Summit, Utah.

The railroad broke Utah's isolation, caused a great influx of non-Mormons to Salt Lake City and areas such as the Tintic mining district (Figure 2-7), and forced the federal government to open a land office for dispersion of the public domain in Utah (Athearn 1971:85). The railroad also opened national markets to Utah stock raisers, which in turn led to increased cattle and sheep production. This growth of herd size contributed to increased use of Skull Valley and later the desert area (Bureau of Land Management 1980). Eventually, two railroads, the Utah Western, later the Salt Lake and Los Angeles (SL&LA), and the Western Pacific (WP) ran close to Dugway. However, both were completed after the turn of the twentieth century (Bureau of Land Management 1980:np) (Figure 2-8).

Completion of the SL&LA and the WP coincided with evolution of the automobile after 1890. Utah state officials recognized the problems inherent with auto traffic and began a program to upgrade local roads, including building bridges to avoid numerous fords and draws not easily crossed by an auto. In 1912, Carl G. Fisher proposed construction of a coast-to-coast paved highway and on July 1, 1913, his plan was formalized by organization of the Lincoln Highway Association (McCarthy 1974:32-34, Utah State Historic Preservation Officer Nomination Form).

By 1918, the Lincoln Highway (locally known as the Goodyear Road) was complete in Tooele County, but within a few years the road was all but abandoned when the Victory Highway (later U.S.-40 and presently I-80) was opened in 1925. The Lincoln Highway remained in use by local residents and stockmen moving herds to and from rangelands (McCarthy 1974:34-37, 89; Bureau of Land Management 1980:np).

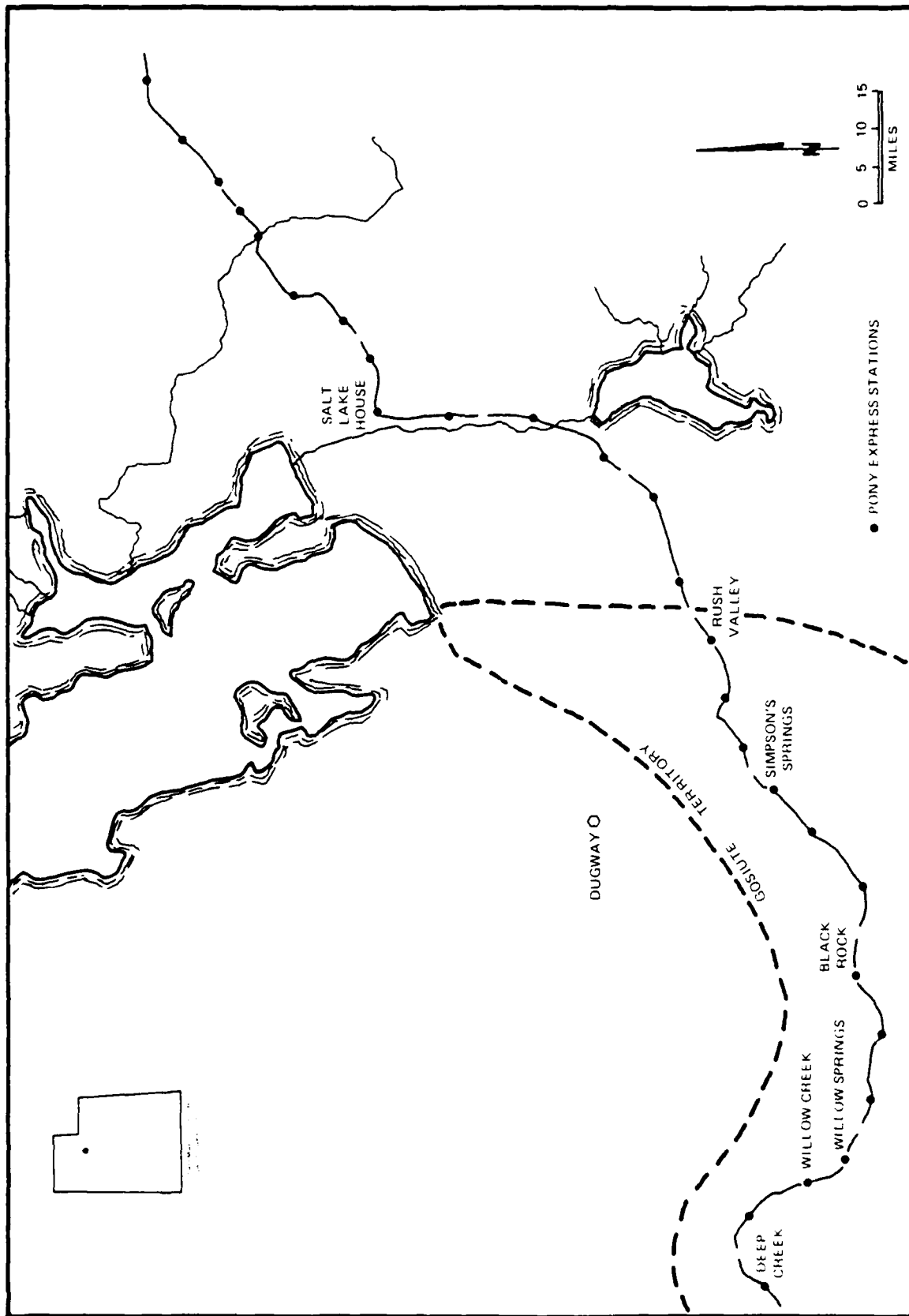


Figure 2-6. LOCATION OF PONY EXPRESS
IN GOSIUTE TERRITORY

IFKE AND HEADLY 1979 III)

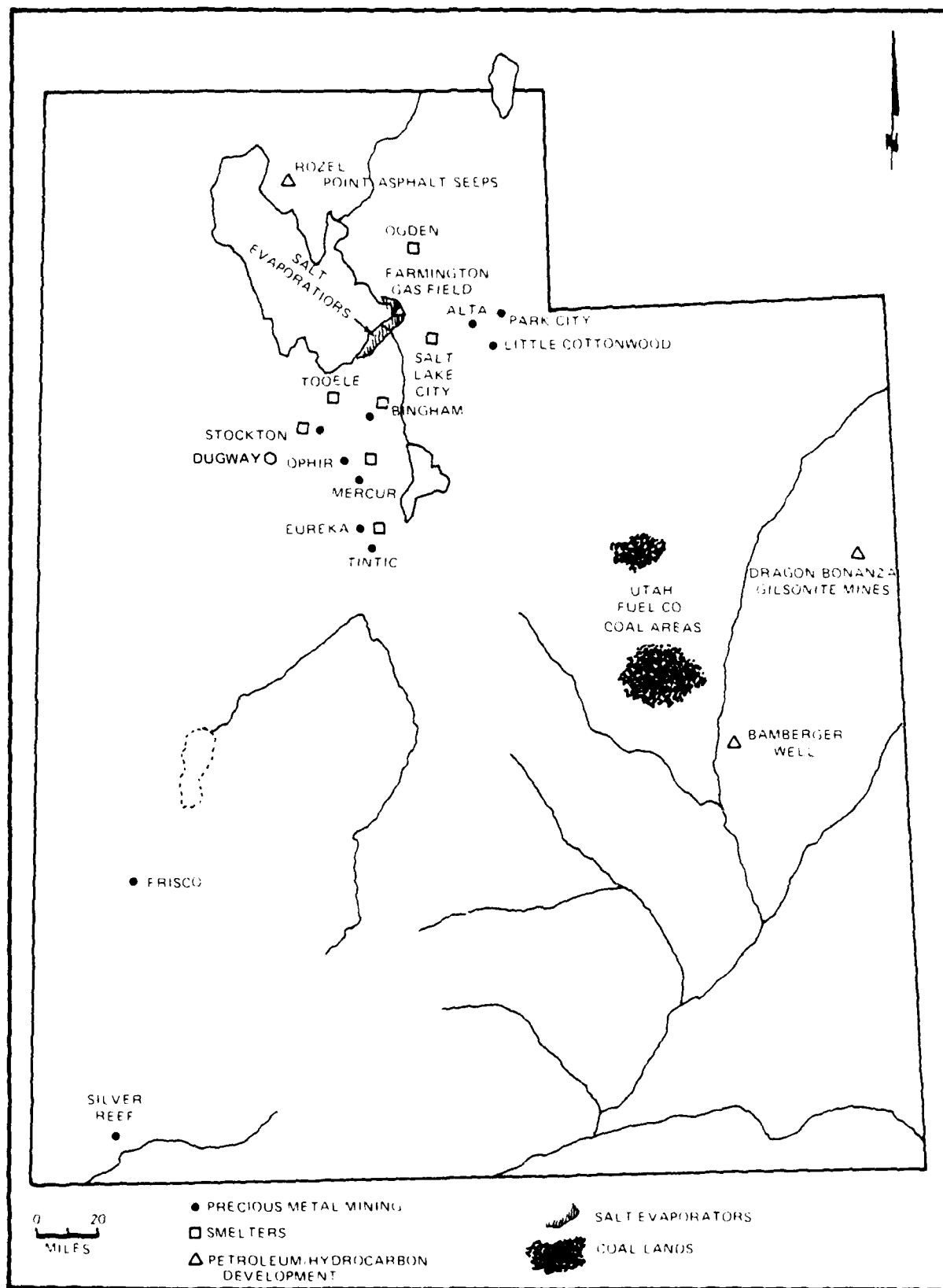


Figure 2-7. 19TH CENTURY UTAH MINERAL DEVELOPMENT

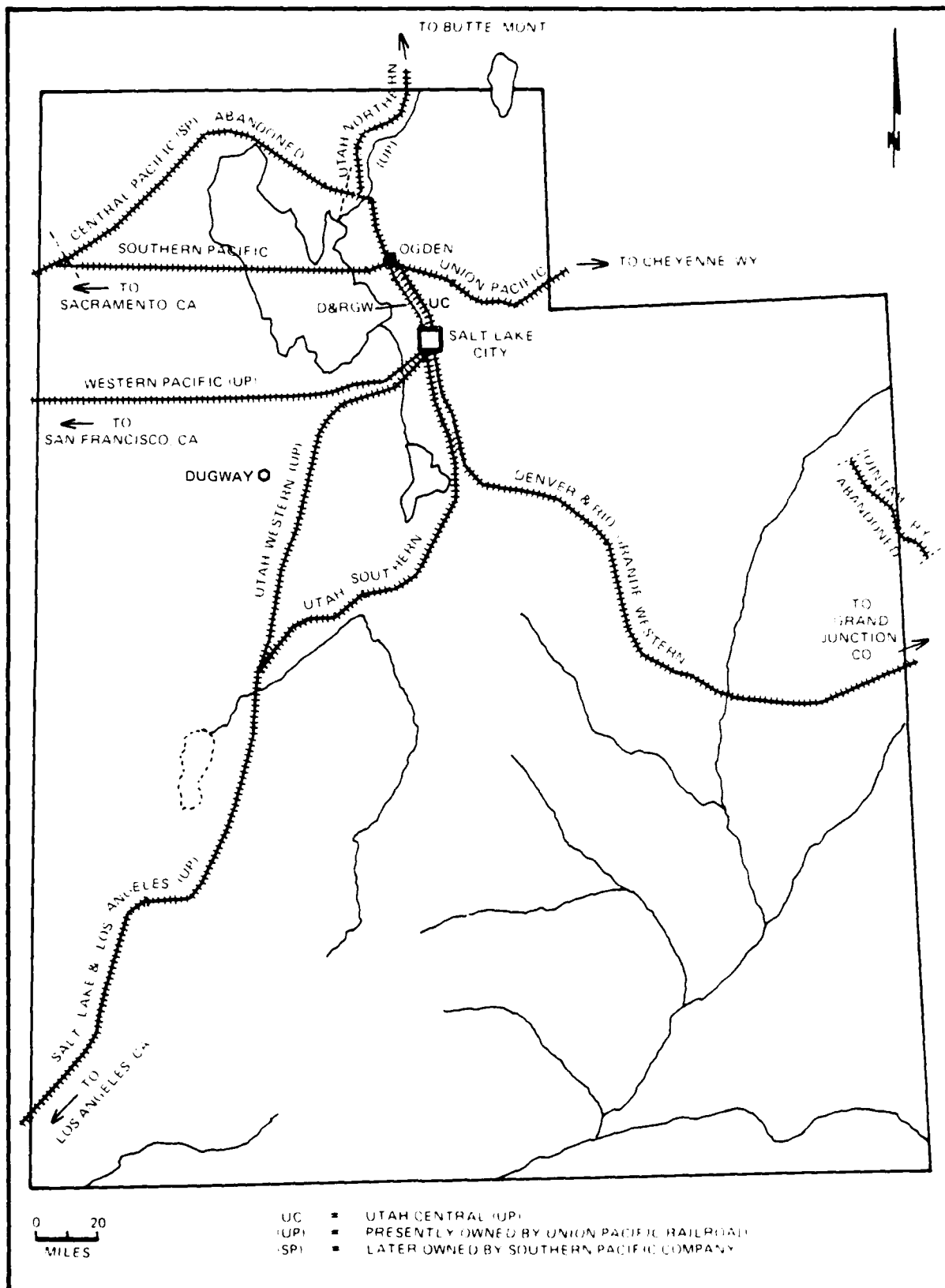


Figure 2-8. MAJOR UTAH RAILROADS

Stockmen had only slight competition from mining, a very prosperous activity in other parts of Utah and Tooele County. Mineral production only briefly touched the lands that became DPG. During the 1870s, as the mines of Ophir, Tintic, and other areas boomed, enterprising prospectors examined the Dugway Mountains. Silver deposits were found and a small smelter was built in 1876 or 1877. The operation was closed by early 1878 (Carr 1972, Utah State Historic Preservation Officer Site Form). With the failure of mining in the area, graziers were left alone to use the range as needed.

Grazing continued to be the exclusive use of the Great Salt Lake Desert and much of Skull Valley for the first four decades of the twentieth century. The ongoing use of the land for over 50 years caused depletion of the natural vegetation and when the extraordinarily dry years of the early 1930s arrived, stockmen found the desert sparsely vegetated. Also, the nation was plunged into the Great Depression following the stock market crash of October 1929. In 1933, Franklin D. Roosevelt introduced a recovery program known as the New Deal. Two of Roosevelt's programs affected DPG, the U.S. Grazing Service (USGS, established 1934), and the Civilian Conservation Corps (CCC, established 1933).

The CCC set up a camp at Simpson Springs to improve grazing conditions in much of the area. The USGS, established by the Taylor Grazing Act, sought to control and improve range conditions on the public domain by setting animal carrying limits and prohibiting overgrazing. Most of the land that became DPG was under USGS stewardship prior to its transfer to the U.S. Army in 1942 (Granstville and Shambip 1976:np; Bureau of Land Management 1980:np).

The U.S. began to prepare for war in 1939. The Chemical Warfare Service (CWS) determined Aberdeen Proving Ground inadequate for their needs and began studies of possible alternate locations. The Great Salt Lake Desert had adequate isolation, climate, altitude, and available lands, primarily public domain. In February 1942, 126,720 acres (51,284 hectares) of public domain were transferred from the Department of the Interior to the U.S. Army, followed by a second transfer of 138,180 acres (55,921 hectares) in April 1942. During the interim, the Army also acquired land from the Utah State Land Board and private individuals.

The CWS began limited weapons testing during the spring of 1942 as construction continued on the headquarters facility at Ditto Area (then known as Dog Area). Dugway did not do much to aid economic recovery of the area because most of the personnel were imported from other parts of the United States due to the technical nature of their mission.

When the war ended in 1945, DPG had made many contributions to the CWS war effort, but Army planners felt the facility's functions could be taken over by other installations in peace time. As a result, Dugway was deactivated (Baum 1947).

DPG was reactivated during the Korean War, when extensive programs began to test weapons and defensive systems for chemical, biological, and radiological (CBR) warfare. By 1952, Army planners determined that Dugway was necessary as a permanent part of military weapons development programs, and upgraded the facilities. Most notable additions were the family housing units and other facilities at Easy Area (now English Village). Eventually, the government built 380 housing units, a hospital, school, recreation center, clubhouses, parks, and a golf course.

DPG expanded into further detailed research on all phases of CBR warfare. During the 1960s, the Proving Ground undertook training missions and a public relations program to inform the media about Army activities. These efforts were dropped during the 1970s as the Army found itself under more criticism and scrutiny by Congress and the public. Despite these setbacks and through many reorganizations of the Army along functional lines, DPG has continued to serve a vital role in America's weapons development program (Department of the Army 1981:4-26, Arrington & Alexander 1964:38-43). (For a cultural history summary, see Table 2-2.)

2.3 ARCHEOLOGICAL RESEARCH DIRECTIONS

2.3.1 Regional Concerns

Archeological interest in the Great Salt Lake Region dates back to the last century (James 1980). However, excavation of real significance did not commence until 1915, when Neil W. Judd excavated a mound site one mile west of Willard, Utah (Judd 1917). From 1915 until World War II, most of the work of Judd and others in the area concentrated on the need to gather data on the prehistory of the area (Judd 1917; Steward 1931, 1933, 1936, 1937; Gillin 1936, 1941; Smith 1938; and Reagan 1934a).

Although it is popular today to emphasize problem orientation in research, the idea is not new. Judd's (1917) work was specifically oriented to determining the nature of the Willard Mounds. Steward's (1931, 1933) was conducted "... with the aim of discovering ancient cultures which could be dated by references to the chronology of the (Bonneville) Lake."

A major program involving the development of a statewide inventory was initiated in 1950. Jack R. Rudy conducted the first areal survey under this program (Rudy 1953).

In the early 1950s, research in the basin took a dramatic turn with the excavation of Danger Cave near Wendover (Jennings 1957). This site, coupled with the ethnographic work of Julian Steward (1970), formed the basis of Jennings's (1964) Desert Culture concept. This concept modified the idea that cultural adaptations in the basin have been relatively stable from the end of the Pleistocene period to around the time of Christ, and that Steward's 1938 model of Shoshone adaptations was applicable to the total span of post Paleo-Indian or Archaic occupation of the basin. Aiken's (1970) work at Hogup Cave seemed to confirm the conclusions reached at Danger Cave. In Steward's model, Shoshone peoples clustered into base camps or villages during the winter months, living on stores of pinyon nuts harvested in the fall. In the spring, when food resources were exhausted, the groups divided into small nuclear-family groups and spread over the landscape. In the fall, when the pinyon nuts were ready to be harvested, the small family groups gathered into the larger groups once again, and completed the annual cycle.

Madsen (1982), using a variety of evidence, has proposed a three-period Archaic stage in which he documents a shift from the exploitation of lacustrine resources to the exploitation of upland resources. This shift is due, according to Madsen, to changing climate conditions and their effect on

Table 2-2. A SUMMARY OF THE CULTURAL CHRONOLOGY OF THE AREA OF DUGWAY PROVING GROUND

Cultural Unit					
Tradition	Period or Phase	Date	General Settlement Patterns	General Subsistence Systems	Kinds of Archeological Remains Representative of Period
American	Post-Great Depression	AD 1940 to Present	Development of Dugway Proving Ground. Continued livestock grazing. Sparse/scattered settlement, except at Dugway (English Village).	Technical/service trades for Army, Ranching.	Anglo-American manufactured goods including auto, farm, and aircraft parts, seamless and seamed cans, clear glass, machine-made bottles, plastic goods. Milled lumber, concrete, brick.
	Statehood	AD 1890 to 1940	Period of sparse settlement, out-migration from old stage route area. Increased use by ranchers (seasonal).	Sheep/cattle ranching on seasonal basis.	Anglo-American manufactured goods including molded-relief ceramics, colored glass, wire nails, canning jars with rubber seals, iron and steel farm implements, early auto parts, leather goods/harness. Milled lumber, brick, concrete.
	Trans-continental	AD 1869 to 1890	Period of sparse settlement, seasonal use. Settlement concentrated along Overland Stage route.	Transportation/service industries, ranching.	Dramatic increase in manufactured goods, soldered tin cans, ceramics and colored glass, iron and steel implements with wooden parts, leather goods/harness. Milled lumber, bricks.
Mormon	Settlement	AD 1847 to 1869	Settlement concentrated along Overland Stage route at/near stage stations.	Transportation/service industries, livestock tending.	Domestic manufacturers. Limited quantities of imported goods. Adobe and log construction.

Table 2-2. A SUMMARY OF THE CULTURAL CHRONOLOGY OF THE AREA OF DUGWAY PROVING GROUND (Continued)

Cultural Unit		General			Kinds of Archeological Remains Representative of Period
Tradition	Period or Phase	Date	Settlement Patterns	Subsistence Systems	
Post-Formative Stage	Nimic Gosiute	AD 780 to present	Basic patterns described by Steward (1970). Based on the seasonal collection of wild plants and periodic hunting. A system in which small groups moved from one resource to another as resource availability dictated.	Hunting and gathering	Lithic scatters and ground stone tools. Use of rock shelters and caves. Rock art where suitable surfaces are available. Campsites in Pinon regions with wickiup structures. Game drives, storage pits. Brown ware ceramics.
Formative Stage	Fremont/Sevier	AD 780 (?) to AD 1200	Sedentary villages often situated on alluvial fans or near to perennial streams.	Horticulture and the collecting of marsh resources supplemented by hunting.	Quadrilateral and circular pithouses, coursed adobe granaries, occasional surface jacal or coursed adobe dwellings. Ceramics-graywares, Lithic scatters.
Archaic	Late/Archaic	1500 BC to 550 BC	A pattern similar to that proposed by Steward with the exception of Pinon nut exploitation.	Upland hunting and gathering. Little use of lakes margins-population reduced/regional abandonment.	Lithic scatters, game drives, campsites, grinding stones, possible rock art. Cave sites and rock shelters of major importance.
	Middle/Archaic	3500 BC to 1500 BC	As above.	Upland hunting and gathering as well as lake edge exploitation of resources.	Cave sites and rock shelters. Lithic scatters, campsites.
	Early/Archaic	6500 BC to 3500 BC	Sedentary lifestyle.	Exclusive exploitation of lake edge and marsh resources.	Cavesites, rock shelters, Lithic scatters, campsites.

Table 2-2. A SUMMARY OF THE CULTURAL CHRONOLOGY OF THE AREA OF DUGWAY PROVING GROUND (Continued)

Cultural Unit		Date	General Settlement Patterns	General Subsistence Systems	Kinds of Archeological Remains Representative of Period
Tradition	Period or Phase				
Lithic	Paleo-Indian	10,000 BC 6500 BC	Not well known in Utah.	Not well known. Probably big game hunting and lake edge exploitation.	Only materials found to date are isolated surface findings.

lake edge lands in the Great Salt Lake Basin. He also notes that the exploitation of pinyon nuts, a major factor in Steward's model, seems to be essentially a Shoshone phenomenon.

Historical research in western and northwestern Utah is limited in scope and volume because of the sparse settlement and environmentally constrained land uses of the region. However, certain specific topics have not been adequately addressed in the past and some historical interpretations are in need of revision. These include the California migrations, particularly the Donner Party, and the Pony Express.

The daily life of sheepherders wintering flocks in Skull Valley or the desert fringes have not been studied. Another topic of study is the impact of revised travel routes opened during the early twentieth century on the population distribution in the area. Also lacking is a detailed study of the Western Pacific Railroad. Within the next few years, synthetic studies of the auto and its impact on the region should be available.

Regional Research Questions. There are a series of basic regional research questions to be resolved for the general area:

1. How far east does the Western Pluvial Lakes tradition extend? What is the nature of the Paleo-Indian/Archaic interface?
2. What is the nature of the altithermal and its effect on both a regional and local basis?
3. What are the origins of the Fremont? What are the natures of its regional variations. Is Marwitt correct when he separates the Great Salt Lake variant from the Sevier variant, or is Madsen correct to treat them as one?
4. Did the Fremont people pack up and move out, and if so, to where? Or, did they drop horticulture and "become" Shoshone?
5. Is there a "Plains" influence in northwestern Utah? If so, what is its nature?

2.3.2 Installation-Specific Archeological Research Directions

Because of its size and environmental zones varying from salt desert to mountain top, Dugway can be considered a choice laboratory in which any or all of the research questions posed above could be addressed. Site-specific concerns for DPG are phrased as questions which will help gather data applicable to regional concerns expressed in Section 2.3.1.

1. What evidences of occasional use and occupation by grazers can be found on DPG, and what can be learned from these sites about daily life on the trail or in winter camps?
2. Can campsites of explorers and mountain men who crossed the Great Salt Lake Desert be found and what can be learned about daily life on the trail in the Desert region?

3. Are there any evidences of deviations from the established travel routes on DPG, including the Pony Express/ Overland Trail and the Lincoln Highway?
4. Are there any evidences of construction camps for the Lincoln Highway left on DPG? What can be learned about the people, method of construction, and other related topics?
5. Local legend maintains that bootleggers operated stills on Granite Peak during the 1920s National Prohibition experiment. Can any evidence be found to confirm or refute this legend?

For any research design to be successful, certain basic criteria must be met: 1) the research problem(s) must be clearly defined, 2) testable hypotheses must be clearly stated and related to the problem(s) posed, 3) the nature, amount, and extent of data needed to test the hypothesis must be determined, 4) the research problem(s) should be prioritized, and 5) specific resource selection for survey, evaluation, or data recovery should be based on the specific research problem.

Based on the evidence currently available, the sorts of questions outlined on Table 2-3 could be raised. The numbers of questions that could be posed is limitless. However, to have meaning, the questions require a data base, and the questions posed in Table 2-3 might reasonably be answered based on the data now known to exist on-post. Additional finds of a different nature than those known to exist would pose different questions.

Table 2-3. REGIONAL RESEARCH QUESTIONS

Problem Domain	Research Topics	Research Question (a)	Data Requirements
Chronology	Projectile Points	What is the date range of Paleo-Indian points in the study area? a. Clovis b. Folsom c. Plano What is the date range of points usually assigned to the Archaic period in the study area? a. Pinto Series b. Humbolt c. Northern Side-Notched d. Elko series What is the date range of Rose Spring and related points in the study area? What is the date range of desert side-notched points (Numic) in the study area? What other types of projectile points and what is their date range that occur in the study area?	Points should be in context with materials of dateable nature, i.e., kill sites with dateable material (open site), or sites with subsurface deposits with dateable material. As above. As above. As above. As above.
Ceramics		What is the earliest date for ceramics in the study area?	As above, excluding kill sites, and sites with ceramics in a dateable context.
		What is the date range for decorated ceramics in the study area?	As above.
		What is the date range for the "supposed Numic" brown wares?	As above.

Table 2-3. REGIONAL RESEARCH QUESTIONS (Continued)

Problem Domain	Research Topics	Research Question (a)	Data Requirements
Settlement and Subsistence	Paleo-Indian Occupation	<p>What tool types and food resources, both plant and animal, occur with the fluted point tradition of the Eastern Great Basin?</p> <p>What tool types and food resources, both plant and animal, occur with the lanceolate, stemmed points, and crescents of the western Pluvial Lakes tradition?</p> <p>What is the spatial relationship between the western Pluvial Lakes tradition and other Lacustrine oriented cultures?</p>	<p>Preservation is critical, therefore dry sheltered sites with subsurface deposits occurring in areas where numerous point styles occur.</p> <p>As above.</p> <p>Two types of sites are needed: 1) sites that contain diagnostic materials of the period and where the surface of origin can be defined, and 2) more archeological sites with datable extinct Lacustrine materials with correlation of rare site surfaces with archeological site destruction would support or reject Lacustrine hypothesis</p> <p>Regional distribution of sites contains Early Archaic materials.</p>
	Archaic Occupation	<p>Are sites classified as Early Archaic exclusively located to exploit Lacustrine marsh resources?</p> <p>What resources were being exploited by Early Archaic peoples?</p> <p>Are sites classified as Middle Archaic found in both Upland and Lacustrine settings?</p> <p>What resources were being exploited by Middle Archaic peoples?</p> <p>Are sites classified as Late Archaic found exclusively in upland settings?</p>	<p>Sites with floral and faunal deposits that are associated with Early Archaic Diagnostics - preferably caves/rock shelters.</p> <p>Regional distribution of sites containing Middle Archaic materials.</p> <p>Sites with floral and faunal deposits that are associated with Middle Archaic diagnostics - preferably cave/rock shelters.</p> <p>Regional distribution of sites containing Late Archaic materials.</p>

Table 2-3. REGIONAL RESEARCH QUESTIONS (Continued)

Problem Domain	Research Topics	Research Question (a)	Data Requirements
Cultural Relationships	Fremont Occupation	What resources were being exploited by Late Archaic peoples?	Sites with floral and faunal deposits that are associated with Late Archaic diagnostics - preferably caves/rock shelters
		What plant and animal resources are associated with Fremont materials in the study area?	Caves, rock shelters, and open sites with well preserved floral and faunal deposits.
		What tool types are associated with diagnostic Fremont artifacts?	Diagnostic Fremont artifacts as datable materials in association with tools associated with various types of food preparation.
	Numic Occupation	Same as for Fremont.	Same as for Fremont.
	Archaic/Fremont Transition	Do diagnostic Fremont artifacts follow Archaic diagnostic artifacts in an unbroken succession?	Deeply stratified sites such as rock shelters or caves.
Fremont/Numic Transition		Do diagnostic Fremont and Archaic artifacts occur in direct association with each other?	As above.
		Do diagnostic Fremont Artifacts follow diagnostic Archaic artifacts in a broken (Hiatus) succession?	As above.
		Same as for Fremont/Archaic transition.	Same as for Fremont/Archaic transition

Table 2-3. REGIONAL RESEARCH QUESTIONS (Continued)

Problem Domain	Research Topics	Research Question (a)	Data Requirements
Demography	Archaic Population Fluctuations	<p>During periods where high population are hypothesized to exist (e.g., ca 1500, 3500, 6500 BP)</p> <p>a. Does site frequency increase? b. Does site frequency decrease? c. Does site frequency remain constant?</p> <p>or</p> <p>Does intensity of site occupation: a. increase b. decrease c. remain constant?</p> <p>During periods when low population is hypothesized to exist (e.g., ca. 2500 BP and 5500 BP)?</p>	<p>Datable cultural materials from either or both stratified sites.</p>
Environments	Lacustrine Environment	<p>What is the date range of the various terraces (beach lines) of Lake Bonneville within the study area?</p> <p>What is the nature of prior Lacustrine environments in the study area?</p> <p>How does this sequence compare with other sequences?</p>	<p>As above.</p> <p>Excavation of non-archeological sites to acquire dateable materials.</p> <p>As above.</p>
	Upland Environment	<p>What is the nature of the evidence for environmental fluctuation in the uplands?</p> <p>What is the date range of these fluctuations?</p> <p>How does this correlate with the Lacustrine environmental fluctuations?</p>	<p>Other sequences - literature.</p> <p>Excavation of non-archeological sites to a) acquire environmental data, and b) to acquire dateable material.</p> <p>As above.</p> <p>Other sequences - literature.</p>

Table 2-3. REGIONAL RESEARCH QUESTIONS (Continued)

Problem Domain	Research Topics	Research Question (a)	Data Requirements
	Dune Environments	What is age and original dune fields in the study area?	Datable materials incorporated in dunes.
		What types of flora and fauna do dune fields support?	Ecological evaluation of dune fields.
		What are the hydrological characteristics of dune fields?	Hydrological study of dunes.
Technology and Material Culture	Lithic Materials	What raw materials were used in working stone tools?	Lithic/Debitage analysis.
		What were the sources of the raw materials?	Regional survey to locate quarry sites and/or lithic sources.
Data Recovery Techniques	Survey Results (Surface)	Can house mounds and other surface features be located through use of aerial remote sensing techniques?	Aerial survey/test at variety of scales and exclusions plus ground truth.
	Survey Results (Subsurface)	Can archeological features (subsurface) be located through the use of aerial remote sensing techniques?	As above.
	Environmental	Can current land forms on environment (washes, terraces, etc.) be located through the use of aerial remote sensing techniques?	As above.

(a) Before Present (BP)

SECTION 3

CHAPTER 3.0 AN ASSESSMENT OF ARCHEOLOGICAL RESOURCE PRESERVATION AND SURVEY ADEQUACY

3.1 ENVIRONMENTAL CONSTRAINTS TO SITE PRESERVATION

Dugway Proving Ground (DPG) is in the Basin and Range Physiographic province and is characterized by a lack of exterior water drainage. The main topographic features of the vicinity, running generally north to south, are a series of fault block mountains with broad intervening valleys (Pinkham et al. 1979:18). Obviously, the mountains are areas of erosion and the intervening valleys are zones of deposition. In the mountain areas, sites can be lost through erosion and sites can be buried in the valleys under alluvines. Between the mountains and playas on DPG are a series of dune fields in varying degrees of stabilization. The active dunes can cover, uncover, and mix the contents of sites.

3.2 HISTORIC AND RECENT LAND USE PATTERNS

The lands that DPG encompass today experienced very little use prior to creation of the Army facility. Sheep and cattle grazed parts of the land from the early 1890s until 1942. With the creation of the military reservation, these activities were concentrated on the fringes of the Great Salt Lake Desert, near and in the mountain ranges and in Skull Valley. No record exists of the erection of any permanent structures associated with these activities within the Proving Ground. As a result of the grazing activity, the Civilian Conservation Corps (CCC) did some range stabilization/improvement work in those areas during the 1930s.

Construction of the Lincoln Highway (locally known as the Goodyear Road), completed in 1918, and other roads created linear right-of-way disturbance. Unconfirmed local tradition maintains that bootleggers ran stills on Granite Peak during the Prohibition era of the 1920s. To date, such activities remain unconfirmed and would have disturbed only small areas of the land.

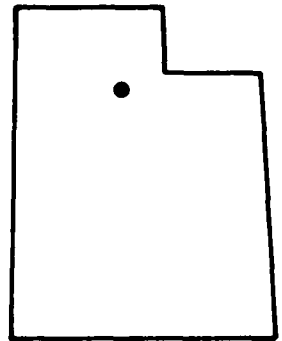
Army presence has disturbed Proving Ground lands. In addition to the relatively limited disturbances resulting from construction of laboratories, test sites, and English Village, the Army also has built roads, airstrips, and target grids on the base that are largely surface disturbances. Due to the secret nature of many activities on the base, very little is known about the types and depths of disturbance that have occurred in the test grid, known dud areas, and other hazard areas of the base. The nature of chemical and biological weapons testing may have disturbed cultural resources in manners not typically expected by archeologists (Figure 3-1, Table 3-1).

3.3 PREVIOUS CULTURAL RESOURCE INVESTIGATIONS; COVERAGE AND INTENSITY

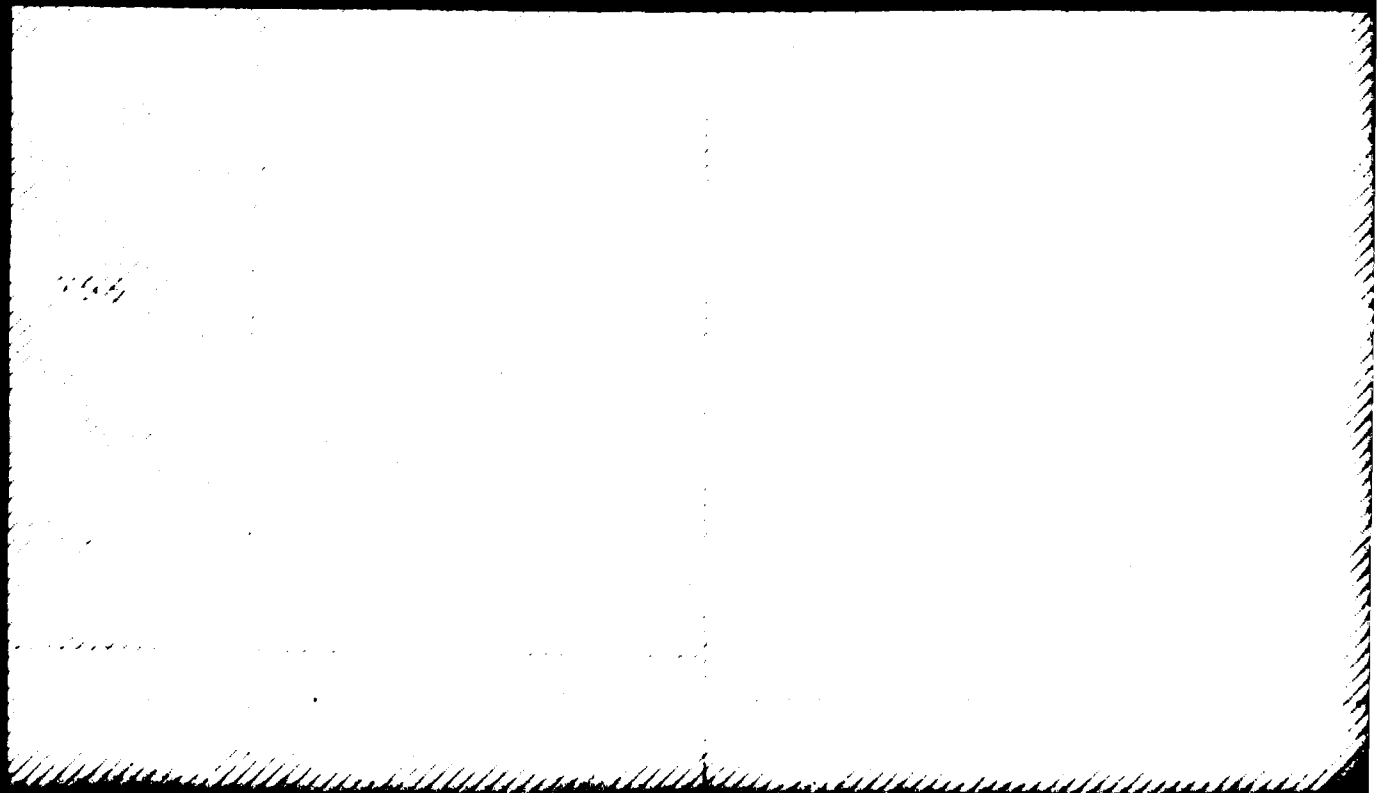
There are no scientific surveys for this installation proper. However, the Bureau of Land Management (BLM) surveyed in a portion of the lands available for use by the Proving Ground (Figure 3-1, Table 3-2). Lt. K. Schmitt's collecting activities in the 1940s can be only superficially

DUGWAY PROVING GROUND

**FIGURE 3-1 HISTORIC
AND
PRESENT GROUND DISTURBANCE**



UTAH MAP LOCATOR
SALT LAKE CITY





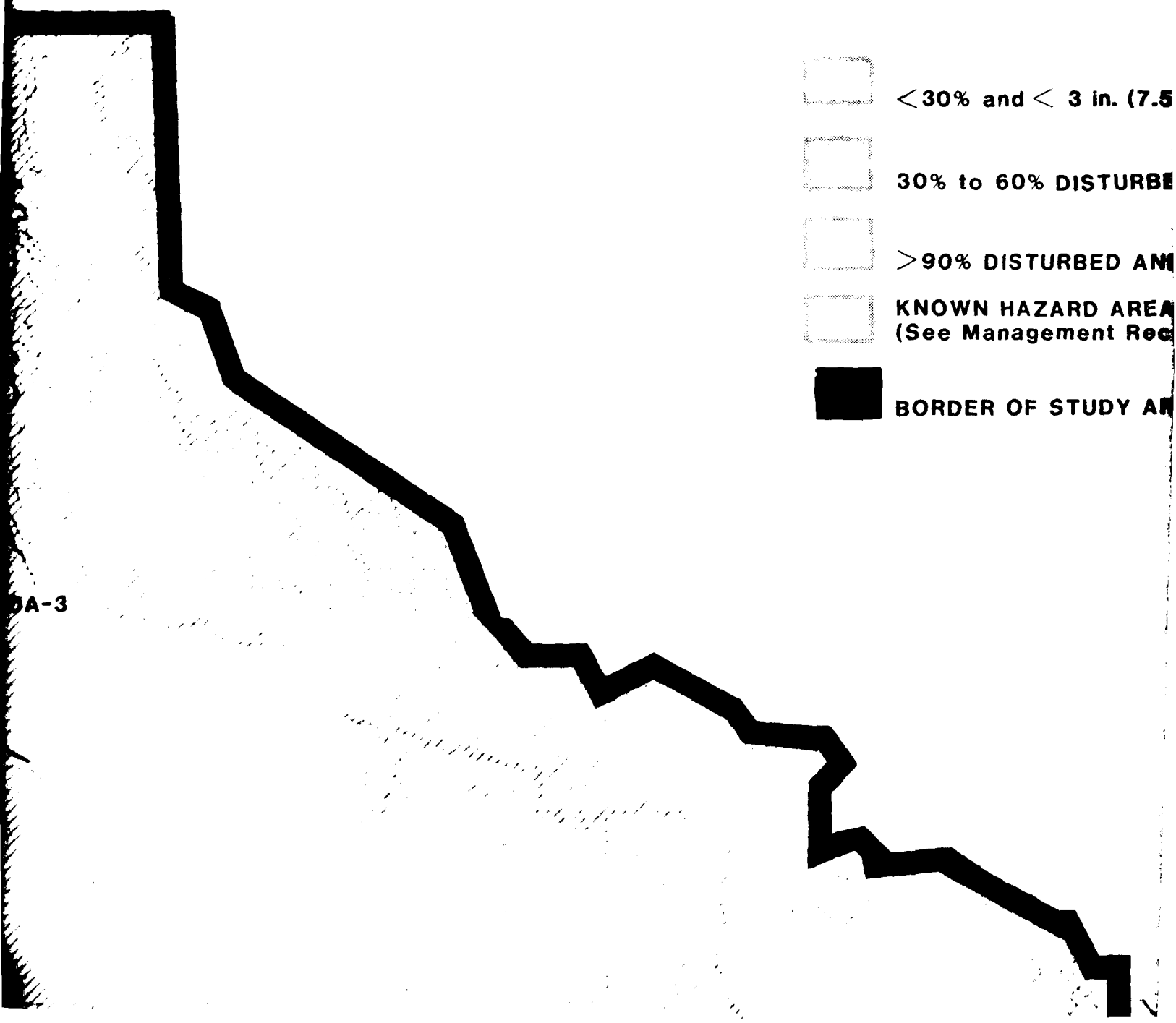
FOR

Fig

GDA-2

GDA-3

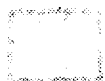
**Figure 3-1 HISTORIC AND PRESENT LAND DISTURBANCE -
DUGWAY PROVING GROUND**



LAND DISTURBANCE - ND



< 30% and < 3 in. (7.5 cm) DEEP



30% to 60% DISTURBED 3 in. to 3 ft. (7.5 cm to 0.9 m) DEEP



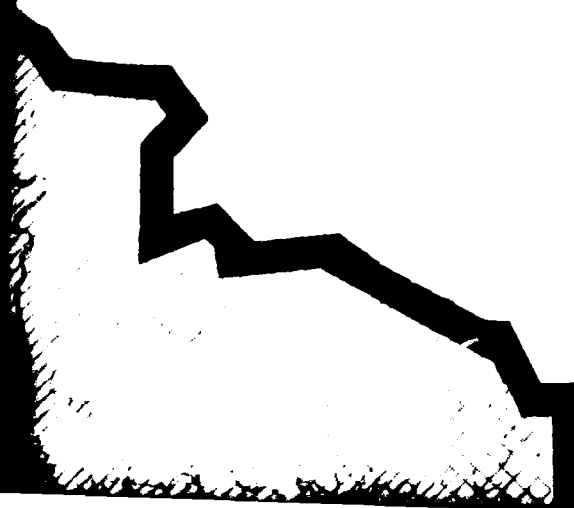
> 90% DISTURBED AND > 6in. (1.8 m) DEEP



KNOWN HAZARD AREAS
(See Management Recommendations Section 6.2)



BORDER OF STUDY AREA



GDA-4

GDA-1

AD-A142 361

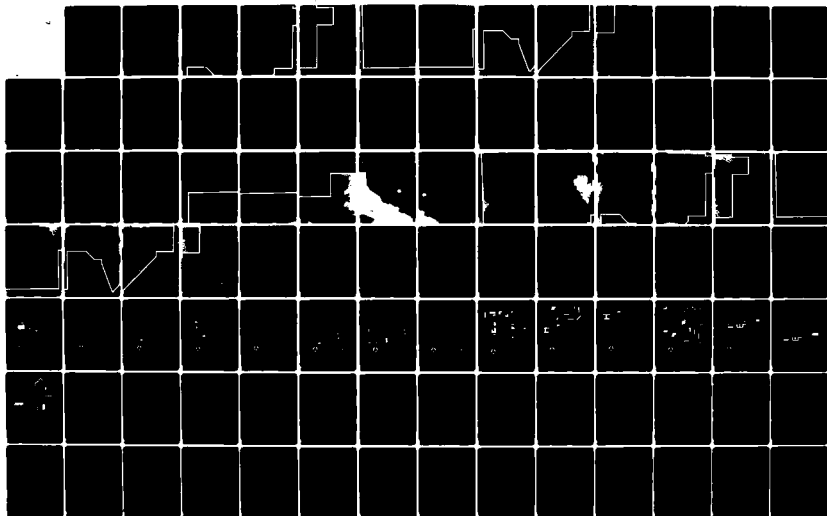
AN ARCHEOLOGICAL OVERVIEW AND MANAGEMENT PLAN FOR THE
DUGWAY PROVING GROUND(U) STEARNS-ROGER SERVICES INC
DENVER CO J GRADY ET AL. 29 MAR 84 CX-0001-2-0048

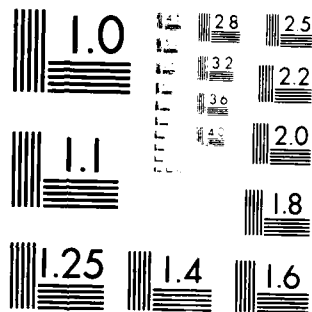
2/3

UNCLASSIFIED

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MICROCOPY RESOLUTION TEST CHART
 NATIONAL BUREAU OF STANDARDS-1963-A

7

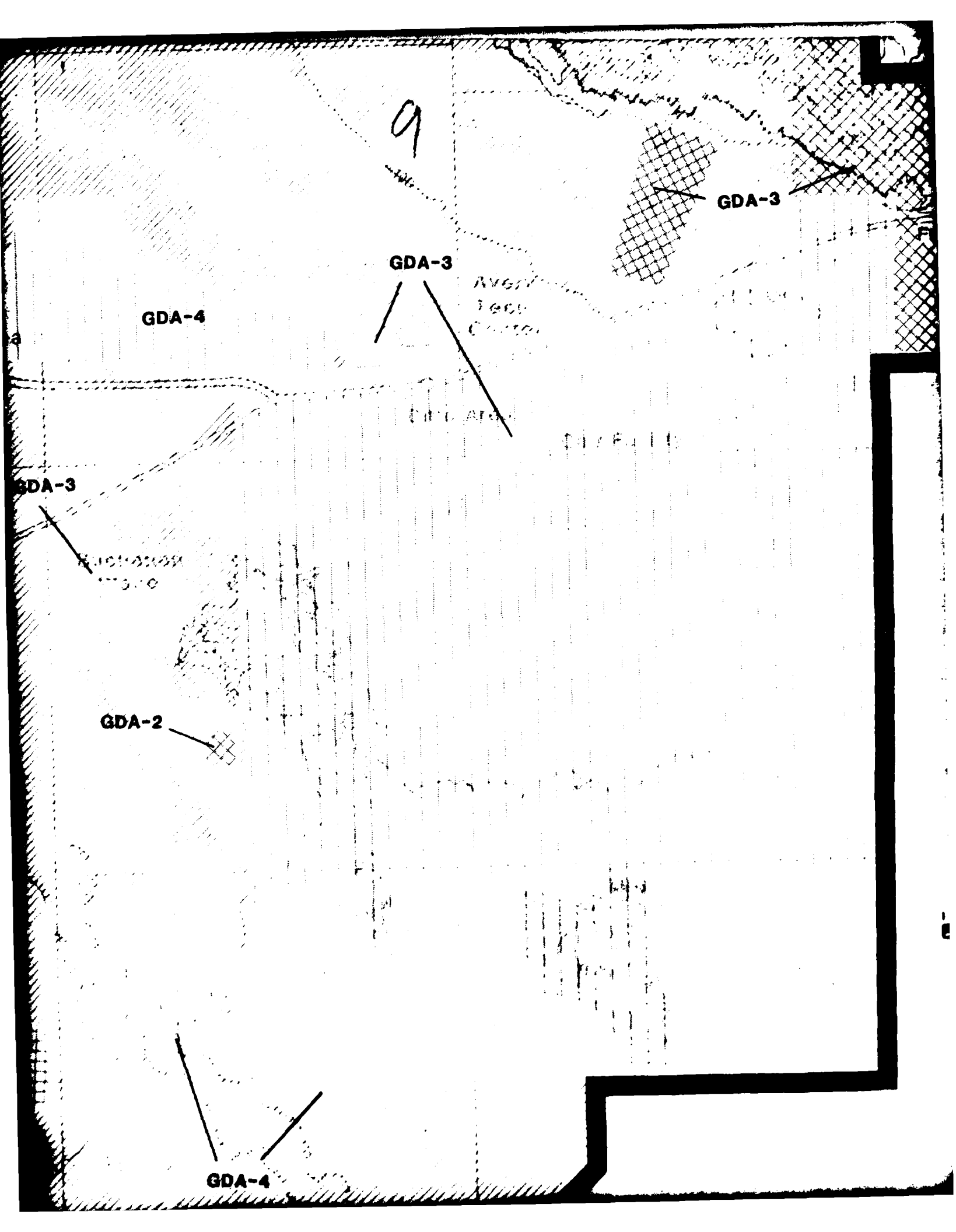


GDA-2

GDA-3

GDA-2

GDA-3



9

GDA-3

GDA-3

GDA-4

RIGHT
1000
CHINA

CHINA AREA

DIVERSED

GDA-3

CHINA AREA

GDA-2

GDA-4

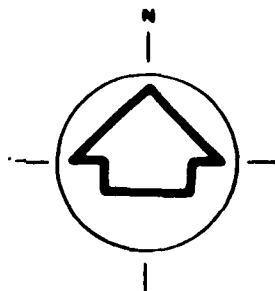
GDA-3

Engken Village

Engken

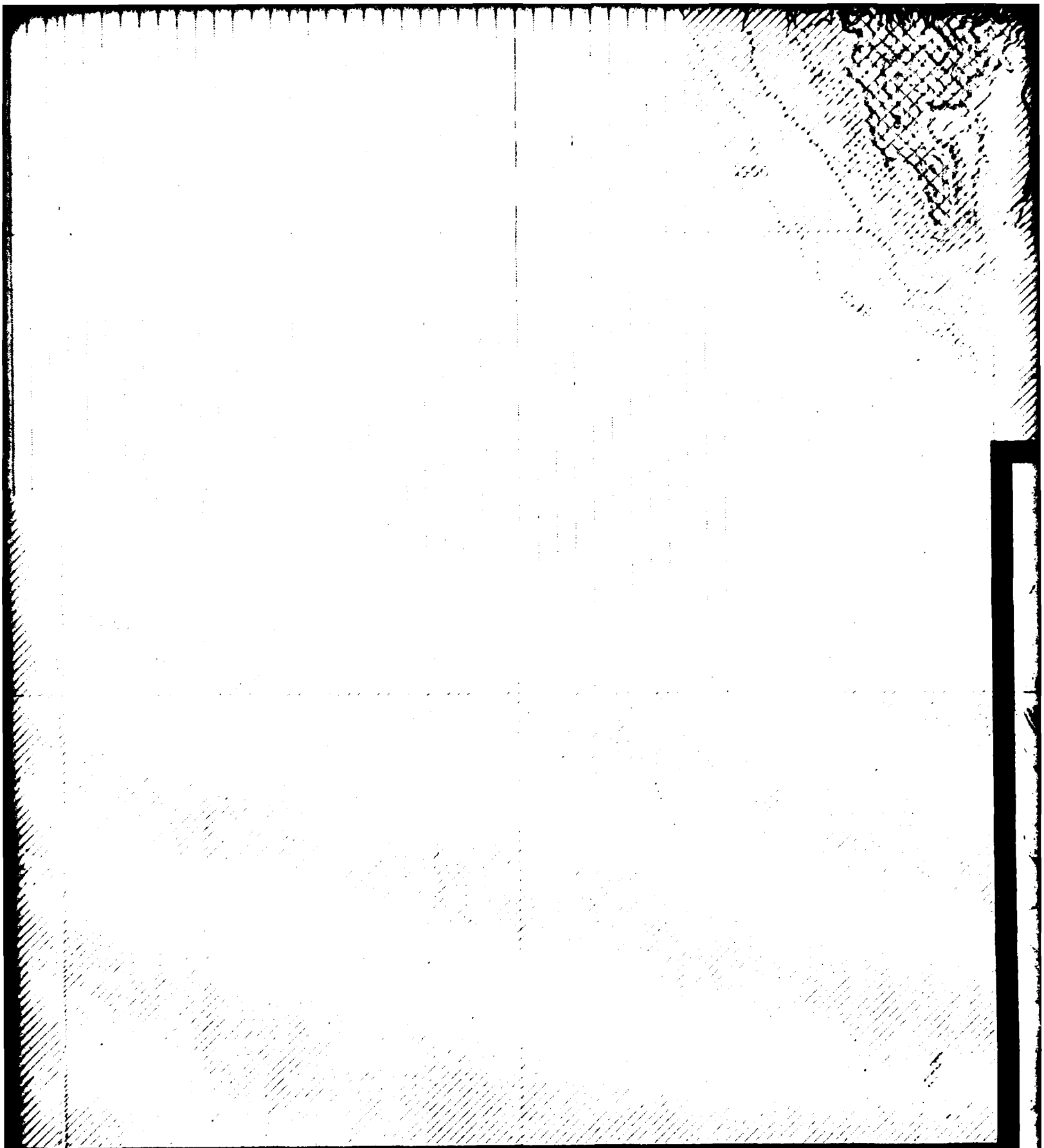
Facility

GDA-3



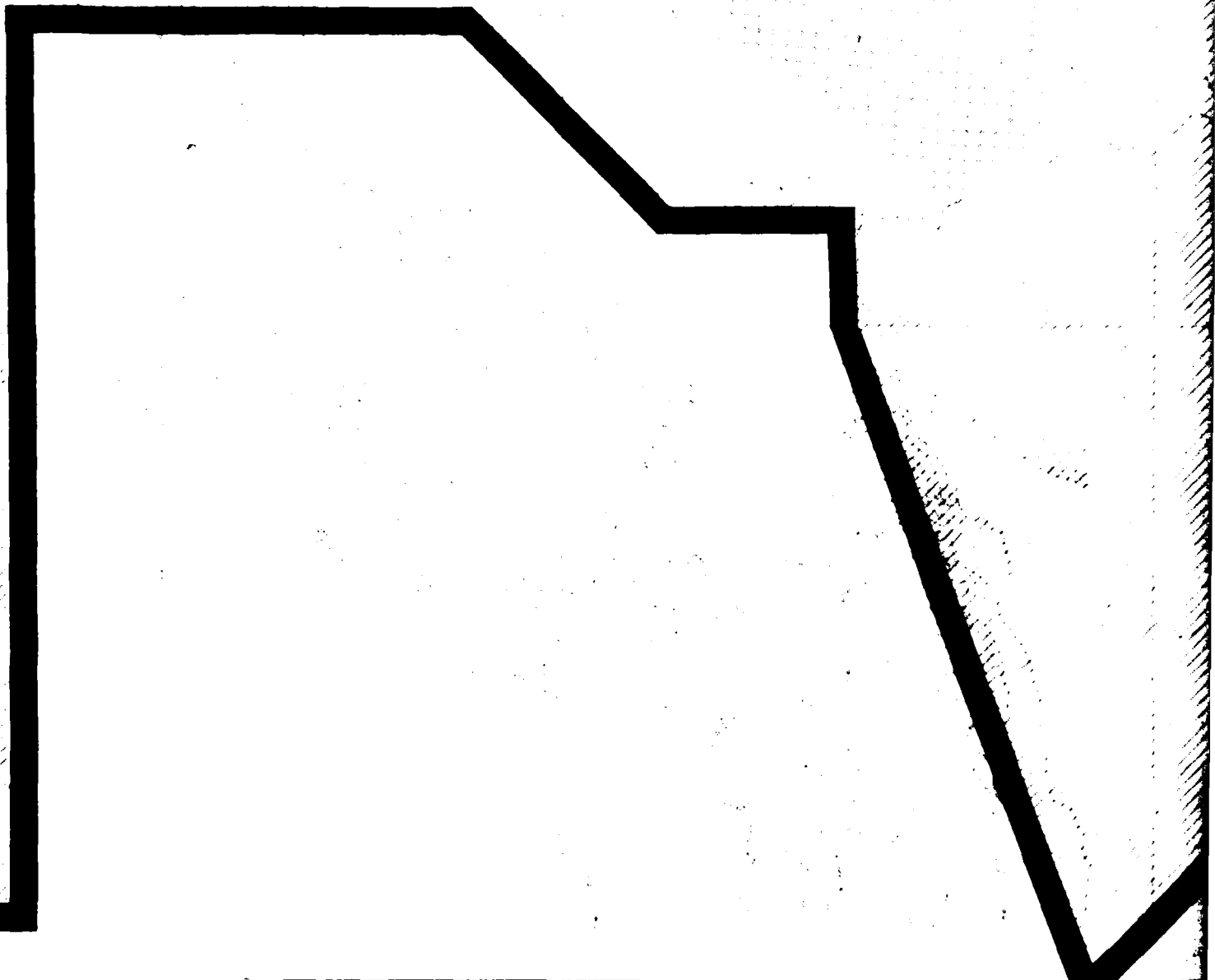
SCALE IN MILES

GDA-1



GDA-2

GDA-3



GDA-2

GDA-4

DUGWA

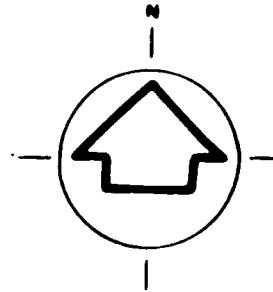
F. C. TORKELSON
ENGINEERS
SALT LAKE CITY, U

RECOMMENDED BY THE INSTALLATION PL

DATE: JUNE 76

REVIEWED & COMMENTED ON BY MAJOR
& FORWARDED TO THE CHIEF OF ENGINE

DATE:



SCALE IN MILES

DUGWAY PROVING GROUND

DUGWAY, UTAH

F. C. TORKELSON CO.
ENGINEERS
SALT LAKE CITY, UTAH

U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

MASTER PLAN BASIC INFORMATION MAPS RESERVATION MAP

RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL

Adalbert E. Toepel, Jr.
ADALBERT E. TOEPEL, JR. COLONEL, P. A.
COMMANDING

DATE: JUNE 76

REVIEWED & COMMENTED ON BY MAJOR COMMANDER
& FORWARDED TO THE CHIEF OF ENGINEERS

DATE:

DATE
JUNE 76

SHEET NO.

2 of 6.

DRAWING NO.
18-02-19

FILE NO.

181-13-48

Table 3-1. A SUMMARY OF HISTORIC AND MODERN GROUND DISTURBANCE THAT MIGHT LIMIT THE PRESENT ARCHEOLOGICAL RESOURCE BASE ON DUGWAY PROVING GROUND

GDA No. (a)	Type Of Disturbance	Date Conducted (yr)	Reference	Area Disturbed (acres)	Depth Below Surface (ft)	Ratio of Disturbed Area Total	Location of Disturbed Area (b)					Coincidental Sites
							UTM (c)		Legal Reference (d)	USGS Quad Sheet (e)		
							Northing	Easting				
GDA-1	Grazing	1890 to 1942	Mercer, 1961	840,909	Less than 6"	1:50	4419000	270000	5 to 8 to 11S	16 W	T25053(R) D25053(R)	
GDA-2	Construction and Use of Target Grids for High Explosive and Chemical Weapons	1942 to Present	Dugway Proving Ground Environment Impact Statement (EIS), Interviews with Base Environmental Specialists, Dugway Master Plan	98,000	3" to 3'	7:10	44495000	345600	7S	6W	T25053(R) D25053(R)	
							4460000	353800				
							4430000	310000	7,8,9S	11W		
							4458500	328700	7,8,9S	12W		
							4437500	301500	7,8S	12W		
							4457000	312500	7,8S	13W		
							4432500	292500	9S	15W		
							4440000	297000				
							4456200	273500	7S	16W		
							4459000	278000				
							4462500	326000	6S	11W		
							4463000	327500				
							4469000	322500	5S	11W		
							4470000	324500				

Table 3-1. A SUMMARY OF HISTORIC AND MODERN GROUND DISTURBANCE THAT MIGHT LIMIT THE PRESENT ARCHEOLOGICAL RESOURCE BASE ON DUGWAY PROVING GROUND (Continued)

GDA No. (a)	Type of Disturbance	Date Conducted (yr)	Reference	Area Disturbed (acres)	Depth Below Surface (ft)	Ratio of Disturbed Total Area	Location of Disturbed Area (b)					USGS Quad Sheet (e)	Coincidental Sites
							UTM (c)		Legal Reference (d)				
							Northing	Easting		Township	Range		
GDA-3	Construction	1942 with Periodic Remodeling and Reconstruction to present	Dugway EIS and Dugway Master Plan	13,490	6'	8:10	4453000	347800	7S	6W	T25053(R)	Lincoln Highway Bridge, German Village, Wig Mtn. Fortifications	
							4459000	352500					
							4465000	325000	5S	11W			
							4465800	326000					
							4448500	335200	6S	10W			
							4452000	337000					
							4470000	3385000	8S	9W			
							4474000	3392000					
							4455000	328000	8S	10W			
							4462500	329000					
							4451000	325700	7S	11W			
							4452000	326500					
GDA-3	Artillery Impacts, Re-contouring with Railroad Rails	1942 to Present	Dugway EIS and Master Plan	1,280	6'	1"	4437250	313250	9S	12W	T25053(R)		
							4434500	315000					

Table 3-1. A SUMMARY OF HISTORIC AND MODERN GROUND DISTURBANCE THAT MIGHT LIMIT THE PRESENT ARCHEOLOGICAL RESOURCE BASE ON DUGWAY PROVING GROUND (Continued)

GDA No. (a)	Type of Disturbance	Date Conducted (yr)	Reference	Area Disturbed (acres)	Depth Below Surface (ft)	Ratio of Disturbed Total Area	Location of Disturbed Area(b)					Coincidental Sites
							UTM(c)		Legal Reference Town-ship	Range	USGS Quad Sheet (e)	
							Northing	Easting				
GDA-4	Ammunition Burial and Destruction	1942 to Present	Dugway EIS and Master plan	76,000	?	?	4433500	333250	7,8,9S	9W	T25053(R)	
							4454500	349500	7,8,9S	10W		
							4453750	326500	7S	10, 11W		
							4454500	328000				
							4437850	329500	9S	10W		
							4434500	331500				

- (a) Ground Disturbance Activities (GDA):
 GDA 2 - Target grid disturbance ways from grid to grid depending on the type of weapons tested and purpose of the tests. The information available does not support further elaboration.
 GDA 4 - These are known dud areas with potentially dangerous weapons in the ground or on the surface and an artillery range. These represent perimeters of the disturbed areas taken from 1:250,000 USGS maps.
- (b) Universal Transverse Mercator (UTM)
 Zone 12 TUV
- (d) Sections are not included for space considerations and due to lack of CADASTRAL survey on much of the Proving Ground.
- (e) U.S. Geological Survey (USGS)
 T25053(R) - Tooele, UT 1:250,000 (1953) Rev. 1970
 D25053(R) - Delta, UT 1:250,000 (1953) Rev. 1972

Table 3-2. ARCHEOLOGICAL SURVEYS CONDUCTED ON THE DUGWAY PROVING GROUND

Survey Administration			Survey Location		Survey Characteristics							Identified Archeological Resources							
SHPD Survey-Institution No. Agency (a)	Survey Date (yr)	Survey Record Repository (b)	Bibliographic Reference	UTM		North	East	Township	Range	Section	USGS Quad Map (c)	Collection Policy (d)	Curatorial Repository (d)	Survey Type Area (d)	Temporal Coverage (e)	Trans-section Type, Interval (m.) (d)	Rate (a./person day) (d)	Sub-surface Tests (d)	Sites
04253	BLM	SLD0	-	No UTM Survey	NW 1/4 T10S	R10W	17	0753	UNK	UNK	UNK	PH	UNK	UNK	UNK	UNK	UNK	UNK	None
04517	BLM	SLD0	-	No UTM Survey	NW 1/4 T10S	R11W	23	0753	UNK	UNK	UNK	PH	UNK	UNK	UNK	UNK	UNK	UNK	4210183 4210189 4210205 4210206
04587	BLM	SLD0	-	No UTM Survey	SW 1/2 T10S	SW 1/4 R10W	8	0753	UNK	UNK	UNK	PH	UNK	UNK	UNK	UNK	UNK	UNK	None
SU32	BLM	SLD0	-	No UTM Survey	NW 1/4 T10S	NW 1/4 SW 1/4 R10W	20	0753	UNK	UNK	UNK	PH	UNK	UNK	UNK	UNK	UNK	UNK	None

Table 3-2. ARCHEOLOGICAL SURVEYS CONDUCTED ON THE DUGWAY PROVING GROUND (Continued)

Survey Administration				Survey Location		Artifacts		Survey Characteristics				Identified Archeological Resources										
SHPU Survey-Insti- vey-tution No. Agency (a) (a)	Survey Date (yr)	Survey Record Reposi- tory (b)	Biblio- graphic Refer- ence	UTM	Legal Description	Northings	Eastings	Township	Range	Section	USGS Quad Map (c)	Col- lection Policy (d)	Curatorial Reposi- tory (d)	Survey Area (d)	Type (d)	Cover- age (e)	Tempo- ral (e)	Inter- val (m.) (d)	Trans- sect Type, Inter- val (d)	Rate (a./ person day) (d)	Sub- surface Tests (d)	Sites
04592	BLM	SLDU	-	No UTM Survey		SE 1/4	SW 1/4	SW 1/4	NW 1/4	NW 1/4	U753	UNK	UNK	UNK	UNK	PH	UNK	UNK	UNK	UNK	UNK	42T0267
						SW 1/4	SW 1/4	SW 1/4	NW 1/4	NW 1/4												
						NW 1/4	SW 1/4	SW 1/4	SW 1/4	SW 1/4												
						NE 1/4	SW 1/4	SW 1/4	SW 1/4	SW 1/4												
						SE 1/4	SW 1/4	SW 1/4	SW 1/4	SW 1/4												
						T9S	R10W			32												
						NE 1/4	NW 1/4	NW 1/4	NW 1/4	NW 1/4												
						SE 1/4	NW 1/4	NW 1/4	NW 1/4	NW 1/4												
						NE 1/4	SW 1/4	SW 1/4	SW 1/4	SW 1/4												
						SE 1/4	SW 1/4	SW 1/4	SW 1/4	SW 1/4												
						NW 1/4	SW 1/4	SW 1/4	SW 1/4	SW 1/4												
						SW 1/4	SW 1/4	SW 1/4	SW 1/4	SW 1/4												
						T10S	R10W			5												

- (a) Bureau of Land Management (BLM) survey number
(b) Salt Lake District Office, BLM
(c) U.S. Geological Survey (USGS)
D753 - Dugway, UT 7.5 min (1953)
(d) Unknown (UNK)
(e) Prehistoric (PH)

included in this category (Table 3-3). Schmitt noted the presence of some 200 hearths on DPG, but whether each hearth represents a separate archeological site has yet to be determined. The principal problem with Schmitt's work was his failure to provide specific locations within the dunes area for his hearths. On the other hand, he recovered material varying in date from the Paleo-Indian Stage to the Post-Formative (Numic speaking) Stage.

Due to DPG's size and environmental complexity, the potential exists for a wide variety of sites and site types. Cave and dune sites are known to exist, but their density and cultural affiliations have yet to be determined. Because of the lack of any organized survey, the entire installation must be considered a data gap.

Table 3-3. ARCHEOLOGICALLY RELEVANT RESEARCH INVESTIGATIONS, EXCLUSIVE OF ARCHEOLOGICAL SURVEYS, CONDUCTED ON THE DUGWAY PROVING GROUND

Study No.	Study Type	Study Date	Institution, Agency, Firm	Principal Investigator	Bibliographic Reference	Location		USGS Quad Map	Associated Archeological Resources
						UTM	Legal		
						Northing	Easting	Township	Range Section
1	Intensive Collecting	1940s	Individual No Affiliation	Lt. K. Schmitt	Smithsonian Cat. #386226 (see Sect. 2.2.1 Fulsom Complex)	Unknown			Unknown

SECTION 4

CHAPTER 4.0 KNOWN ARCHEOLOGICAL RESOURCES ON THE DUGWAY PROVING GROUND

There are several known archeological sites and resource areas on Dugway Proving Ground (DPG). Site 42T0135 is a cave site on the west side of a rock outcrop located south of Wig Mountain. Occupation evidence is limited to the cave floor and consists primarily of chipping debris. The site has been extensively potted, and no further work is recommended.

Site 42T0136 is an open camp site 2 miles (3.2 km) south-southeast of Wig Mountain. The site lies in a sand dune area and near a seep. The site consists mainly of fire-cracked rock and chipping debris. One hearth was observed. The entire dune area should be surveyed periodically.

Site 42T0213 is located 874 yards (800 m) northwest of Wig Mountain and consists of a blowout in a stabilized dune. The site is attributed to the Fremont Period because of the presence of engraved pebbles. According to the site form, five engraved pebbles were recovered.

Site 42T0214 is a lithic scatter surrounding Cave Springs in the Cedar Mountains. Considering the arid conditions of the area, virtually all seeps and springs are likely to have evidence of prehistoric occupation.

To the south, in the joint land use area along Pismire Wash, are a series of sites (42T0183; 42T0184; 42T0206; 42T0267; and 42T0268), described as lithic scatters. Of the five, 42T0183 and 42T0184 are thought to be archaic campsites and may be associated with each other. One other site, 42T0205, has been assigned to the Fremont Period because of the presence of ceramic materials. Sites 42T0183, 184, 205, and 206 are all described as being in good condition and as having interpretational potential. Site 42T0267 is described as being in fair condition and 42T0268 is described as poor. Neither are considered to be significant (Tables 4-1, 4-2, 4-3, and 4-4).

The Army has already identified a series of dunefields, in its 1979 Environmental Impact Statement for DPG, as having cultural resource potential (Pinkham et al. 1979). No corroborating data, i.e., site forms, are available for these dune areas. Approximate locations of these dunefields are identified in the Installation Environmental Impact Assessment (Pinkham et al. 1979:Fig. A.2-15).

Table 4-1. PRESENTLY IDENTIFIED ARCHEOLOGICAL RESOURCES ON THE DUGWAY PROVING GROUND: ADMINISTRATIVE DATA

Site Number	Site Recorder (a)	Date of Site Record	Survey Number (b)	SHPO Record Repository	Survey Collection Policy (c)	Current Status of Investigation (d)	NRHP Status (e)	State Local Status	Architectural Association (f)	Bibliographic Reference
42T0135	Pinkham et al. 1979	1975	-	-	UNK	D	RIP	-	N/A	Site Form
42T0136	Pinkham et al. 1979	1975	-	-	UNK	D	INSF	-	N/A	Site Form
42T0213	Pinkham et al. 1979	1982	-	-	UNK	UNK	INSF	-	N/A	Site Form
42T0214	Cave Springs									
42T0183	BLM	1979	D.T.	-	UNK	UNK	INSF	-	N/A	Site Form
42T0184	BLM	1979	D.T.	-	UNK	UNK	INSF	-	N/A	Site Form
42T0205	BLM	1979	D.T.	-	UNK	UNK	INSF	-	N/A	Site Form
42T0206	BLM	1979	D.T.	-	UNK	UNK	INSF	-	N/A	Site Form
42T0267	BLM	1981	P.W.O.	-	UNK	UNK	INSF	-	N/A	Site Form
42T0268	BLM	1981	P.W.O.	-	UNK	UNK	INSF	-	N/A	Site Form

NO DATA AVAILABLE

- (a) Bureau of Land Management (BLM)
 (b) Surveys performed by BLM in the Dugway Triangle (D.T.) and Pismire Wash Obsidian (P.W.O.)
 (c) Unknown (UNK)
 (d) Damaged or vandalized without scientific control (D); Unknown (UNK)
 (e) Recommended as eligible by qualified professionals but no formal agency or SHPO recommendation (RIP); insufficient information available by which to make a judgement (INSF)
 (f) Not applicable (N/A)

Table 4-2. PRESENTLY IDENTIFIED ARCHEOLOGICAL COMPONENTS ON THE DUGWAY PROVING GROUND: DESCRIPTION AND EVALUATION

Site Number	Unit Age			Unit Description				Dimension			Evaluation			
	Date		Temporal Unit	Artifacts (d)	Features	Depositional Context	Landform (e)	Area (m ²) (f)	Depth	Ascribed Function	Value Percent Intact(g)	Integrity (u)	RV (i)	CR (j)
	UM (a)	Years BC/AD												
42T0135	Rel.	UNK	Archaic	UNK	-	Cave Site Badly Potted	Cave	60	1 m	Habitation	5	MA	1	3
42T0136	Rel.	-	-	UNK	Fire Cracked Rock	Surface	Dune	UNK		Campsite	UNK	MA	3	3
42T0213	Rel.	AD 700-1200	Fremont	Sevier	Engraved Fire Cracked Rock	Surface	Dune	UNK		UNK	UNK	UMA	4	3
42T0183 and 42T0184	Rel.	UNK	Archaic		-	Surface	UNK	UNK		Limited Activity	UNK	MA	4	3
42T0184	Rel.	UNK	Archaic		-	Surface	UNK	UNK		Limited Activity	UNK	MA	4	3
42T0205	Rel.	AD 700-1200	Fremont	Sevier	F.L. and Ceramics	Surface	Wash	6	UNK	Limited Activity	UNK	MA	3	2
42T0206		UNK	UNK		-	Surface	Wash	1	UNK	Limited Activity	UNK	MA		2
42T0267		UNK	UNK		-	Surface	Wash	90	UNK	Limited Activity	UNK	M	2	2
42T0268		UNK	UNK		-	Surface	Wash	300	UNK	Limited Activity	UNK	M	1	2

(a) Dating method (DM) is relative (Rel.)

(b) Unknown (UNK)

(c) Unknown (UNK)

(d) Flaked lithics (F.L.) which may or may not be accompanied by hammerstones or other flaking stone tools

(e) Unknown (UNK)

(f) Unknown (UNK)

(g) Unknown (UNK)

(h) Code describing the value and integrity of the site: design (D), materials (M), association (A)

(i) Ranking of research value (RV) from 0 (no value) to 5 (highest value)

(j) Confidence rating (CR): 1 = not reliable, 2 = moderately reliable, 3 = reliable

Table 4-3. PRESENTLY KNOWN ARTIFACT, ECOFACT, OR DOCUMENTARY COLLECTIONS FOR ARCHEOLOGICAL RESOURCES ON THE DUGWAY PROVING GROUND

Site Number, Name	Collection Characteristics					
	Collection Location	Artifact	Size/No.	Brief Description	Size/No.	Documentary
Schmitt Collection	Curatorial Repository	Accession Number(s)		Brief Description		
	Smithsonian	386213	1 carton	Total collection		
		386215		consists of points, ranging in date from Folsom Period to		
		386219		Numic Period includes		
		386220		Chipped and ground implements as well as ceramics.		
		386221				
		386222				
		386223				
		386224				
		386225				
Dugway Collection	Curatorial Repository	Accession Number(s)		Brief Description		
	Smithsonian	386226				
		386229				
		386230				
		386231				
		386232				
	Unknown	Unknown		A collection of prints, photos are on file at Base Photo Lab.	None	None
				Negative # 42-007-TEC-75-50132		
				42-008-TEC-75-50133		
				A collection of points drills, and grinding stones.	None	None
				Negative # V2642A		
				V2642B		

Table 4-3. PRESENTLY KNOWN ARTIFACT, ECOFACT, OR DOCUMENTARY COLLECTIONS FOR ARCHEOLOGICAL RESOURCES ON THE DUGWAY PROVING GROUND (Continued)

Site Number, Name	Collection Characteristics					
	Collection Location	Artifact		Ecofact		Documentary
	Curatorial Repository	Accession Number(s)	Brief Description	Size/No.	Brief Description	Size/No.
	Utah State Historical Society	B-57			WPA Pioneer Personal History Interviews, Questions 63-73	136 linear ft. of documents

Table 4-4. POTENTIALLY IDENTIFIABLE BUT NOT PRESENTLY RECORDED ARCHEOLOGICAL RESOURCES ON DUGWAY PROVING GROUND

<u>Site Number, Name</u>	<u>Reference</u>	<u>Description</u>	<u>Research Value CR</u>
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None are presently known

SECTION 5

CHAPTER 5.0 AN ASSESSMENT OF THE SIGNIFICANCE OF THE ARCHEOLOGICAL RESOURCE BASED ON DUGWAY PROVING GROUND

The descriptive data already presented are synthesized in this section to provide the cultural resources planner with an understanding of the significance and values needed to make sound judgements.

In order to clarify the assessment of significance of archeological sites, Schiffer and Gumerman (1977) have isolated five different kinds of significance that pertain to the archeological record. These are: 1) legal, 2) ethnic, 3) public, 4) historic, and 5) scientific significance.

- Legal Significance - Legal significance, as a national policy, is based on the passage and enactment of the Antiquities Act of 1906, the Historic Sites Act of 1935, and the National Historic Preservation Act of 1966 (NHPA), as amended.

The latter two established the responsibility for maintaining a National Register for Historic Places (NRHP). For a site or property to be eligible for the NRHP, it must meet certain criteria, including:

It must be at least fifty years old, and the quality of the significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- 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 lives of persons significant in our past; or
 - C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, 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 to prehistory or history.
- Ethnic Significance - Ethnically significant sites are those sites (Moratto 1975) having either religious, mythological, or other special importance for a specific population. Such a determination depends entirely on the views and values of the specific study population.
 - Public Significance - Public significance centers on the value of archeological research to the public. Moratto (1975) defines public significance in terms of the educational value of a site,

the use of research findings for enrichment or for practical industrial applications, and the use of material cultural remains for exhibits or public enjoyment, and for the enhancement of public appreciation for local history and prehistory.

- Historic Significance - Cultural resources must have "the potential for the identification and reconstruction of specific cultures, periods, lifeways, and events, or provide a typical or well-preserved example of a culture, historical tribe, period of time, or category of human activity," or "be associated with a specific event or aspect of history" (Scovill et al., 1972:56) to be historically significant.
- Scientific Significance - Scientific significance deals with a given site's ability to produce useful data capable of solving archeological problems. There are inherent problems in determining scientific significance, including changing research direction through time and the development of new methods and techniques. Consequently, the site that today is considered insignificant may tomorrow be of critical importance.

The types of significance discussed above also contain levels of significance. These are local, state, regional, and national significance.

5.1 THE SIGNIFICANT RESOURCE BASE

As archeologists classify data to facilitate analysis, cultural resource values must also be classified to facilitate sound management. Table 5-1 represents such an attempt at classification. In this table the cultural resources, both actual and potential, are presented by cultural period and thematic unit. The known resources are quite small considering the size and ecological complexity of the installation (Figure 5-1). This is undoubtedly due to the fact that no large-scale resource survey of the installation has yet occurred.

Highest research values were given to these main temporal units: the Clovis and Folsom Periods of the Paleo-Indian Stage; the Early Archaic Period; and the Formative Stage, Fremont Period. The Clovis and Folsom Periods are particularly important since they are thought to represent an early adaptation to late glacial and post-glacial conditions in the New World. This adaptation seems to have emphasized the taking of large and now extinct animals, i.e., mammoths (Clovis Period) and Bison antiquus (Folsom Period). Sites attributable to these periods are extremely rare in Utah, however, a fluted point attributable to the Folsom Period was found on the Dugway Proving Ground (DPG) and is now curated at the Smithsonian Museum in Washington, D.C.

As far as the Early Archaic Period is concerned, any site that contains data on the very early Desert Culture adaptives (Early Archaic) by human groups are particularly important to our understanding of the origins of the desert way of life.

Table 5-1. SUMMARY OF SIGNIFICANT ARCHEOLOGICAL RESOURCES ON THE DUGWAY PROVING GROUND

Temporal Unit	Thematic Unit	Resource Type	Type Occurrence			Sociocultural Association	Landform Association	Physical Integrity	Research Value (b)	Socio-Cultural Value (c)	
			Known Occurrences (No.)	Potential Occurrences (No.)	Other Likely Occurrences (a)					RV CR (c)	SCV CR (c)
Historic Period	Ranching/Farming	Homesteads/outbuildings Pony Express Stations Highway Bridge 6	0	0	+	Euro/American	Open plain	Fair	3	2	2
Ethno-historic	Transport Seasonal hunting/gathering	Rock Art/campsites	0	0	+	Native American	Terraces open plains near water	Fair	3	3	2
Post Formative Period (Numic speakers)	Seasonal hunting/gathering	Rock Art/campsites	0	0	+	Native American	Terraces open plains near water	Fair	4	3	2
Formative stage Fremont (sevier)	Horti-cultural	Village/campsites	2	0	++	Native American	Floodplains and dune fields	Fair to good	5	3	3
Late Archaic	Seasonal hunting/gathering	Campsite	0	0	+	Native American	Dunes/Terraces/springs	Fair	4	3	2
Middle Archaic	Seasonal hunting/gathering	Campsite	0	0	+	Native American	Dunes/Terraces/springs	Fair	4	3	2
Early Archaic	Seasonal hunting/gathering	Campsite	0	0	+	Native American	Dunes/Terraces/springs	Fair	5	3	2
Archaic	Seasonal hunting/gathering	Campsite	2	0	+	Native American	Dunes/Terraces/springs	Fair	4	3	2

Table 5-1. SUMMARY OF SIGNIFICANT ARCHEOLOGICAL RESOURCES ON THE DUGWAY PROVING GROUND (Continued)

Temporal Unit	Thematic Unit	Resource Type	Type Occurrence			Sociocultural Association	Landform Association	Physical Integrity	Research Value (b)	Socio-CR Value (c)		SCV CR (c)
			Known Occurrences (No.)	Potential Occurrences (No.)	Other Likely Occurrences (a)							
Plano	Big game hunting	Kill and butchering site	0	0	+	Native American	Arroyos/dunes	Fair to poor	4	3	3	2
Folsom	Big game hunting	Kill and butchering site	0	0	+	Native American	Arroyos/dunes	Fair to poor	5	3	3	2
Clovis	Big game hunting	Kill and butchering site	0	0	+	Native American	Dunes/basins/springs	Fair to poor	5	3	3	2
Pre-Clovis	Big game hunting	Kill and butchering site	0	0	+	Native American	Dunes/basins/springs	Fair	4	3	3	2

(a) The number of presently known or potential archeological resources of this type is specified here. In addition a judgement has been made as to the likelihood that other members of this resource occur within the facility, based on an analysis of the ethnohistoric or historic land use patterns and/or a review of the landform patterning of prehistoric materials. The probability of these additional occurrences has been noted as negative (-), positive (+), or highly positive (++).

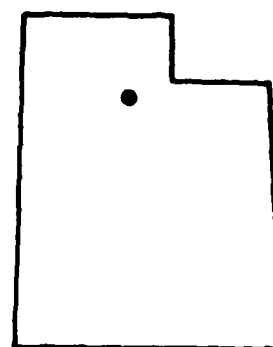
(b) This is a subjective summary assessment of the overall research value (RV) of the resource class. It is an evaluation of the class' quality of preservation, representation of activity diversity or uniqueness, and temporal distinctiveness or reflection of diachronic relationships. It incorporates the need to avoid triviality, but to acquire what may be redundant data so as to discern patterns among those data. Based on these research values, the resource classes under discussion are ranked from 0 (no value) to 5 (highest value), including "NA" if such an evaluation is believed to be impossible given the available information.

(c) The Confidence Rating (CR) is a further evaluation of the perceived reliability of the research (RV) or sociocultural (SCV) values of the resource class. 1 = the judgement is more guess than science, and likely not to be reliable; 2 = the judgement is moderately reliable; 3 = the judgement is most likely reliable.

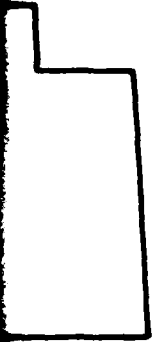
(d) This is a subjective summary assessment of the overall sociocultural value (SCV) of the resource class. It is an evaluation of the social, religious, or political importance of the resource to a contemporary community, from 0 (no value) to 5 (highest value).

DUGWAY PROVING GROUND

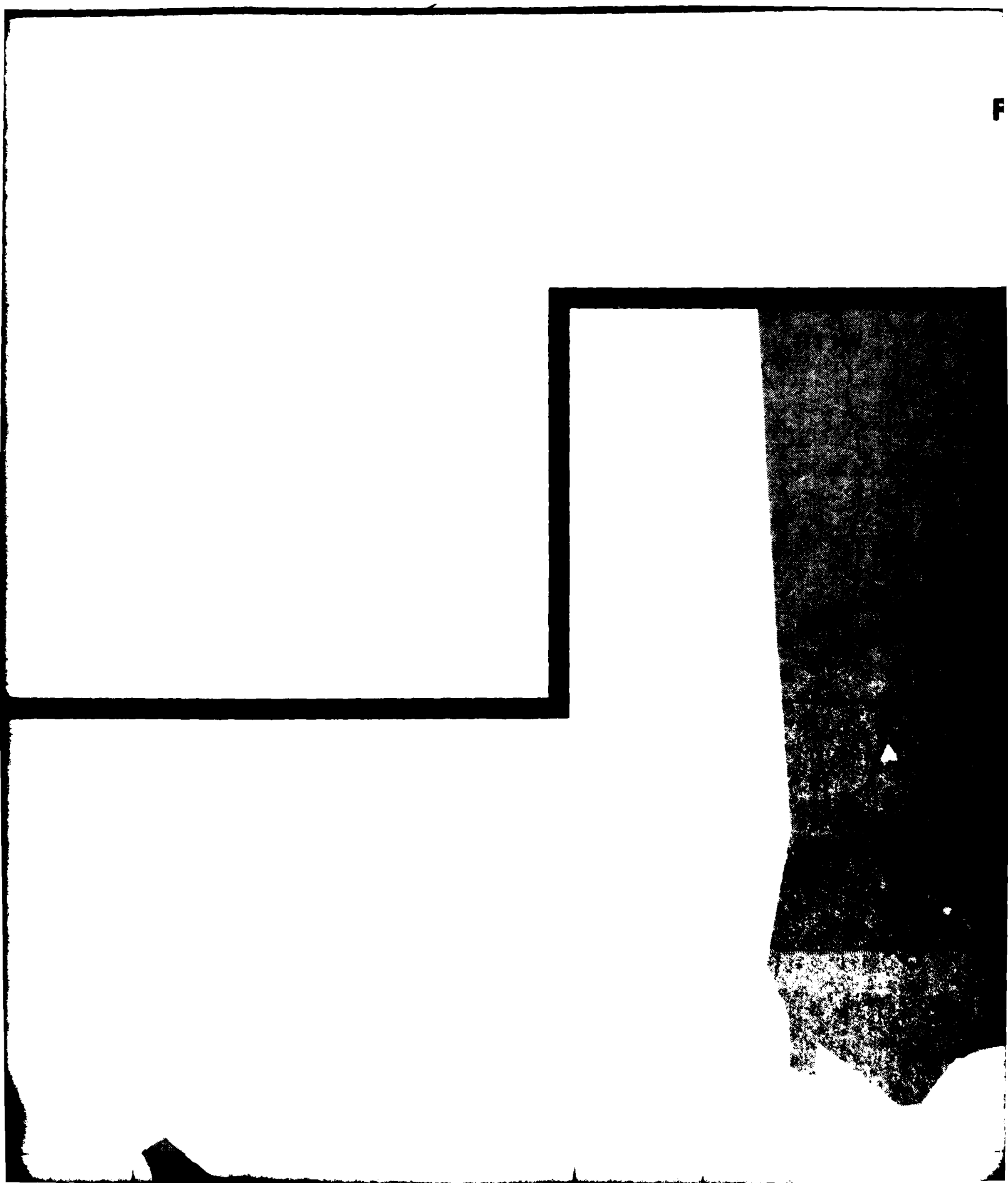
**Figure 5-1 KNOWN, POTENTIAL
AND
SURVEYED ARCHEOLOGICAL SITES**



UTAH MAP LOCATOR
SALT LAKE CITY



LOCATOR
AKE CITY



**Figure 5-1 KNOWN, POTENTIAL AND SURVEYED ARCHEOLOGICAL SITES
DUGWAY PROVING GROUND**

 NATIONAL REGISTER OF HISTORIC PLACES

 HISTORIC SITE

 PREHISTORIC SITE

 POTENTIAL SITES

 BORDER OF STUDY AREA

VEYED ARCHEOLOGICAL SITES -

 **NATIONAL REGISTER OF HISTORIC PLACES SITE**

 **HISTORIC SITE**

 **PREHISTORIC SITE**

 **POTENTIAL SITES**

 **BORDER OF STUDY AREA**

6



8

16
P

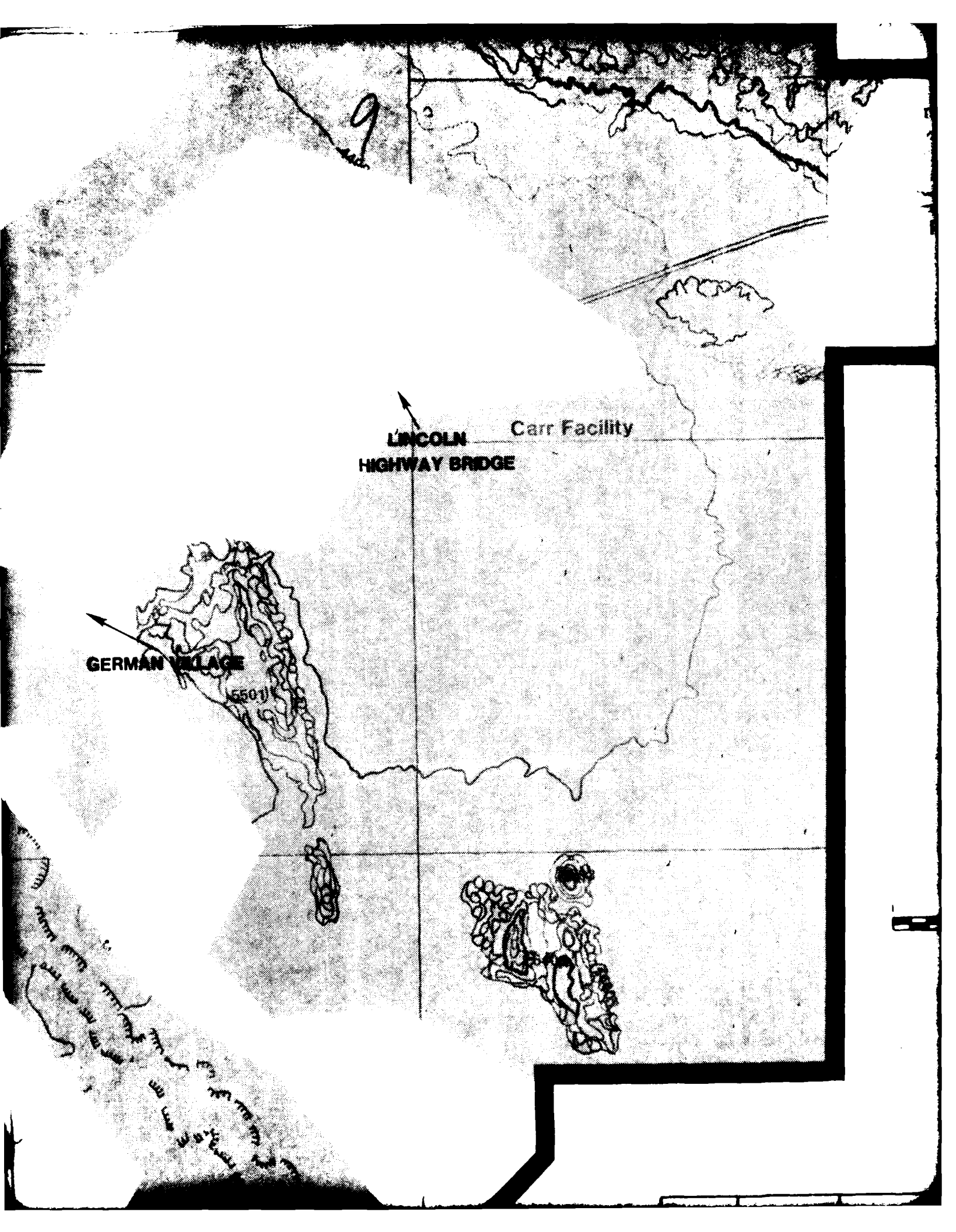


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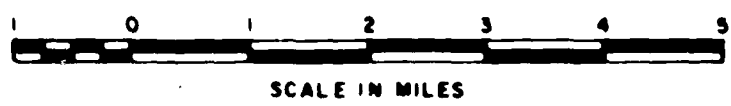
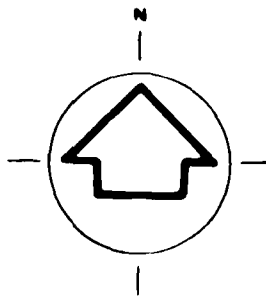
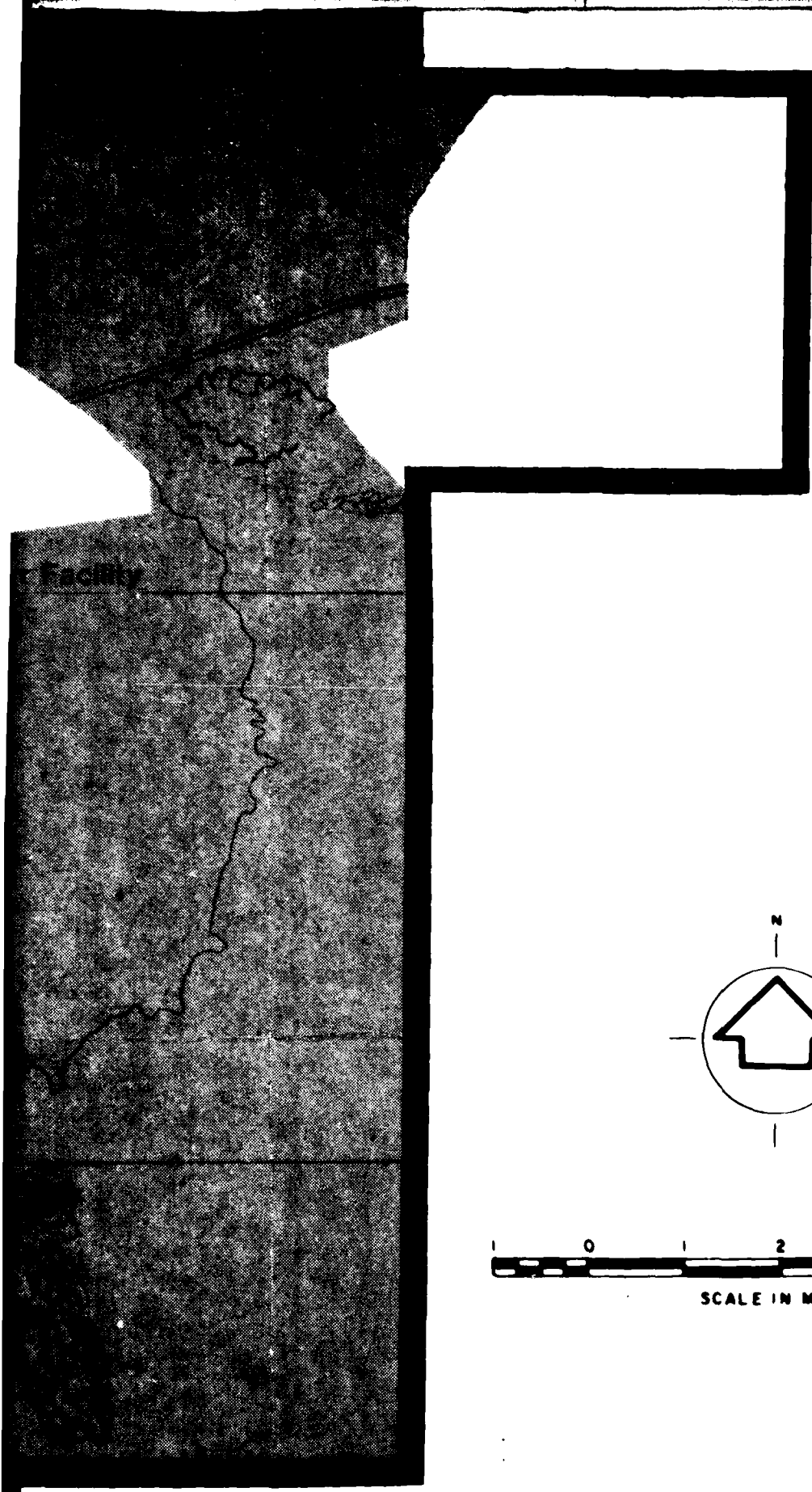
LINCOLN Carr Facility
HIGHWAY BRIDGE

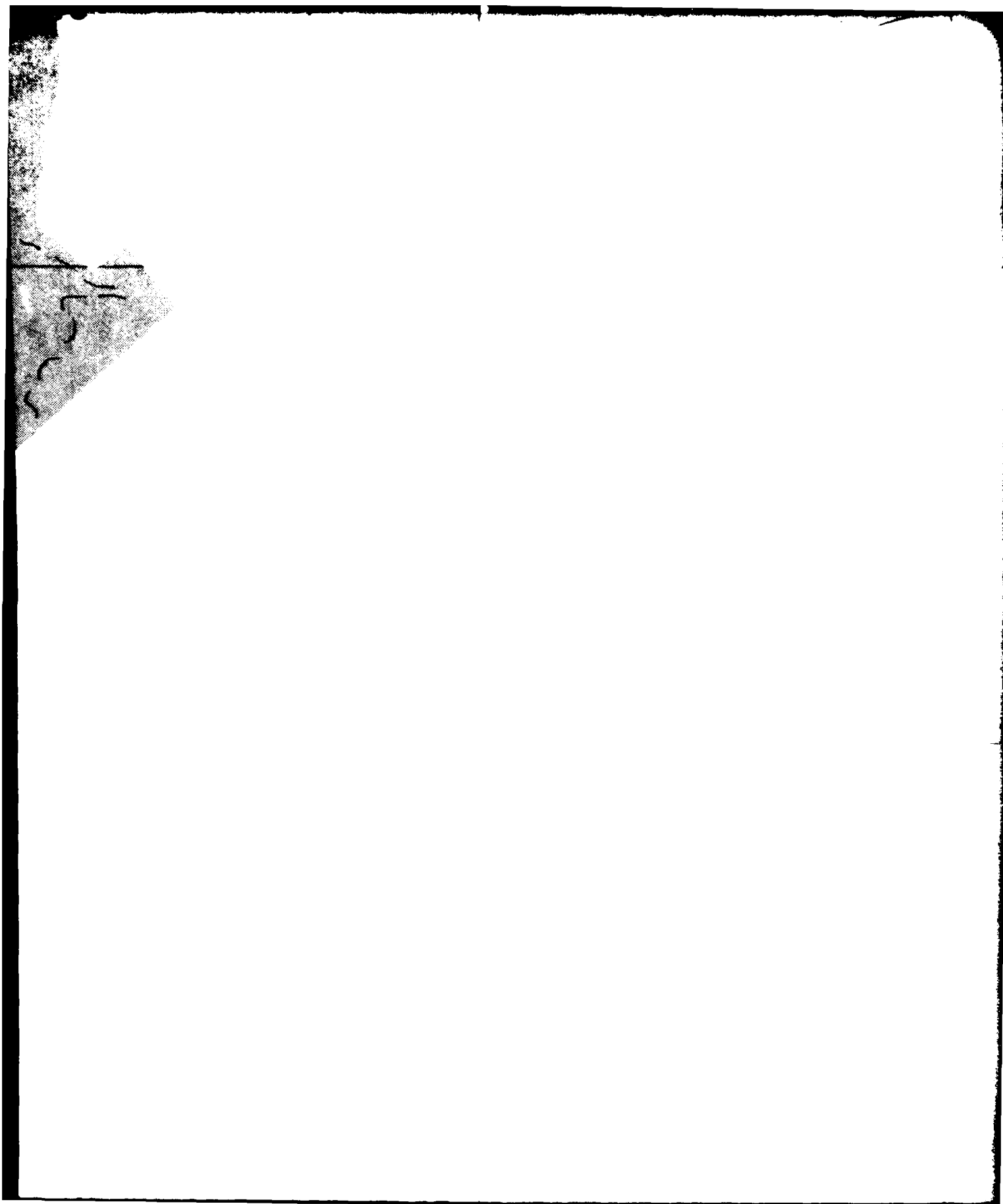
GERMAN VILLAGE

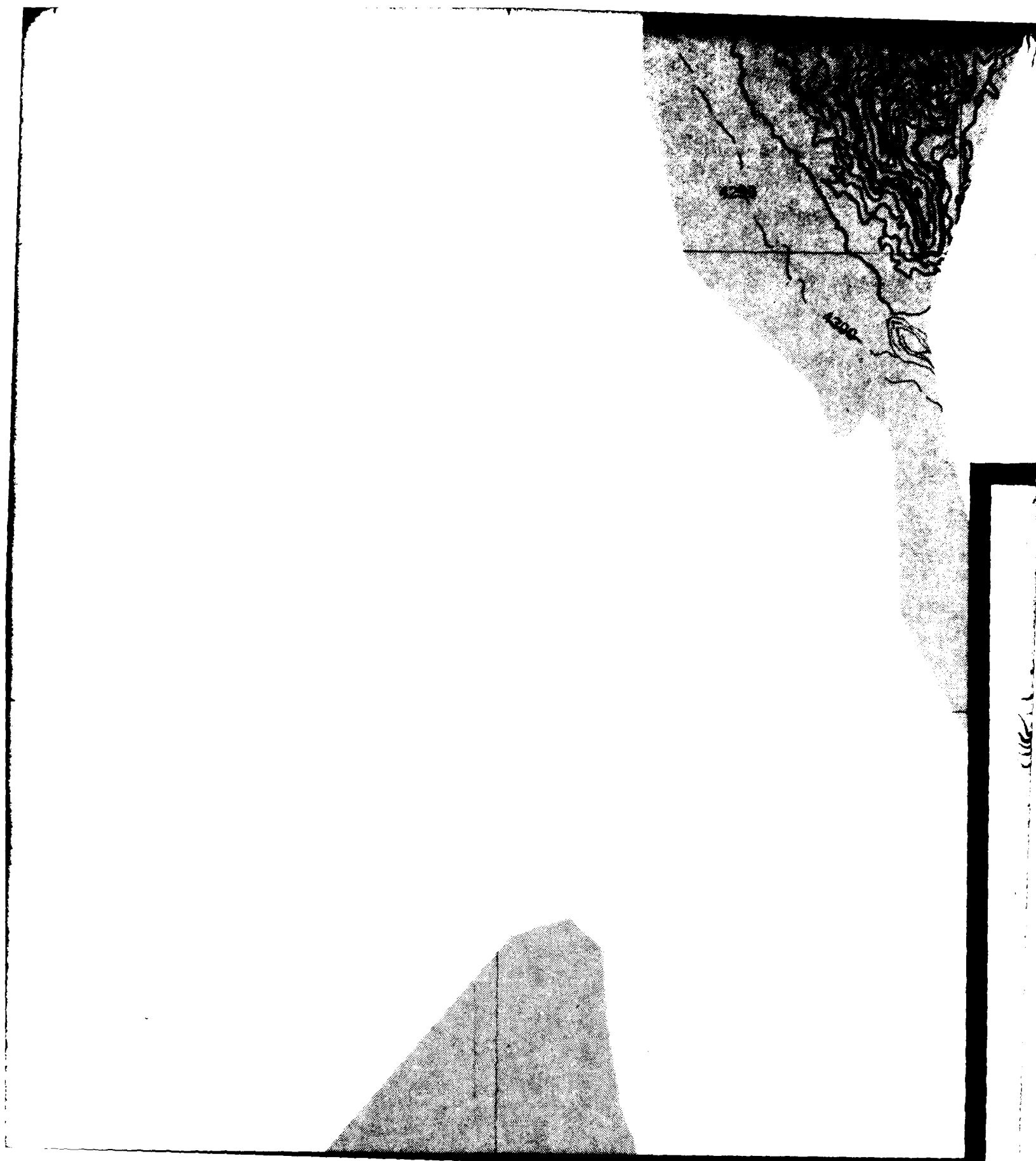
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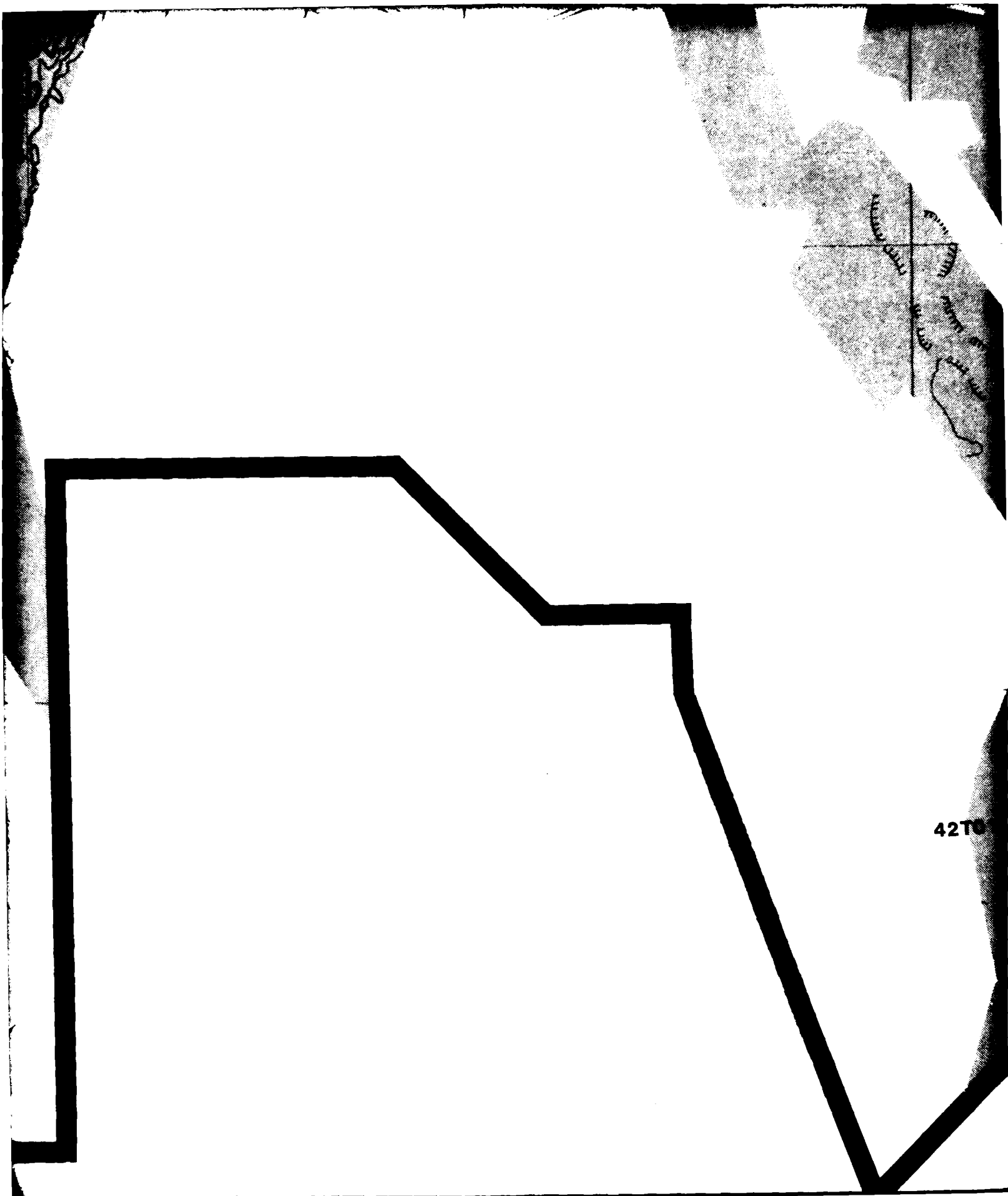


10









42T0

GERM

42T0267

42T0268

42T0184

42T0183

42T0205

42T0206

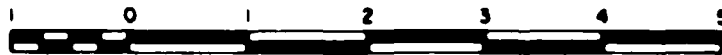
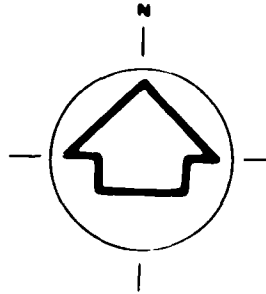
DUGWA

F C TORKELSON CO
ENGINEERS
SALT LAKE CITY, UT.

RECOMMENDED BY THE INSTALLATION PLANS

DATE: JUNE 76
REVIEWED & COMMENTED ON BY MAJOR COB
& FORWARDED TO THE CHIEF OF ENGINEERS

DATE:



SCALE IN MILES

DUGWAY PROVING GROUND

DUGWAY, UTAH

F C TORKELSON CO.
ENGINEERS
SALT LAKE CITY, UTAH

U S ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

MASTER PLAN

BASIC INFORMATION MAPS

RESERVATION MAP

RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL

Adalbert E. Toepel, Jr.
ADALBERT E TOEPEL, JR COLONEL, F A
COMMANDING

DATE: JUNE 76

REVIEWED & COMMENTED ON BY MAJOR COMMANDER
& FORWARDED TO THE CHIEF OF ENGINEERS

DATE:

DATE
JUNE 76

SHEET NO.

2 of 6.

DRAWING NO.
18-02-19

FILE NO.
181-13-48

In terms of the Fremont Period, the recovery of Fremont engraved pebbles in the dune north of Wig Mountain (site 42T0213) argues for the presence of Fremont horticulturalists in the area, as well as indicates the possible presence of data that could yield valuable insights into Fremont ideology.

5.2 IDEAL GOALS AND OBJECTIVES

An ideal cultural resource management program would consist of: 1) identification of resources, 2) evaluation of these resource as to their significance and potential to provide useful scientific data, and 3) an active program of conservation of these resources.

Identification would be accomplished through a two-phase program. Phase I would consist of a literature review to identify any known archeological and historic properties located on the Depot.

Phase II of the identification program would consist of a field survey of the undisturbed portions of the Proving Ground to locate and identify surface evidence of prehistoric and/or historic sites. This survey program would include a close-interval pedestrian survey supplemented by detailed topographic maps and aerial photography. Standard forms as specified by the Utah State Archeologist, plus any needed supplementary forms, should be completed for any prehistoric and historic materials found. Artifacts collected during the course of the survey should be kept to a bare minimum and all materials removed from the site should be fully documented and appropriately curated.

In some instances, it may be necessary to include subsurface investigations (e.g., augering, test excavation, remote sensing) to determine site content, extent, and significance.

It is during this phase of the identification program that important research values, as well as other values, will be identified to serve as a basis for the development of future research designs and to serve as the basis for a variety of management options.

All sites located during the survey should be evaluated, in consultation with the State Historic Preservation Officer (SHPO) for the State of Utah, regarding eligibility for nomination to the NRHP. In accordance with Section 106 of the Historic Preservation Act, any plans to modify or disturb a site, 1) determined to be eligible for nomination to, 2) pending nomination to, or 3) listed on the NRHP, will have to be submitted to the Advisory Council on Historic Preservation for comment.

Active conservation as an ideal concept embodies the idea that archeological resources are a non-renewable resource and that once they are destroyed they can never be recovered. Consequently, it is critical that the cultural resource manager be able to exercise management options in a nonreactive manner (i.e., being present when decisions are made which may influence cultural resources). In other words, the greater the input of the cultural resource manager into the planning process, the better the management decisions.

Full-scale excavation and analysis of any resource is a course of action that should be taken only where the resource is threatened with unavoidable destruction or damage. On the other hand, excavation and analysis should take place if site destruction is inevitable. It is important to the data

recovery and the mitigation process that the archeologist be placed in a nonreactive situation (e.g., the site being threatened with immediate destruction). Again, the greater the lead time the archeologist has, the greater and more efficient the data recovery process will be.

In either case, conservation or excavation, an ideal program would also incorporate an interpretative component in which the public is provided with the substance of the information values that are inherent in the resources present.

SECTION 6

CHAPTER 6.0 A RECOMMENDED ARCHEOLOGICAL MANAGEMENT PLAN FOR DUGWAY PROVING GROUND

Given the known and potential for significant cultural resources on Dugway, the following management plan provides the basis for decisions concerning impacts on eligible cultural resources. The following section outlines the Dugway Master Plan and appropriate cultural resource goals, with scope of work and estimated cost limits for the identified management needs.

6.1 FACILITY MASTER PLAN AND PROPOSED IMPACTS

The text for this section was condensed from Pinkham et al. (1979) and from Robert G. Muir and Associates (personal communication, Charles M. Benson), who are developing the Master Plan through 1990. The assigned mission of Dugway Proving Ground (DPG) has remained relatively static for the past decade, and no major expansion of the present mission, or introduction of additional missions is anticipated. The national policy for de-emphasizing Chemical Warfare/Biological Defense research and testing has apparently influenced potential major expansion at DPG. Although the emphasis will be to replace existing facilities as funding becomes available, DPG will continue to provide testing and research services as directed by the U.S. Army Test and Evaluation Command (TECOM).

The development plans are influenced by two primary factors. First, the isolation of the installation from any sizeable civilian communities has dictated an orientation toward recreational and social facilities for DPG residents. Secondly, the land use of the installation reflects the unique mission at DPG, with land use being largely dependent on meeting various explosive and chemical testing safety criteria. External encroachment is not a factor because of existing topographic barriers.

Because the Master Plan is in the developmental stage, many projects have only funding and time schedules projected. The exact location of many of the ground disturbing activities is as yet unknown. Many projects are planned to upgrade and modify existing structures.

A summary of on-going and planned ground disturbing activities (Table 6-1) includes the affected cultural resources and the potential impacts, with mitigation recommendations. The summary is based on the Environmental Assessment (Pinkham et al. 1979) and conversations with Charles M. Benson, Environmental Planner for Muir and Associates. There are 27 ground disturbing construction activities planned during the 5-year period. Building modifications and upgrading information has been excluded from Table 6-1, unless there are ground disturbing activities associated with construction. The improvements in the Master Plan are shown in detail as they are planned within Areas Baker, Carr, Ditto, and English Village (Figures 6-1 through 6-15). The named areas are identified in Figure 3-1.

6.2 APPROPRIATE ARCHEOLOGICAL MANAGEMENT GOALS WITHIN DUGWAY PROVING GROUND

This section presents appropriate and efficient cultural resource management objectives for DPG. The basis of management objectives are the

Table 6-1. A SUMMARY OF ON-GOING AND PLANNED ACTIVITIES ON THE DUGHAY PROVING GROUND THAT COULD AFFECT ARCHEOLOGICAL RESOURCES (PROPOSED ACTIVITIES WITH DATES, AND PROJECT LOCATION INFORMATION)

Description	Date	Area (a)	Size Sq/Ft.	Estimated Ratio of		Recommen- dation Survey or Monitor (d)	Resource Class (e)	Resource Known or Predicted (f)	NRHP Status (g)	Other Value (h)	Direct (i)	Indirect (j)	Mitiga- tion Options
				Depth Below Surface (ft.)	Total Disturbed Area (b)	Total Impact (c)							
Addition to Gymnasium (Fig. 6-12)	1987	English Village	1,764	2 - 6	2.5	9.4	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	N/A	Arch. Data Recovery
Auto Craft Shop Improvements (Fig. 6-13)	1987	English Village	3,872	2 - 6	2.5	10	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	N/A	Arch. Data Recovery
Supply Division Warehouse (Fig. 6-14)	1989	English Village	62,900	2 - 6	3.5	16.5	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	N/A	Arch. Data Recovery
Demineralli- zation Facility (Fig. 6-15)	1990	English Village	2,400	2 - 6	2.5	9.6	M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	N/A	Arch. Data Recovery
Construc- tion Secu- rity Fence Relocation of Building 2058 (Fig. 6-1)	No Date	Baker Info.	No Info.				M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	N/A	Arch. Data Recovery

Table 6-1. A SUMMARY OF UN-GOING AND PLANNED ACTIVITIES ON THE DUGWAY PROVING GROUND THAT COULD AFFECT ARCHEOLOGICAL RESOURCES (Continued)
(PROPOSED ACTIVITIES WITH PROJECT LOCATION INFORMATION)

Description	Date	Area	Size Sq/Ft.	Estimated Ratio of			Recommen- dation Survey or Monitor	Resource Class	Resource Known or Predicted (f)	NRHP Status (g)	Other Value (h)	Direct (i)	Indirect (j)	Mitiga- tion Options
				Depth Below Surface (ft.)	Disturbed Area (b)	Total Acres Impact (c)								
Physical Security Improvements Stradley Igloos (Fig. 6-2)	No Date	Carr	9,840	10	2.5	11	S	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery
Munitions and Material Support Facility (Fig. 6-3)	No Date	Carr	17,380	2 - 6	3.5	12.3	S+M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery
Heavy Weapons Maintenance Building (Fig. 6-4)	No Date	Carr	4,500	2 - 6	2.5	10	S+M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery
Toxic Waste Evaporation (Fig. 6-5)	No Date	Carr	4,500	10	2.5	10	S+M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery
Environ- mental Conditioning Language Facility (No Figure)	No Date	Carr	No				S+M	Paleo Archaic Fremont Numic Historic	L L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery

Table 6-1. A SUMMARY OF ON-GOING AND PLANNED ACTIVITIES ON THE DUGWAY PROVING GROUND THAT COULD AFFECT ARCHEOLOGICAL RESOURCES (Continued)
(PROPOSED ACTIVITIES WITH PROJECT LOCATION INFORMATION)

Description	Date	Area (a)	Size Sq/Ft.	Depth Below Surface (ft.)	Estimated Ratio of			Recommen- dation Survey or Monitor (d)	Resource Class (e)	Resource Known or Predicted (f)	NHHP Status (g)	Other Value (h)	Direct (i)	Indirect (j)	Mitiga- tion Options
					Area (b)	To Total Impact (c)	Disturbed Total (c)								
Technical Storage Facility (Fig. 6-6)	No Date	Ditto	40,000	2 - 6	3.5	15	15	M	Paleo Archaic Fremont Numic Historic	L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery
MTD Operations and Engi- neering Criteria (Fig. 6-7)	No Date	Ditto	32,140	2 - 6	3.5	14	14	M	Paleo Archaic Fremont Numic Historic	L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery
(Combined Laboratory Facility (Fig. 6-8)	No Date	Ditto	80,154	2 - 6	3.5	18	18	M	Paleo Archaic Fremont Numic Historic	L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery
Motor Pool Relocation Physical Security Imp. (Fig. 6-9)	No Date	Ditto	2,400	2 - 6	2.5	9.6	9.6	M	Paleo Archaic Fremont Numic Historic	L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery
Communi- cations Facility Expansion (Fig. 6-10)	No Date	English Village	3,784	2 - 6	2.5	10	10	M	Paleo Archaic Fremont Numic Historic	L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery
Golf Club House (Fig. 6-11)	No Date	English Village	5,000	2 - 6	2.5	10.3	10.3	M	Paleo Archaic Fremont Numic Historic	L L L L	INSF	No	Destroy Resources	N/A	Arch. Data Recovery

Table 6-1. A SUMMARY OF ON-GOING AND PLANNED ACTIVITIES ON THE DUGWAY PROVING GROUND THAT COULD AFFECT ARCHEOLOGICAL RESOURCES (Continued)
(PROPOSED ACTIVITIES WITH ONLY PROJECT LOCATION AND PROJECTED DATE, NO OTHER INFORMATION AVAILABLE)

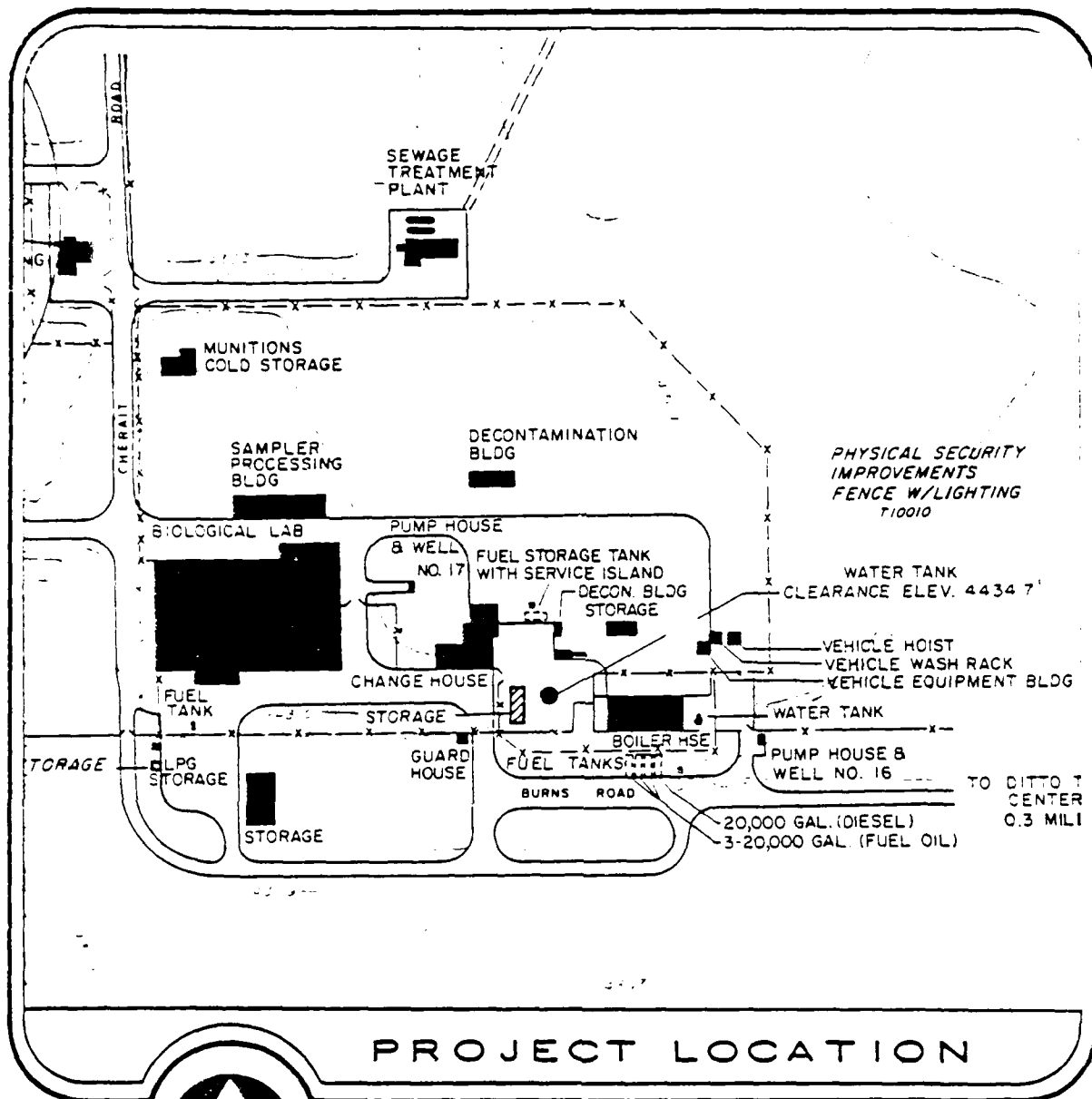
Description	Date	Area (a)	Size Sq/Ft.	Estimated Ratio of		Total Acres	Recommen- dation Survey or Monitor	Resource		NRHP	Other	Mitiga-	
				Depth Below Surface (ft.)	Disturbed To Total Area (b)			Class	Predicted			Direct	Indirect
				(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Chemical Change House	1984	Carr	No Information										
Explosive Change House	1985	Carr	No Information										
Ditto Change House	1984	Ditto/ Avery	No Information										
Rebuild Water Dis- tribution System	1985	Ditto/ Avery	No Information										
Rail Spur to Ditto/ Avery	1989	Dugway Reser- vation	No Information										
Construct Third Sewage Lagoon	1985	English Village	No Information										
Construct 104 New FH Units	1986	English Village	No Information										
New Commu- nity Services Center	1987	English Village	No Information										
Move Standby Power Plant From Ditto	1990	English Village	No Information										
Mobile Home Facility	1986	Fries Park	No Information										

Table 6-1. A SUMMARY OF ON GOING AND PLANNED ACTIVITIES ON THE HIGHWAY PROVING GROUND THAT COULD AFFECT ARCHEOLOGICAL RESOURCES
(Continued)

- (a) Plans for these areas are shown in Figures 6-1 through 6-15.
- (b) Not all the ground within the boundaries of an on-going or proposed activity area will necessarily be affected. This ratio is an evaluation of the acres of surface projected to be disturbed within a proposed activity area in proportion to the overall size of the area itself.
- (c) Total acreage estimates are based on a 300 ft. perimeter added to the proposed construction/modification activity.
- (d) Survey (S), Monitor (M)
- (e) This is a synthetic statement of temporal unit plus thematic unit plus resource type, as presented in Table 5-1.
- (f) This is an identification on the known (K) or potential (P) resources that are located within the proposed activity area, as well as the positive (+) chance that presently unknown resources are likely (L) to be found there.
- (g) The National Register of Historic Places (NRHP) status of the resource is identified by the following code. NSF = insufficient information available by which to make a judgment.
- (h) Other values may include concerns such as traditional Native American religious significance, local zoning requirements.
- (i) Direct impacts are those whose ground-disturbing activities will directly damage or destroy the identified resource.
- (j) Indirect impacts include activities such as vandalism because of increased knowledge of a resource, increased erosion of a resource because of projected-related activities (e.g., loss of vegetative cover), or loss of structural integrity of surface or buried structural elements because of increased traffic vibration. Not applicable (N/A).

Figures 6-1 through 6-15

A Summary of Ongoing and Planned Activities on the
Dugway Proving Ground That Could Affect Archeological Resources



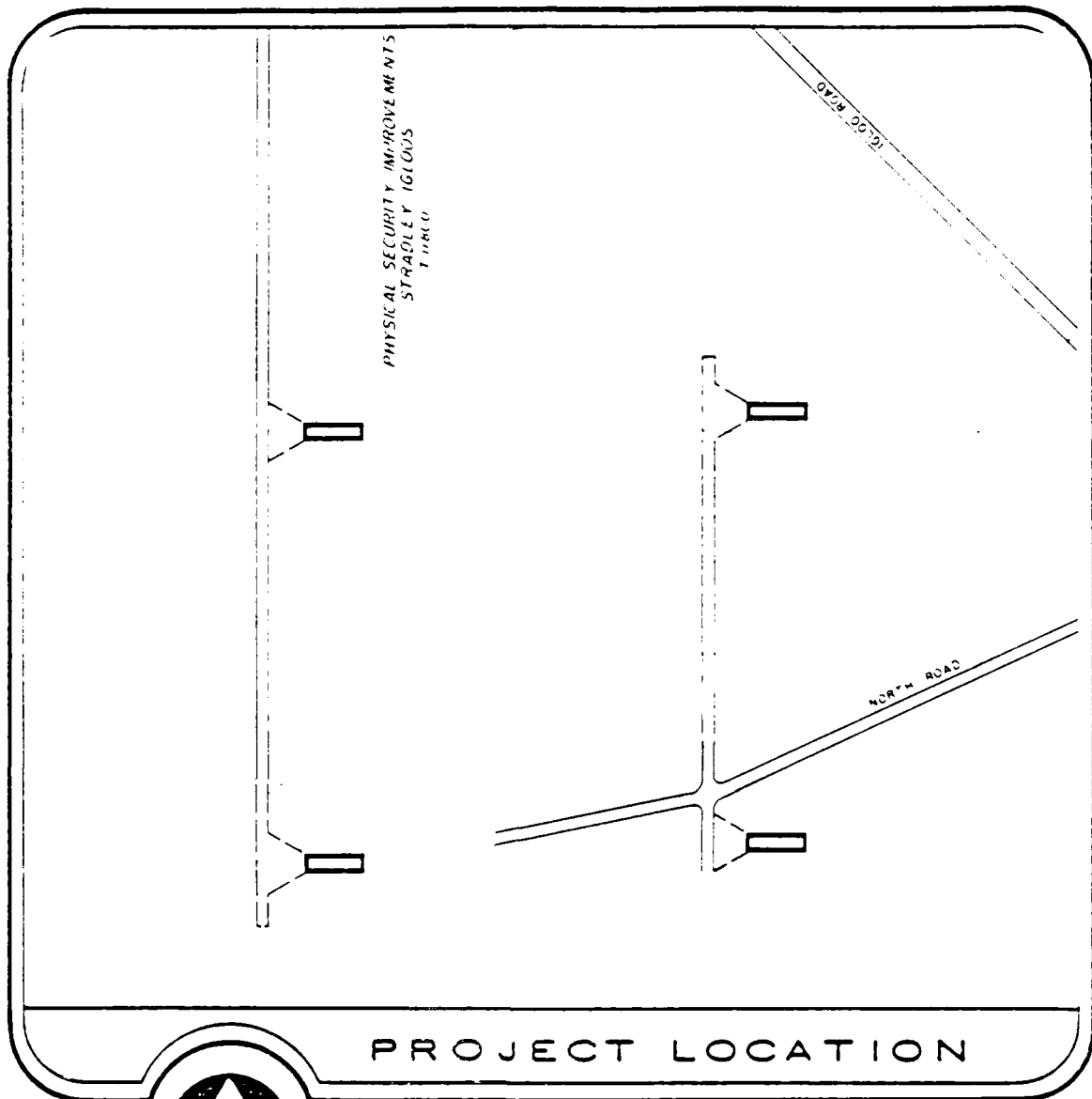
PROJECT DATA

PROJECT NO. T10010
 PROJECT TITLE PHYSICAL SECURITY IMPROVEMENTS
 GENERAL SITE PLAN AREA NO. BAKER
 PROJECT ENTRY, TAB PAGE NO. 69
 GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. 22
 PROJECT SCOPE _____
 PROJECT PRIORITY NO. _____
 CATEGORY CODE NO. B7210

REMARKS: CONSTRUCTION OF SECURITY FENCING, INSTALLATION OF SECURITY LIGHTING, AND RELOCATION OF BUILDING 2058.

SITE: NO MAJOR SITE MODIFICATIONS ARE REQUIRED, AND NO ADVERSE ENVIRONMENTAL IMPACTS ARE EXPECTED.

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PROJECT LOCATION

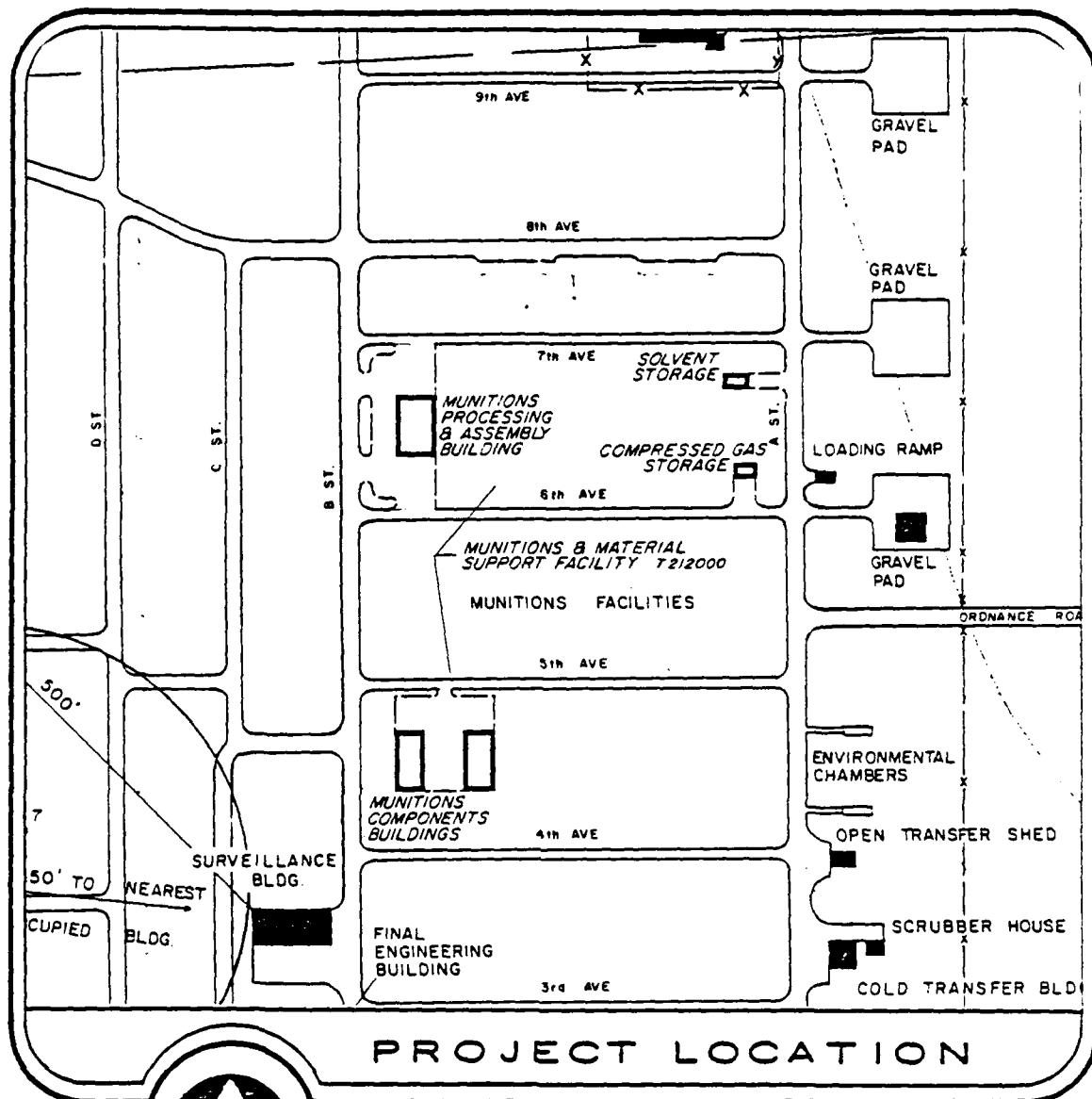


PROJECT DATA

PROJECT NO. 11800
 PROJECT TITLE PHYSICAL SECURITY IMPROVEMENTS, STRADLEY IGLUUS
 GENERAL SITE PLAN AREA NO. CARR
 PROJECT ENTRY, TAB PAGE NO. 25
 GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. 22
 PROJECT SCOPE 9,840 SF
 PROJECT PRIORITY NO. 42280
 CATEGORY CODE NO. 42280

REMARKS _____

BARBER & ASSOCIATES - ARCHITECTS & PLANNERS - COLORADO SPRINGS, COLORADO



PROJECT DATA

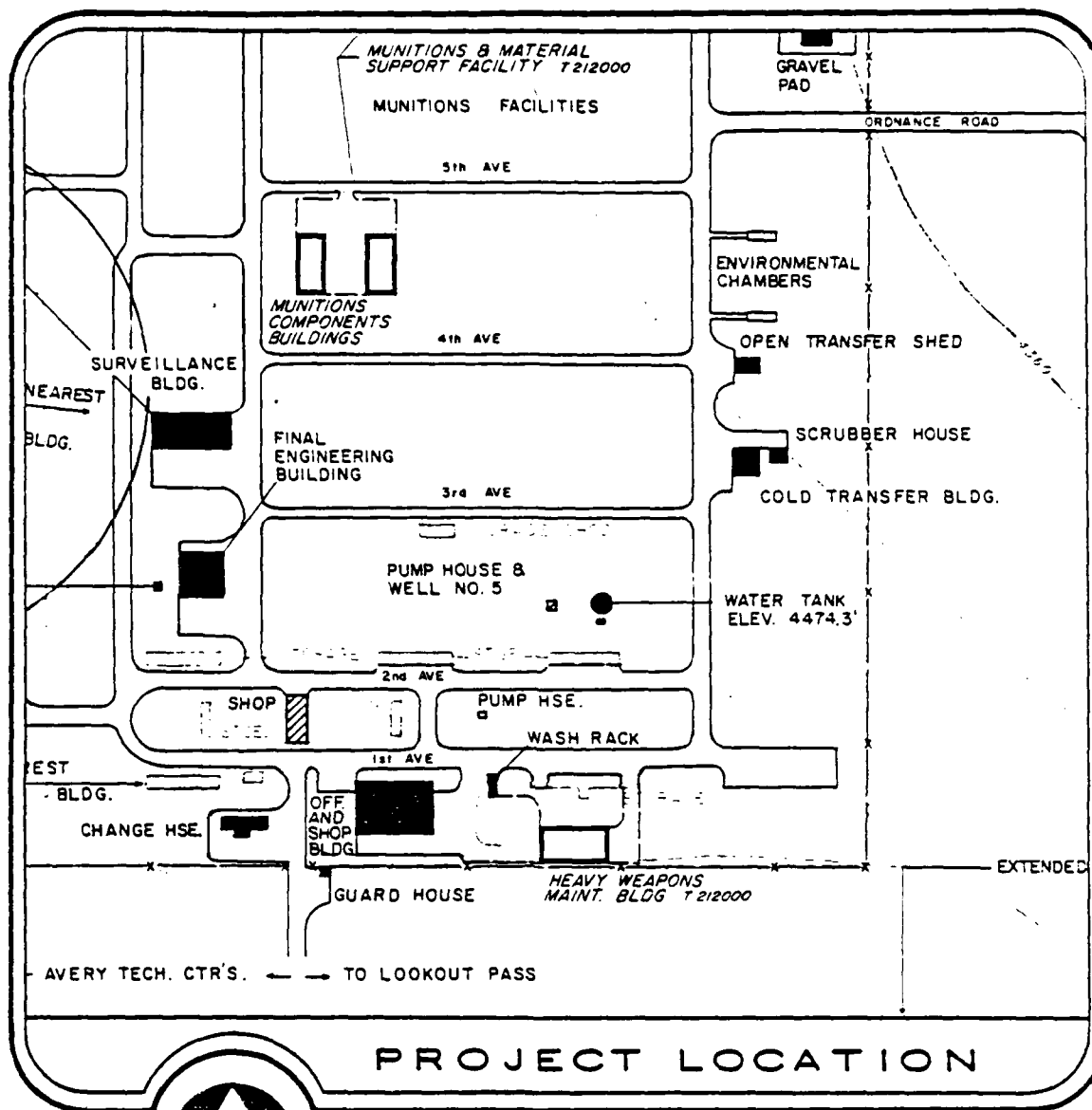
PROJECT NO. 212000 (3 pages)
 PROJECT TITLE MUNITIONS AND MATERIAL SUPPORT FACILITY
 GENERAL SITE PLAN AREA NO. CARR
 PROJECT ENTRY, TAB PAGE NO. 20
 GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. 22

PROJECT SCOPE SEE REMARKS
 PROJECT PRIORITY NO.
 CATEGORY CODE NO. VARIOUS

REMARKS: CONSISTS OF FIVE NEW BUILDINGS HAVING A TOTAL SQUARE FOOTAGE OF 17,380 SF REQUIRES ALL MAJOR UTILITIES IN ADDITION TO SUPPORTING ROADS AND PARKING. SEE "HEAVY WEAPONS BUILDING"

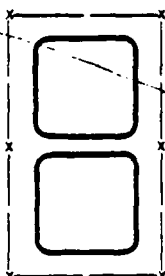


SITE: SITES ARE DISPERSED (SEE MAP) NO EXTENSIVE EARTHWORK FOR ENVIRONMENTAL IMPACTS. SEE TEXT. SEE "MUNITIONS/MATERIAL SUPPORT FAC"

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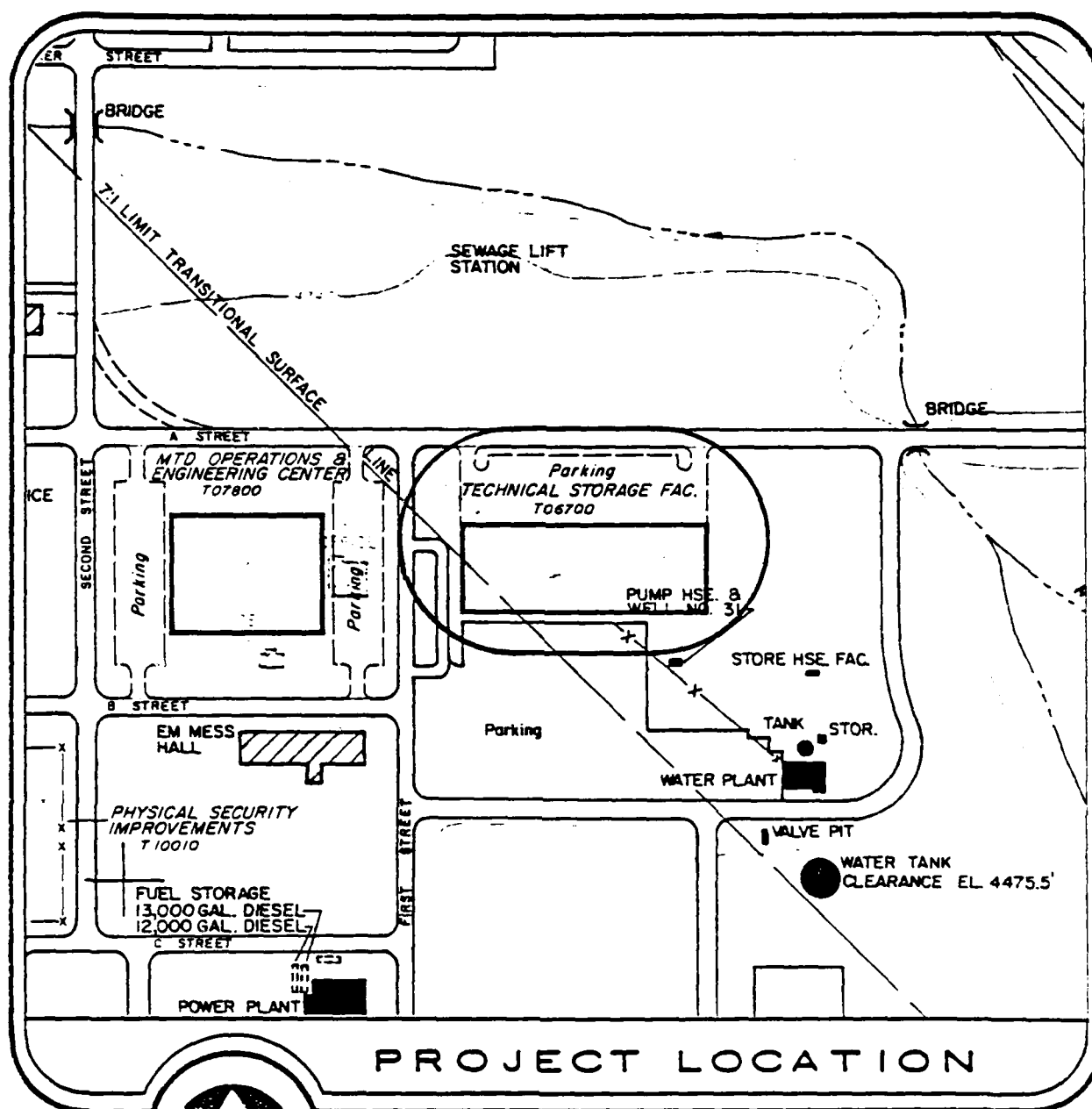
PROJECT DATA	
PROJECT NO. <u>212000 (3 pages)</u>	REMARKS: <u>SEE PROJECT DATA</u>
PROJECT TITLE <u>HEAVY WEAPONS MAINTENANCE BUILDING</u>	<u>SHEET FOR "MUNITIONS/MATERIAL SUPPORT FACILITY"</u>
GENERAL SITE PLAN AREA NO. <u>GARR</u>	
PROJECT ENTRY, TAB PAGE NO. <u>16</u>	
GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. <u>22</u>	
PROJECT SCOPE <u>4,500 SF</u>	
PROJECT PRIORITY NO. _____	
CATEGORY CODE NO. <u>21530</u>	

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<h1 style="margin: 0;">RR FACILITY</h1>	
<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 30%;"> <p>TEST STRUCTURES</p> </div> <div style="width: 30%; text-align: center;">  </div> <div style="width: 30%;"> <p>TOXIC WASTE EVAPORATION PONDS T 212000</p> </div> </div>	
<h2 style="margin: 0;">PROJECT LOCATION</h2>	
	
<h2 style="margin: 0;">PROJECT DATA</h2>	
<p>PROJECT NO. <u>T 212000 (3 pages)</u></p> <p>PROJECT TITLE <u>MUNITIONS AND</u></p> <p><u>MATERIEL SUPPORT FACILITY</u></p> <p>GENERAL SITE PLAN AREA NO. <u>CARR</u></p> <p>PROJECT ENTRY, TAB PAGE NO. _____</p> <p>GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. <u>22</u></p> <p>PROJECT SCOPE <u>SEE REMARKS</u></p> <p>PROJECT PRIORITY NO. _____</p> <p>CATEGORY CODE NO. _____</p>	<p>REMARKS: <u>TOXIC WASTE EVAPORATION</u></p> <p><u>PONDS. SEE "MUNITIONS/</u></p> <p><u>MATERIEL SUPPORT FACILITY</u></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

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Figure 6 - 5.

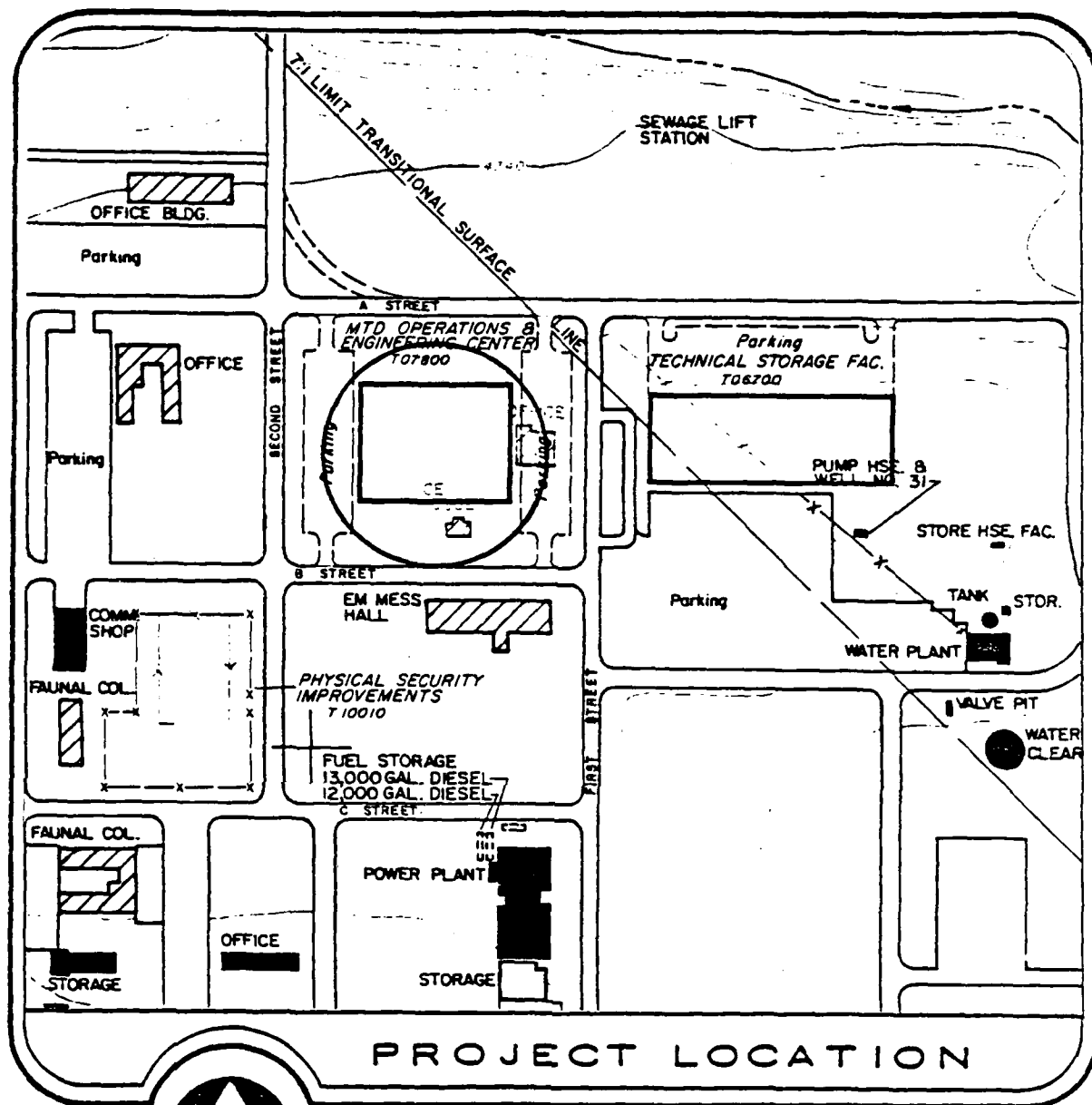


PROJECT DATA

PROJECT NO. TO 6700
 PROJECT TITLE TECHNICAL STORAGE FACILITY
 GENERAL SITE PLAN AREA NO. DITTO
 PROJECT ENTRY, TAB PAGE NO. NA
 GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. 22
 PROJECT SCOPE 40,000 SF
 PROJECT PRIORITY NO. _____
 CATEGORY CODE NO. _____

REMARKS: 40,000 SF MASONRY BLOCK STRUCTURE FOR HEATED STORAGE OF DECONTAMINATION TRUCKS, AND UNHEATED STORAGE OF FIELD TEST EQUIPMENT. MAJOR UTILITIES ARE AVAILABLE ON-SITE.

SITE: NO MAJOR EARTHWORK IS REQUIRED.



PROJECT LOCATION

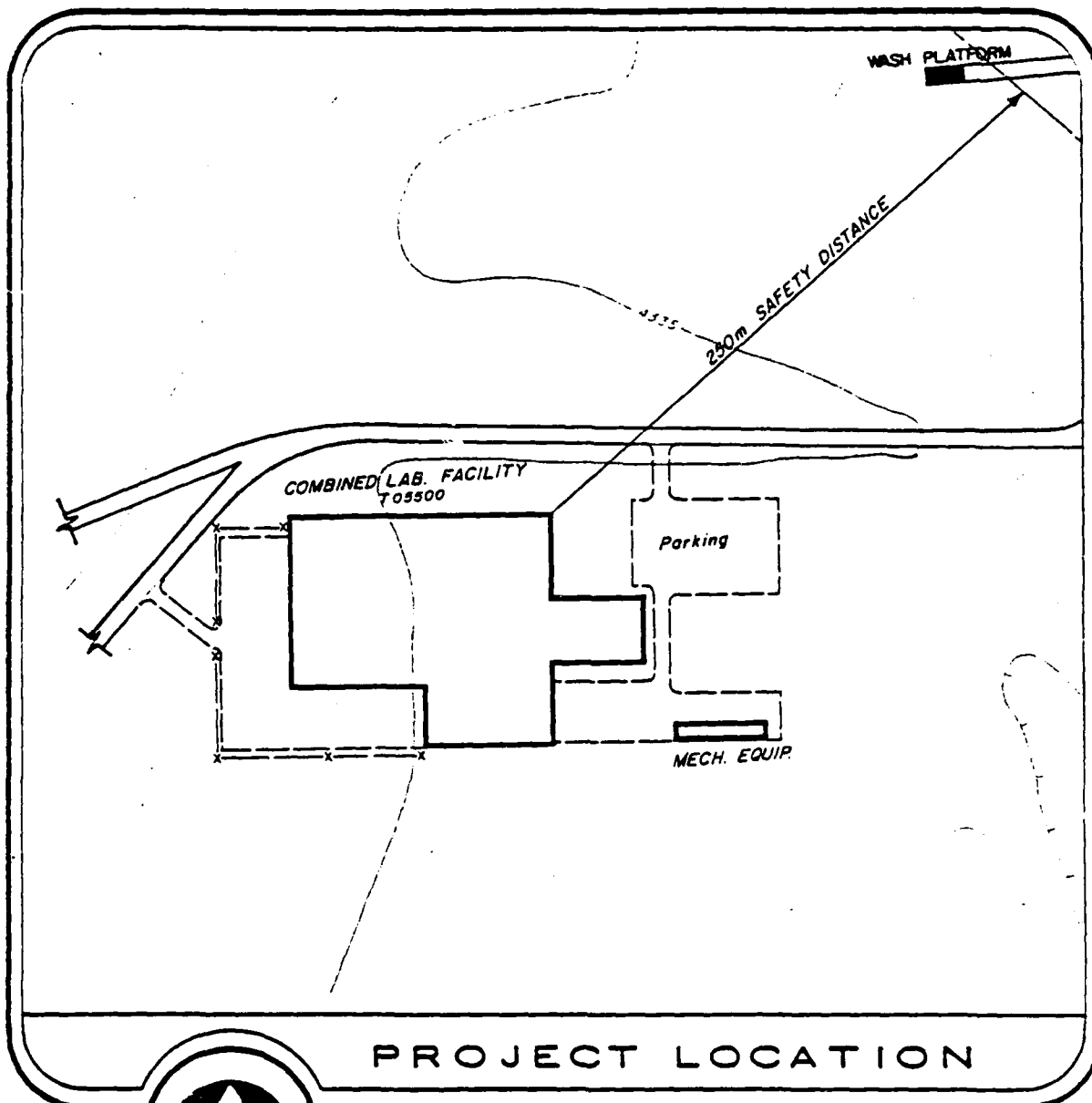
PROJECT DATA

PROJECT NO. T07800
 PROJECT TITLE MTD OPERATIONS & ENGINEERING CENTER
 GENERAL SITE PLAN AREA NO. DITTO
 PROJECT ENTRY, TAB PAGE NO. 36
 GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. 22
 PROJECT SCOPE 32,140 SF
 PROJECT PRIORITY NO. _____
 CATEGORY CODE NO. 61090

REMARKS: PERMANENT CONCRETE COMPONENT STRUCTURE TO SERVE AS MTD OPERATIONS CENTER. REQUIRES COMPLETE UTILITIES SUPPORT AND AIR CONDITIONING.

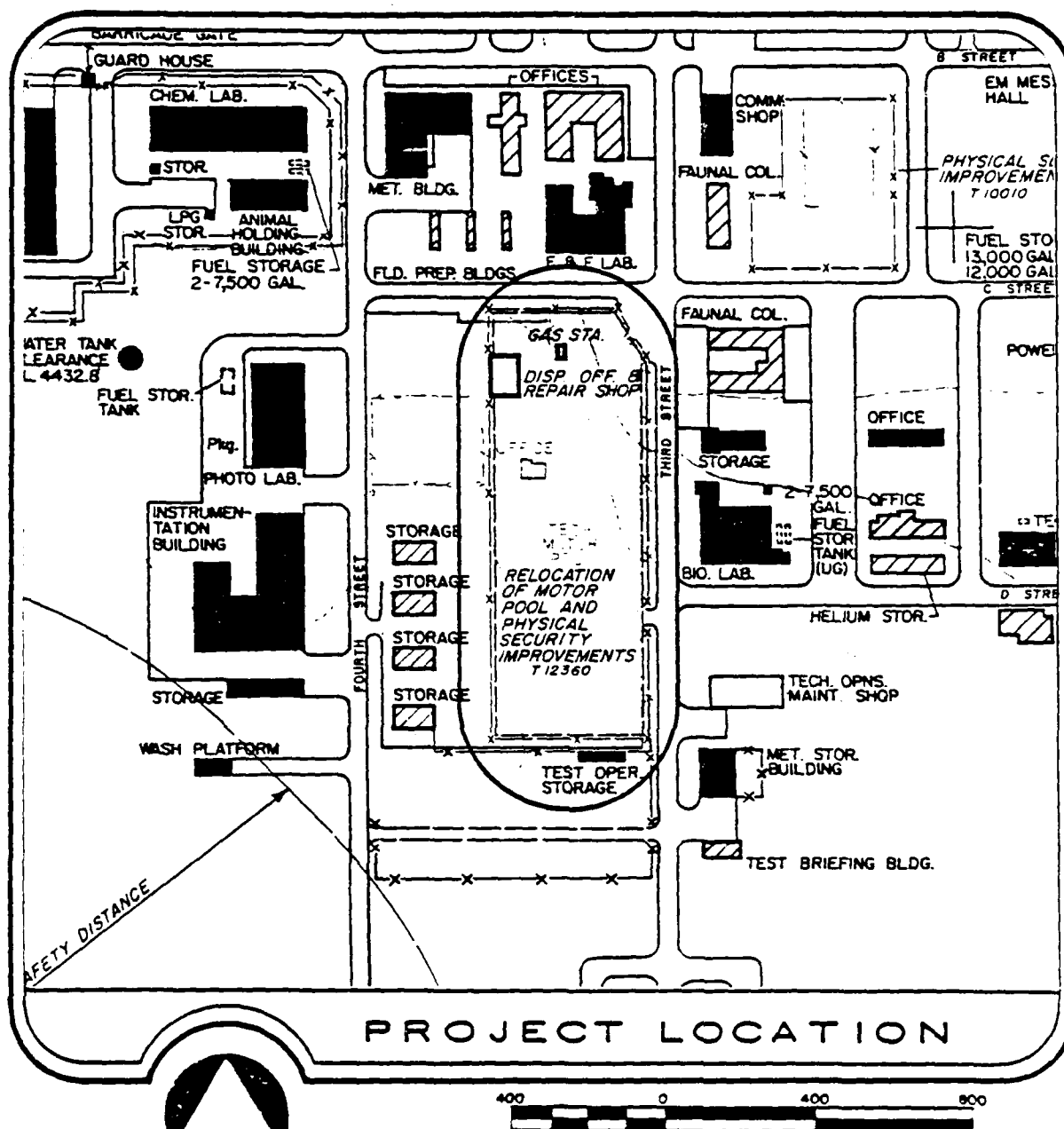
SITE: FLAT, AND SERVED BY EXISTING ROAD NETWORK. NO EXTENSIVE EARTHWORK REQUIRED. NO ADVERSE ENVIRONMENTAL IMPACTS ARE EXPECTED.

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PROJECT DATA	
PROJECT NO. <u>T05500</u>	REMARKS: <u>CONSTRUCTION OF A</u> <u>CHEMICAL AND BIOLOGICAL</u> <u>LABORATORY. 80,154 SF OF</u> <u>MASONRY BLOCK CONSTRUCTION,</u> <u>INCLUDING 3,240 SF OF MECHANICAL</u> <u>ROOM.</u>
PROJECT TITLE <u>COMBINED LABORATORY FACILITY.</u>	
GENERAL SITE PLAN AREA NO. <u>DITTO</u>	
PROJECT ENTRY, TAB PAGE NO. _____	
GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. <u>22</u>	
PROJECT SCOPE <u>80,154 SF</u>	<u>NO UNUSUAL SITE CONDITIONS</u>
PROJECT PRIORITY NO. _____	
CATEGORY CODE NO. _____	

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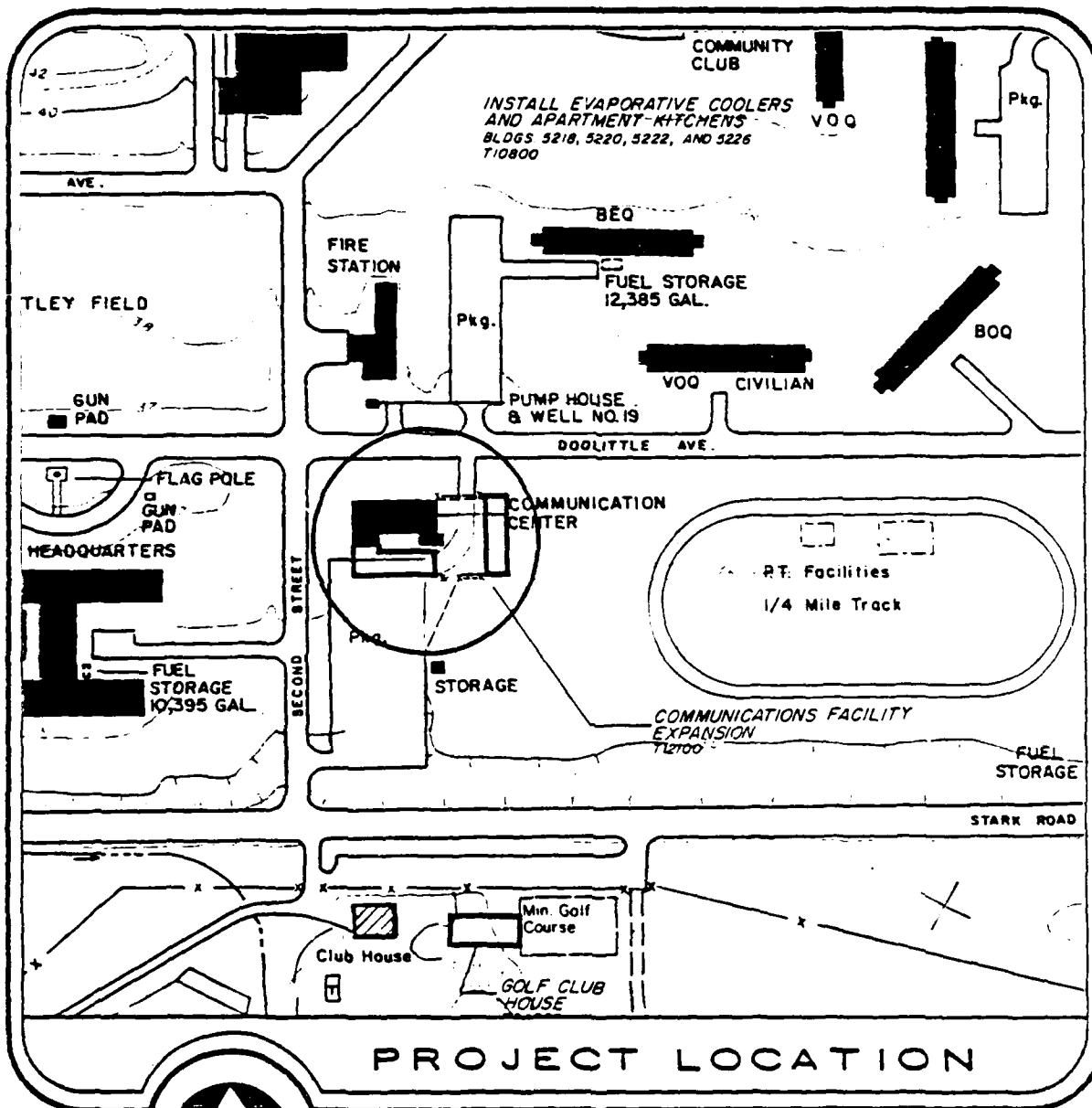
PROJECT LOCATION

PROJECT DATA

PROJECT NO. T 12360
 PROJECT TITLE MOTOR POOL RELOCATION AND PHYSICAL SECURITY IMPROVEMENTS
 GENERAL SITE PLAN AREA NO. DITTO
 PROJECT ENTRY, TAB PAGE NO. 14
 GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. 22
 PROJECT SCOPE 2,400 SF
 PROJECT PRIORITY NO. _____
 CATEGORY CODE NO. 21410

REMARKS: PROJECT CONSISTS OF A PERMANENT, INSULATED FIRE RESISTANT STRUCTURE TO SERVE AS DITTO AREA MOTOR POOL. WATER, SEWER, AND ELECTRICAL SERVICE ARE REQUIRED.

SITE CONDITIONS: FLAT, REQUIRING LITTLE EARTHWORK. NO NEW TRAFFIC WILL BE GENERATED SINCE FACILITY IS RELOCATED.

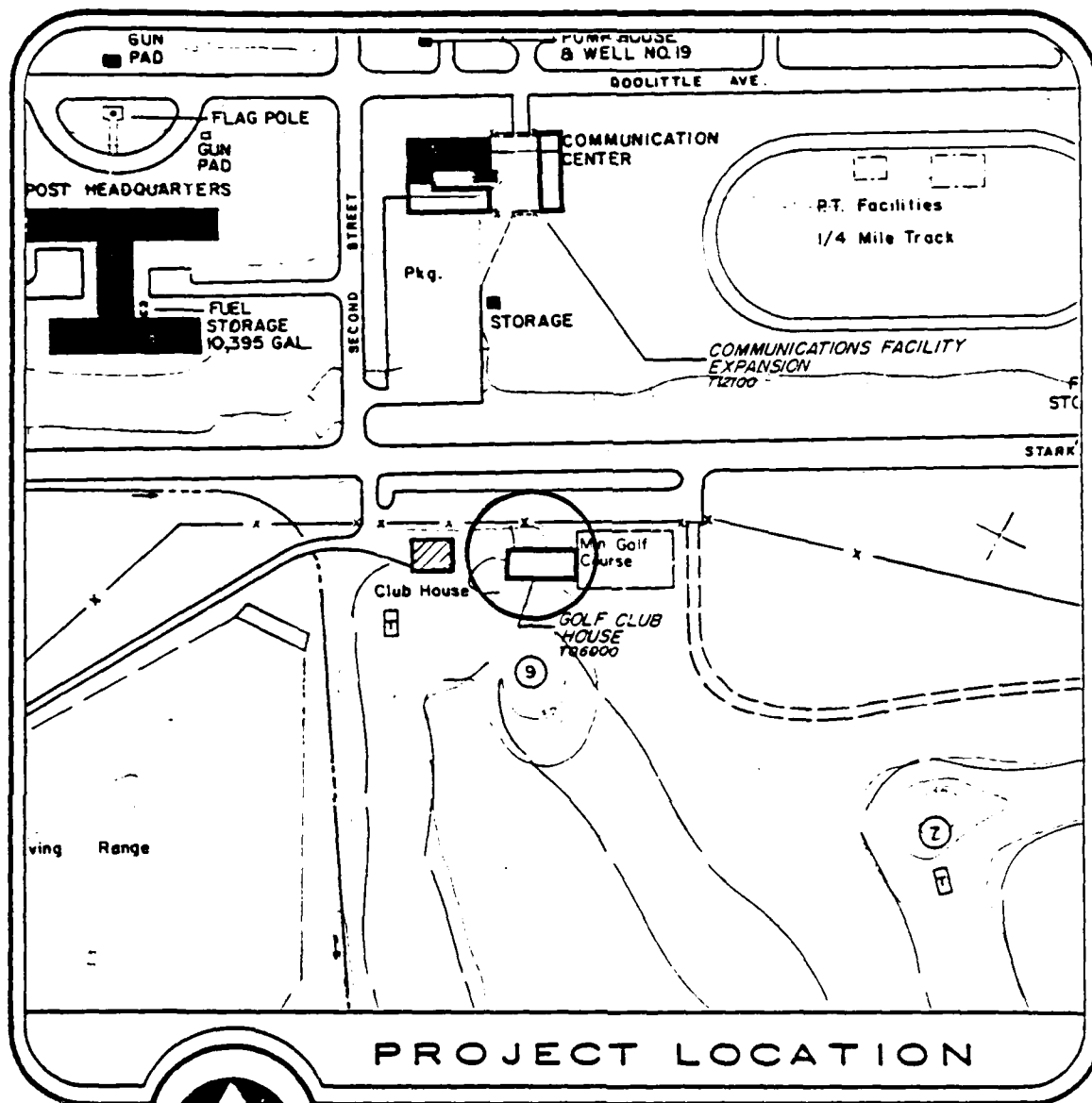


PROJECT DATA

PROJECT NO. T12100
 PROJECT TITLE COMMUNICATIONS FACILITY EXPANSION
 GENERAL SITE PLAN AREA NO. ENGLISH VII
 PROJECT ENTRY, TAB PAGE NO. 7
 GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. 22
 PROJECT SCOPE 3,784 SF
 PROJECT PRIORITY NO. 13120
 CATEGORY CODE NO. 13120

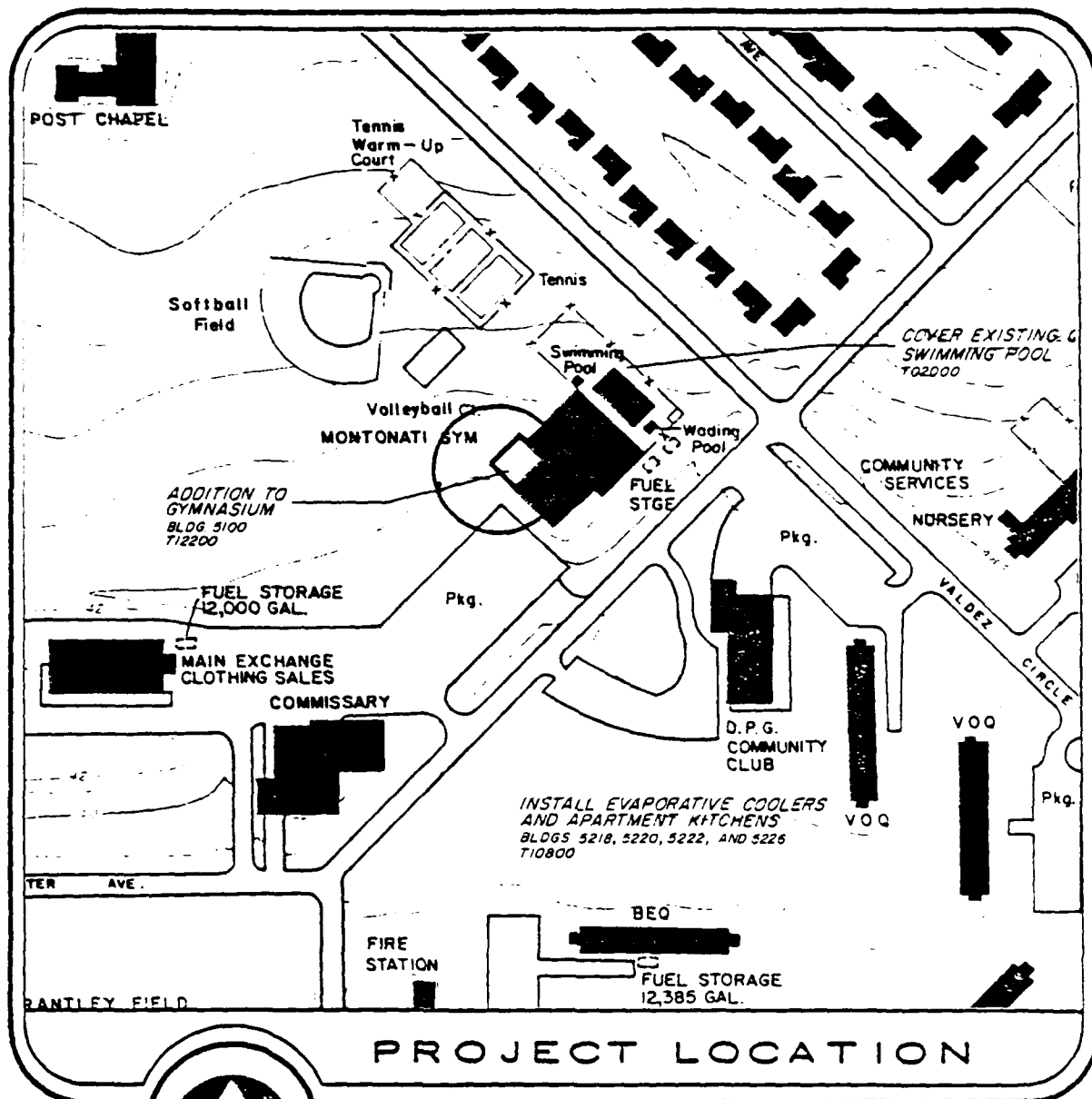
REMARKS: CONSTRUCTION OF AN ADDITION TO THE EXISTING COMMUNICATIONS BUILDING. (5444) CONCRETE/ CONCRETE MASONRY CONSTRUCTION. SUPPORTING UTILITIES ARE AVAILABLE.

SITE: NO MAJOR EXCAVATION OR SITE WORK REQUIRED. MINIMAL ENVIRONMENTAL IMPACTS.



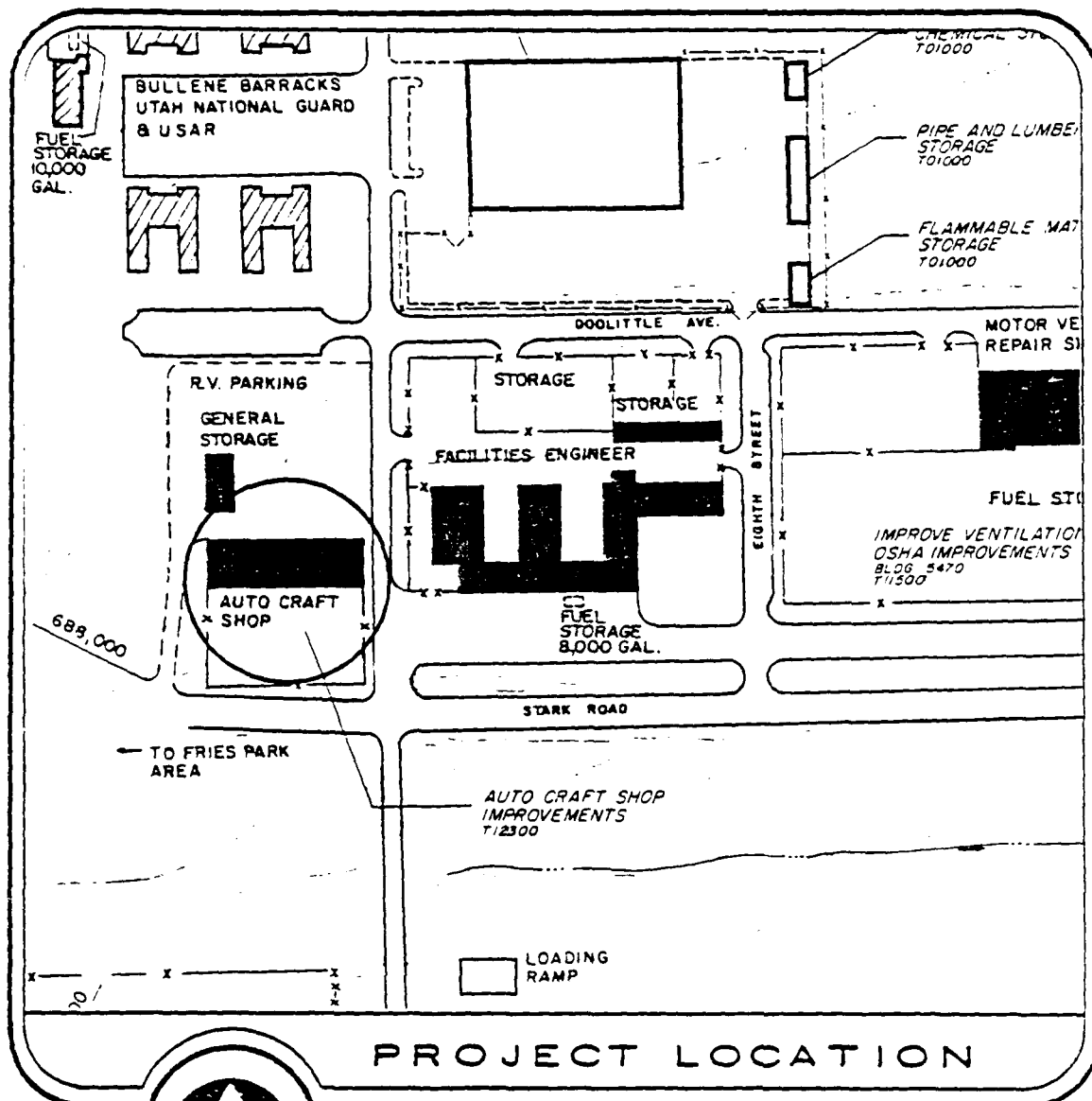
PROJECT DATA	
PROJECT NO. <u>TOG00</u>	REMARKS: <u>MASONRY BLOCK BUILDING WITH PAVED PARKING. MAJOR UTILITIES SERVICES ARE REQUIRED, AND ARE AVAILABLE ADJACENT TO THE SITE.</u>
PROJECT TITLE <u>GOLF CLUB HOUSE</u>	
GENERAL SITE PLAN AREA NO. <u>ENGLISH VILL.</u>	
PROJECT ENTRY, TAB PAGE NO. <u>NONE</u>	
GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. <u>22</u>	
PROJECT SCOPE <u>5,000 SF</u>	SITE: <u>NO UNUSUAL SITE CONDITIONS OR EARTHWORK.</u>
PROJECT PRIORITY NO. _____	
CATEGORY CODE NO. <u>74030</u>	

ROBERT G. MUIR & ASSOCIATES—ARCHITECTS & PLANNERS—COLORADO SPRINGS, COLORADO



PROJECT DATA	
PROJECT NO. <u>T-12200</u>	REMARKS: <u>ADDITIONAL SPACE</u>
PROJECT TITLE <u>ADDITION TO GYMNASIUM BUILDING 5100</u>	<u>WILL HOUSE HANDBALL</u>
GENERAL SITE PLAN AREA NO. <u>ENGLISH VILL.</u>	<u>COURTS. NO ADDITIONAL</u>
PROJECT ENTRY, TAB PAGE NO. <u>47</u>	<u>UTILITIES ARE REQUIRED.</u>
GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. <u>22</u>	
PROJECT SCOPE <u>1,764 SF (NEW)</u>	<u>SITE: NO ADVERSE ENVIRON-</u>
PROJECT PRIORITY NO. _____	<u>MENTAL IMPACTS ARE</u>
CATEGORY CODE NO. <u>74034</u>	<u>EXPECTED.</u>

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PROJECT LOCATION

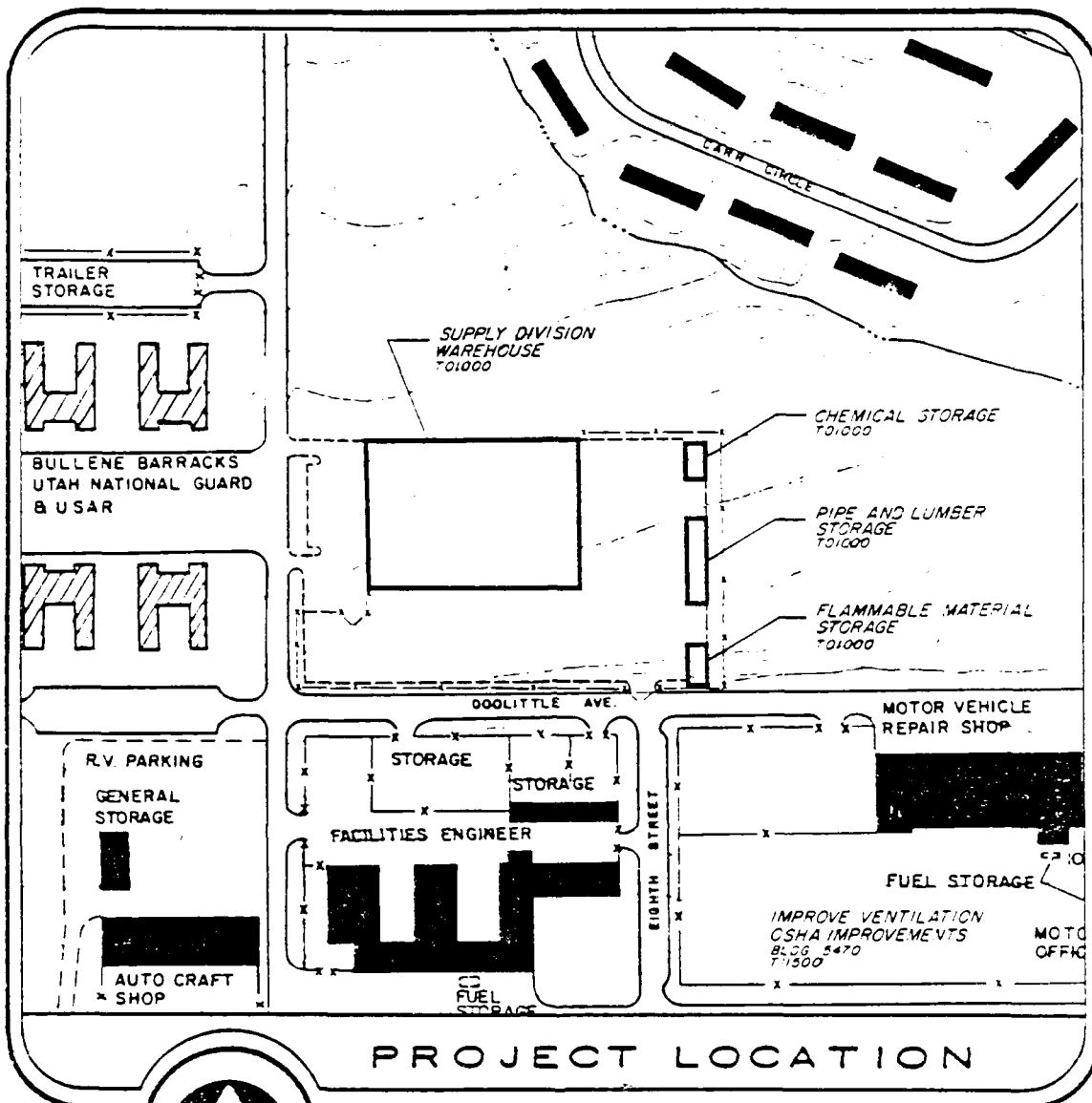
PROJECT DATA

PROJECT NO. T12300
 PROJECT TITLE AUTO CRAFT SHOP IMPROVEMENTS
 GENERAL SITE PLAN AREA NO. ENGLISH VII
 PROJECT ENTRY, TAB PAGE NO. 46
 GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. 22
 PROJECT SCOPE SEE REMARKS
 PROJECT PRIORITY NO.
 CATEGORY CODE NO. 74024

REMARKS: MODERNIZE EXISTING FACILITY BY CONSTRUCTING 3,872 SF OF NEW STRUCTURE TO REPLACE EXISTING SUBSTANDARD TEMPORARY CONSTRUCTION. NO MAJOR EXTENSION OF UTILITIES IS REQUIRED. AIR CONDITIONING REQUIRED. SITE: SOME MINOR EXCAVATION REQUIRED. SEE TEXT FOR OTHER ENVIRONMENTAL CONSIDERATIONS

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Figure 6 - 13.



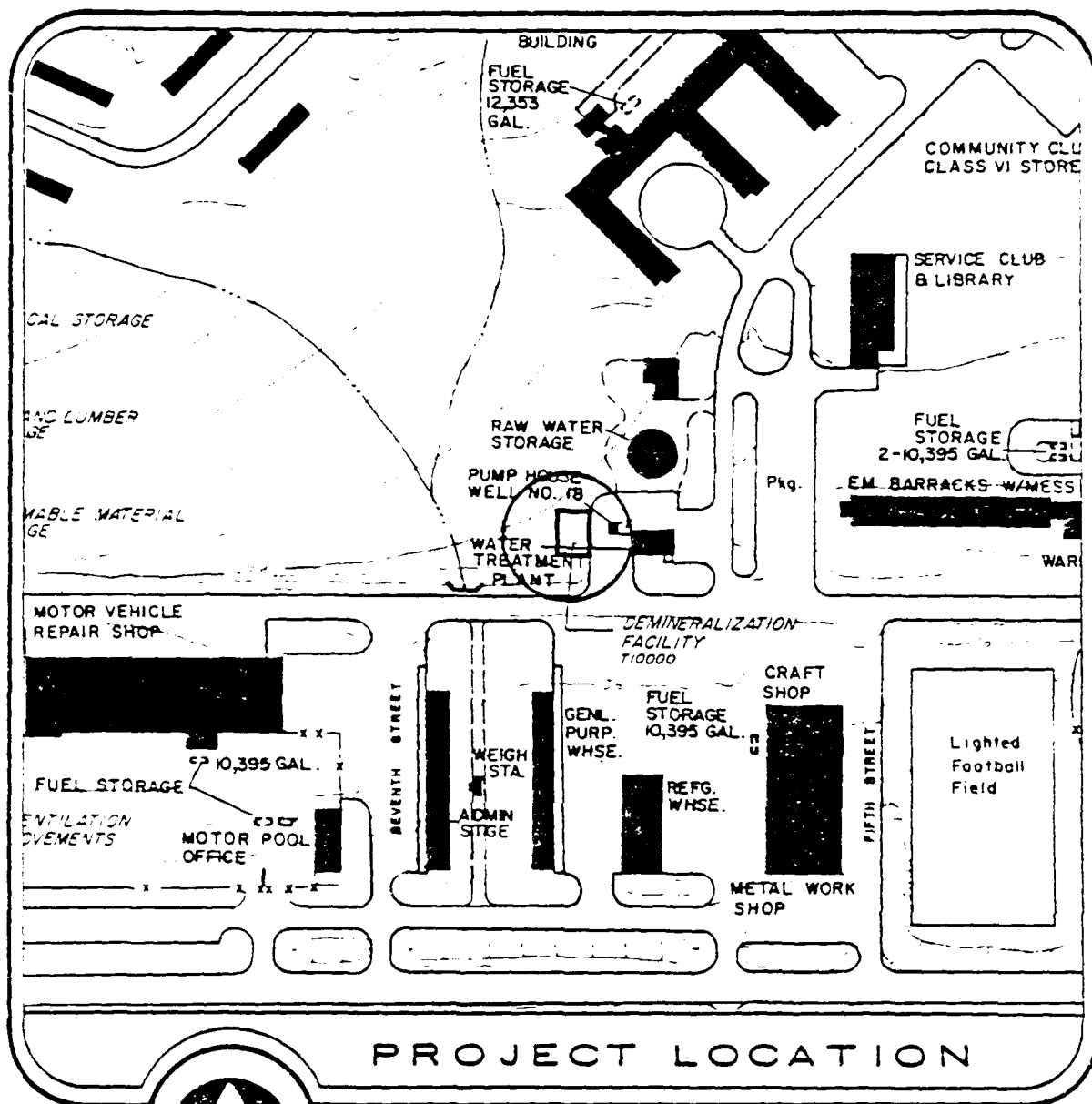
PROJECT DATA

PROJECT NO. TO1000
 PROJECT TITLE SUPPLY DIVISION
WAREHOUSE COMPLEX
 GENERAL SITE PLAN AREA NO. ENGLISH V.
 PROJECT ENTRY, TAB PAGE NO. 27
 GENERAL DESCRIPTION AND SITING RATIONALE,
 ANALYTICAL REPORT, PAGE NO. 22
 PROJECT SCOPE 62,900 SF
 PROJECT PRIORITY NO. 44220
 CATEGORY CODE NO. 44220

REMARKS. STRUCTURE OF CONCRETE/
CONCRETE MASONRY UNITS ALL
MAJOR SUPPORTING UTILITIES
ARE REQUIRED.

SITE: SITE IS FLAT WITH LITTLE
EARTHWORK REQUIRED FOR
ENVIRONMENTAL IMPACTS SEE
TEXT.

ROBERT G. MUIR & ASSOCIATES—ARCHITECTS & PLANNERS—COLORADO SPRINGS, COLORADO



PROJECT DATA

PROJECT NO. T 10000
 PROJECT TITLE DEMINERALIZATION FACILITY
 GENERAL SITE PLAN AREA NO. ENGLISH VILL.
 PROJECT ENTRY, TAB PAGE NO. 63
 GENERAL DESCRIPTION AND SITING RATIONALE, ANALYTICAL REPORT, PAGE NO. 22
 PROJECT SCOPE 2,400 SF
 PROJECT PRIORITY NO. 841 10
 CATEGORY CODE NO. 841 10

REMARKS: PLANT WILL REDUCE SALINITY TO 20 PPM BY SODIUM CATION EXCHANGE METHOD
PLANT CAPACITY IS 7,200 KILO GALLONS.

ROBERT G. MUIR & ASSOCIATES-ARCHITECTS & PLANNERS-COLORADO SPRINGS, COLORADO

installation's long-range planning needs and the specific short-term needs based on projected land-disturbing activities.

6.2.1 General Facility Planning

The Draft Army Regulations, 420.XX, describes Army policy, procedures, and responsibilities for compliance with the National Historic Preservation Act (NHPA), for the maintenance and state-of-the-art standards for preservation personnel and preservation projects, and for the timely implementation of a historic preservation program. The AR.420.XX requires that each U.S. Army Materiel Development and Readiness Command (DARCOM) installation develop and implement a Historic Preservation Plan (HPP).

Following are the objectives of the DARCOM HPP:

- Integration of historic preservation requirements with military needs, construction activities, and real property and land use decisions.
- Provide cultural resources data for the installation information system.
- Provide guidelines for the management of historic properties.
- Prioritize the acquisition of additional information to determine if there may be additional cultural properties not yet located or identified.
- Prioritize installation undertakings by their potential effect on historic properties.

Criteria to determine the necessity for developing a plan is based on evidence of known cultural properties that may be eligible for inclusion on the National Register of Historic Places (NRHP). A file search was conducted at the State Archeologists Office to identify known sites on the installation. Ten archeological sites, 42T0135, 42T0136, 42T0183, 42T0184, 42T0205, 42T0206, 42T0213, 42T0214, 42T0267, 42T0268, were identified and plotted on U.S.G.S. topographic maps (Figure 5-1). A search was conducted at the Smithsonian Institute, Washington D.C., where Lt. Karl Schmitt's collection is located. He identified approximately 200 fire hearths and many surface sites in the dune area of DPG (Pinkham et al. 1979:75). A search of the NRHP revealed there is one historic site listed, known as the Lincoln Highway Bridge. The German Village was nominated but the nomination has been withdrawn. The remains of several Pony Express Stations and Wilson's Hot Springs, a reported active spa in the 1920's and 30's, exist near the DPG southern border (personal communication, Charles M. Benson).

Because of the potentially significant archeological and historic archeological properties on DPG, the installation meets the criteria and should develop a HPP. The information provided in this report will provide the basis from which the Plan may be developed and implemented.

The identification procedure has been initiated by the completion of this overview and recommended management plan, and with the identification of historic and prehistoric sites. This needs to be followed by a complete

identification and evaluation program, an extensive oral and archival review, field surface and subsurface inventory on all accessible undisturbed DPG land, and evaluation of resource significance by the criteria established in 36 CFR 60.6. The HPP would be the basis for developing a Memorandum of Agreement (MOA) with the Advisory Council on Historic Preservation (ACHP). Proposed ground-disturbing activities would require monitoring or a field survey prior to construction. Intensive field surveys could be postponed until there are specific ground disturbing projects.

Under any schedule, until known archeological properties have been determined not to be significant, they must be treated as if they are significant for compliance with the NHPA. NHPA states, "Each Federal agency shall exercise caution to assure that any such property that might qualify for inclusion is not inadvertently transferred, sold, demolished, substantially altered, or allowed to deteriorate significantly." It is recommended that the Pony Express Stations and Wilson's Hot Springs be professionally evaluated for significance. It is further recommended that the sites listed in the state inventory files be located and evaluated. All properties should be managed in the interim as if they were eligible to the NRHP. It is further recommended that these sites be avoided by any Army activities and the area restricted to prevent further vandalism.

The next recommended stage in the assessment of the importance of DPG historic and archeological properties is an extensive review of archival materials and analysis of regional historic research objectives. The archival review would include information contained in Tooele County land records, county libraries, the National Archives and Records Service, Bureau of Land Management (BLM) records, as well as other pertinent local documents and interviews with pre-1940 residents in and around DPG property. The review should include consultation with the Utah State Historic Preservation Officer (SHPO) in order to determine if known historic and archeological properties on the installation will answer specific regional research questions.

Executive Order 11593 and Section 110(a)(2) of the National Historic Preservation Act, as amended, requires that each federal agency establish a program to locate and nominate to the Secretary of the Interior all cultural properties under its control or ownership, that appear to qualify for inclusion on the NRHP. The identification stage of the recommended archeological management plan, consists of a field surface survey and subsurface elevation to locate archeological properties to determine their integrity and boundary extent and subsurface potential. Rather than require a 100 percent survey as the legislation implies, the current federal policy for implementing this requirement states that there should be a reasonable program consistent with schedules, budget, and multiple objectives of the land managing agency. Due to the sensitive nature and extreme size of the installation and extensive ground disturbance, a random sample survey to locate eligible cultural resources and identify archeological sensitive areas is recommended. Hazard areas (Figure 3-1) should not be considered for field surveying. In the archeologically sensitive areas, it would be most cost-effective to complete a professional random sample archeological inventory for future installation management needs. The purpose of this inventory is to determine the cultural resource potential at the DPG installation, to predict zones of greater or lesser activity by past known populations, to develop projections of expected site density, distribution, and diversity, and to develop a research design to provide future research direction.

Based on the historic research and field inventory information, all identified sites should be evaluated for inclusion in the NRHP by the criteria set forth in 36 CFR 60.6 and by the research objectives of the Utah SHPO. If sites are determined to be significant, a long-term management plan should be incorporated in the installation's property management plan. Management considerations may include preservation and conservation with an annual field review of site condition or scientific investigation of sites to answer important research questions and to fill research gaps.

The HPP containing the information in this report would constitute the basis for a preliminary case report required for a MOA with the ACHP. Procedures are outlined in 36 CFR 800.6(c). The Utah SHPO should be consulted and his written concurrence included in the ACHP request. A ratified MOA would constitute comments of the Council and complete the Army's compliance responsibilities under Section 106 of the National Historic Preservation Act. The MOA reduces time consuming and often costly delays in compliance procedures that may occur when significant cultural properties may be affected on a project by project basis.

It is further recommended that an individual be appointed who will be responsible for all historic preservation planning and who will act as the Army liaison between the SHPO and ACHP. It is recommended that the installation Preservation Office provide the Utah SHPO and the ACHP an opportunity to review the installation's HPP. The plan should include information on any on-going activities or any special projects that may adversely affect any eligible properties. Alternatives should be developed that will reduce or mitigate any adverse effect.

However, if, after consultation with the SHPO, none of the identified sites are eligible, the installation should obtain a letter of agreement from the SHPO. With this correspondence and supporting documentation, the facility's historic preservation compliance responsibilities are completed.

6.2.2 Dugway Proving Ground Project Specific Resource Protection or Treatment Options

The following project-specific management program is based on the planned ground disturbing activities to the year 1990 and their potential to affect significant cultural properties. Figures 6-1, 6-6 through 6-15 identify the projects in heavily disturbed areas where the potential exists for subsurface prehistoric and historic material to be present. Therefore, an on-site professional archeologist should be retained to monitor these projects during ground disturbance. Monitoring activities include observance of trenching, blading, or bull-dozing (etc.) the construction area to identify any subsurface cultural material. All activities should be halted if previously unknown historical or prehistorical materials are revealed. The Cultural Resource Coordinator should follow the procedures outlined in the Council's regulations, 36 CFR 800.7 and AR.420.XX. They are as follows:

Discovery of Historic Property During an Undertaking

- a. When a historic property is discovered during an undertaking, the commander will ask the Secretary of the Interior to study the

discovery to see what 36 CFR 800.7 requires. This study should start within 48 hours of the Secretary of the Interior being notified.

- b. The commander will phone the National Park Service (NPS) to request the study and will send a telegram to confirm the request.
- c. The commander will advise the SHPO and MACOM (sic) at the same time.
- d. If the Secretary of the Interior or commander find that the ACHP should be advised of the find, the commander will request the comments of the ACHP (36 CFR 800.8(b), AR 420.XX:4-11).

New proposed construction activities that may directly affect archeological properties are Stradley Igloo improvements (Figure 6-2), munitions and material support facility (Figure 6-3), heavy weapons maintenance building (Figure 6-4), and toxic waste evaporation pond (Figure 6-5). The construction activities will affect 100 percent of the ground surface and may directly impact and destroy unknown archeological properties. These areas should be surveyed before construction to inventory and evaluate any archeological, historical, or architectural properties within 300 ft. of the proposed construction.

If eligible cultural properties are found, plans should be developed in consultation with the SHPO and ACHP, to avoid or mitigate possible adverse effects. Avoiding the significant resource, if possible, is generally the most cost-effective and efficient management tool, or construction designs can be altered to conserve the resources, or resources can be protected by fencing or posting areas. Mitigation actions can be taken for specific archeological properties. Mitigation action would be a program to collect data that would answer specific research questions. With an HPP approved in advance by the SHPO and ACHP, possible time delays in the consultation process could be avoided.

Lt. Karl Schmitt's Sites in the Sand Dune Area

Schmitt identified "200 archeological sites" in the dune area in 1944. This area now contains non-sequestered subsurface duds. Access is forbidden. Therefore, any archeological resources located in this area are protected. Long-range plans may be developed to locate subsurface duds and sterilize the area (personal communication, Charles M. Benson). When this plan is implemented, a professional archeology inventory should be undertaken.

Pony Express Sites and the Wilson Hot Springs

These sites may have potential historical archeological significance and should be professionally evaluated. It appears that the Army has no plans to impact these areas. The most appropriate and most cost-effective goal consistent with the Master Plan would be to protect and preserve the sites. When a resource is selected for preservation, a management program that minimizes deterioration or destruction of the scientific, cultural, and

associated values is required. In situ preservation, including avoidance by any Army ground disturbing activities and restricted access with monitoring of the area to prevent vandalism, is recommended as the more responsible management procedure.

All of the project-specific management recommendations require consultation with the Utah SHPO. If eligible properties will be affected by project activities, compliance with Section 106 is required and the Army is obliged to request ACHP comment. Figure 6-16 outlines the procedure for compliance with the ACHP's regulations, 36 CFR 800 and AR 420.XX.

6.2.3 A Summary of Recommended Management Direction and Priorities for Effective Compliance and Program Development

It is recommended that a professional archeological inventory and evaluation be completed in the areas where new construction is planned as soon as possible (Table 6-1). It is appropriate to complete a random sample field inventory to identify archeological sensitive areas for compliance with Executive Order 11593 and Section 110 of the NHPA. It is recommended that for new construction activities, a professional archeologist monitor ground disturbing activities, (Table 6-1). Further, Pony Express Stations, Wilson Hot Springs and various archeological sites should be evaluated by a professional archeologist for possible inclusion in the NRHP.

6.3 ESTIMATED SCOPES OF WORK AND COST LEVELS FOR PRESENTLY IDENTIFIED MANAGEMENT NEEDS

6.3.1 Recommendation I

Executive Order 11593 and Section 110 of the NHPA require a land holding agency to identify significant cultural properties under their jurisdiction for future planning needs. Based on the size, the ecological variations and diversity of known resources, the archeological resources on this installation have the potential to answer important regional research questions. Therefore, the first long-range management recommendation includes a random sample, a four percent field inventory of 33,636 acres (13,612 hectares) of the 840,909 acres (224,853 hectares) of the area that make up DPG. A 4 percent inventory will provide the basic data necessary to develop a predictive model whose confidence level will be at the 95+01 percentile level.

An intensive archival and historical review should precede the field survey and require an estimated 15 days for completion. The field inventory should be conducted by a professional archeologist who meets the qualifications outlined in Appendix C of AR 420.XX, the National Park Service regulation 36 CFR 61.4 and/or the Society of Professional Archeologist (SOPA), and have obtained an Antiquities permit issued by the Secretary of the Army, granted in accordance with AR 405-80. The archeologist should have demonstrated expertise in the Great Basin.

ADVISORY COUNCIL REGULATIONS FOR THE PROTECTION OF
HISTORIC AND CULTURAL PROPERTIES, 36 CFR-800

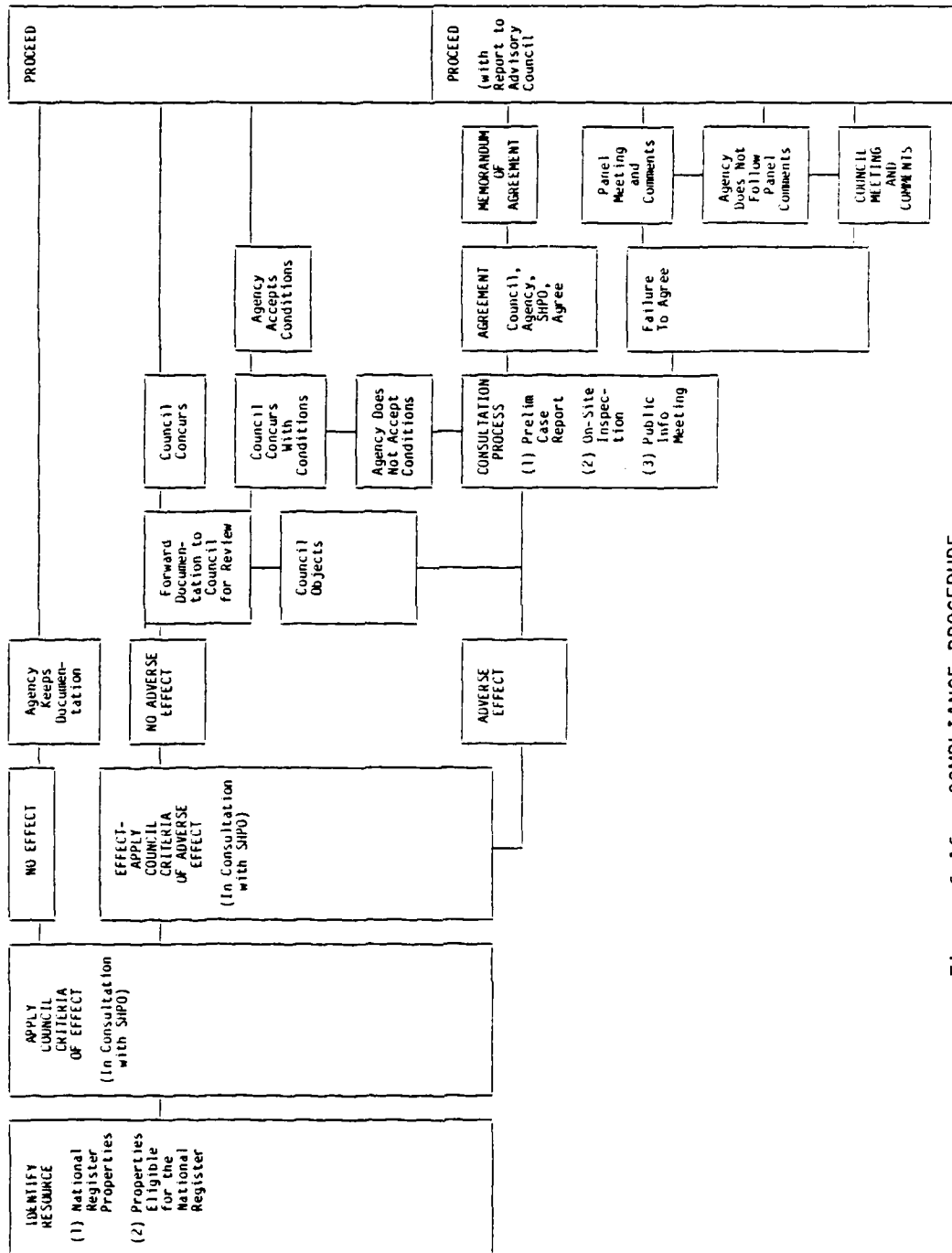


Figure 6-16. COMPLIANCE PROCEDURE

The inventory should be conducted with field personnel spaced at close intervals. All cultural resource locations and required information should be incorporated on the Utah Intermountain Antiquities Computer System (IMACS) site form. Only diagnostic artifacts, i.e., projectile points and pottery, or artifacts in danger of being lost, should be collected. Any artifacts recovered should be properly curated in an institution approved by the Army. All cultural properties should be evaluated for inclusion in the NRHP, and recommendations should be made for an appropriate management program.

At a rate of 100 acres a day, and an assumed site density of five sites per square mile, field operations are estimated to require at least 90 days. The field operations would entail a 4 percent, random sample survey in the non-hazardous areas only. The field inventory does not include costs for subsurface investigation. The field inventory, analysis, and evaluation program including travel (local expertise only), communication, and report preparation costs average \$20 to \$25 per work hour. Archival review and supervisory expertise average between \$25 to \$35 per work hour. The costs of this optional management recommendations are estimated in 1983 dollars (Table 6-2). The cost estimate covers only routine involvement of the subcontractor in the federal and state consultation process.

Table 6-2

COSTS OF OPTIONAL MANAGEMENT RECOMMENDATION

	<u>Acres</u>	<u>Acres Per Day</u>	<u>Man Days</u>	<u>Man Hours</u>	<u>Total Dollars</u>
Archival		--	15	160 x 25 x 35	4,000 5,600
field Survey	33,636	100	337	2696 x 20 x 25	53,920 67,400
Report Analysis			752	6016 x 20 x 25	120,320 150,400
			Estimated Costs*	Lowest Highest	178,240 223,400

*Estimated costs do not include administrative costs or fee/profit.

Milestones for recommended sequential procedures are:

- Complete archival and oral historical review to document potential significance of any historical archeological resources which might be located in the Army Depot.
- Complete field inventory and evaluation of all identified archeological, historical, or architectural resources including subsurface investigations to support evaluations.

- Complete draft report on field investigations, recommended evaluations, development of predictive model, mapping archeologically sensitive areas, and management program for DARCOM review.
- Complete DARCOM review with DARCOM approval for interagency review.
- Complete consultation among Utah SHPO, DARCOM and the cultural resource consultant concerning evaluations and HPP.
- Complete review by the Keeper of the NRHP of evaluation submitted by DARCOM (a letter of agreement will complete documentation).
- Initiate consultation process among DARCOM, SHPO, and ACHP on the HPP submitted as a basis for a Preliminary Case Report for MOA.

6.3.2 Recommendation II

The Pony Express Stations, Wilson Hot Springs, and the ten archeological sites 42T0135, 42T0136, 42T0183, 42T0184, 42T0205, 42T0206, 42T0213, 42T0214, 42T0267, 42T0268 should be evaluated for inclusion in the NRHP by determining the present conditions of the sites and assessing whether the site will yield information important to the prehistory or history of the area. A field investigation would include locating and mapping of the sites, followed by on-site testing to determine if there are subsurface remains, and the extent and conditions of the site. All qualification requirements outlined in Recommendation I should be met.

There are remains of an estimated 6 Pony Express Stations, each station and Wilson Hot Springs would take crews of three people one day for each historic site. The archeology sites should take three people two days for each site with subsurface testing. It would be more cost-effective to combine all investigations into one time frame to minimize travel and per diem expenses. The cost estimate assumes that the field investigation will be coordinated, that costs do not include archival review and the costs for labor are \$20 to \$25 in 1983 dollars. It would be necessary to perform an historical and archival review if this had not been completed in connection with Recommendation I. Estimated costs of the evaluation program with field survey and mapping, including necessary travel, communications, data management, and report preparation are between \$37,840 and \$47,300. These costs include preparation of NRHP forms, if appropriate, completion of report and analysis, and limited participation in the SHPO consultation process. Estimated costs do not include administrative costs, fee, or profit.

Milestones for sequential activities include:

- Complete field investigation including mapping and subsurface testing.
- Complete evaluation for significance.
- Complete NRHP inventory form, if appropriate.

- Complete consultation process with Utah SHPO for eligibility determination with necessary documentation, if appropriate.
- Complete review by the Keeper of the NRHP of evaluation submitted by DARCOM (a letter of agreement will complete documentation).
- Complete management procedures to protect significant properties from further vandalism or destruction.

6.3.3 Recommendation III

It is recommended that monitoring of construction activities in areas Baker, Carr, Ditto, and English Village be completed. Each project is identified along with the area of expected ground disturbance in Table 6-1.

The scope of work requires monitoring or surveillance of construction activities by a professional archeologist who meets the previously cited standards. Areas of ground disturbing activities are: Carr - 33.3 acres (13.5 hectares), Ditto - 41.6 acres (16.9 hectares), and English Village - 65.8 acres (26 hectares). Monitoring will require some preliminary archival and oral historical research, and on-site examination during ground altering activities to determine if any previously undiscovered cultural resources are present. If cultural resources are encountered, the SHPO should be notified and the procedures followed as outlined in AR 420.XX.

Discovery of Historic Property During an Undertaking (AR 420.XX:4-11).

- When a historic property is discovered during an undertaking, the commander will ask the Secretary of the Interior to study the discovery to see what 36 CFR 800.7 requires. This study should start within 48 hours of the Secretary of the Interior being notified.
- The commander will phone the NPS to request the study and will send a telegram to confirm the request.
- The commander will advise the SHPO and MACOM (sic) at the same time.
- If the Secretary of the Interior or commander find that the ACHP should be advised of the discovery, the commander will request the comments of the ACHP (36 CFR 800.8(b)).

Generally, cultural resources found in these areas may be disturbed and have little or no integrity. However, should potentially significant prehistoric or historic remains be discovered, their appropriate treatment should be evaluated before continuing construction. Any human remains that are encountered should be handled following the U.S. Department of the Interior (1982) guidelines for burial treatment.

All areas in DPG with ground disturbing activities that should be monitored total 140.7 acres (56.9 hectares).

Carr	33.3 acres - 4 work days
Ditto	41.6 acres - 5 work days
English Village	65.8 acres - 8 work days

The minimal time frame for monitoring activities is 10 acres per day for a crew of one. The time parameters are estimated and land modification plans should be reviewed before preparing the scope of work. Five work days are estimated for historic review and, depending on general construction schedules, a minimum of 17 work days for monitoring. Another 25 work days should be scheduled for reporting the monitoring results. This schedule is based on a limited number of cultural items being recovered and no involvement in the consultation process. To adhere to this scheduling, consideration should be given to scheduling construction projects so the archeologist can monitor each project in sequence. The logistics connected with scattered acreage will not permit a lower cost per acre figure for monitoring.

Based on the above assumptions and qualifications, the archival research, monitoring, and report preparation would require a minimum of 47 man days estimated at \$20 to \$25 per work hour, including travel, per diem, and report preparation. The estimate cost in 1983 dollars is between \$7,500 and \$9,400. The cost could increase drastically if construction schedules create increased mobilization and if data recovery is required.

Assuming that no significant archeological or historical resources are identified during these activities, milestones for monitoring would sequentially include:

- Complete archival and historical research.
- Complete archeological monitoring program.
- Complete report including results from archival review and monitoring activities for approval by DARCOM.
- Submittal of the report to the Utah SHPO.

If archeological and historical materials are identified that appear to be eligible for inclusion in the NRHP, the program should include these milestones:

- If a resource is identified, the ground disturbing activity should be interrupted until the materials have been evaluated. In-field consultation should involve the U.S. Department of the Interior Archeologist or his designee and the Utah SHPO. If the resource is not considered eligible, construction may resume. If however, the resource is considered eligible, professional recovery may be required to mitigate the adverse effect.
- A report containing a description and analysis of materials recovered should be prepared for inclusion in the installation project report.

The appropriate state and federal consulting authorities are: The Utah State Historic Preservation Officer, 300 Rio Grande, Salt Lake City, Utah, 84101. (He is the consulting agent for compliance responsibilities outlined in 36 CFR 800 and should be contacted for any problems relating to cultural resource management.); the Utah State Archeologist, 300 Rio Grande, Salt Lake City, Utah; Advisory Council on Historic Preservation, Western Division of Project Review, 730 Simms St., Room 450, Golden, Colorado, 80401; U.S. Department of the Interior, National Park Service, Interagency Archeological Services, 655 Parfet Street, P.O. box 25287, Denver, Colorado, 80225.

SECTION 7

CHAPTER 7.0 SUMMARY

Prehistoric and historic archeological resources are known or presumed to exist on the undisturbed portions of the Dugway Proving Ground (DPG). Considering the total size of the Proving Ground, its ecological diversity, as well as the amount of disturbance, the numbers of potential resource sites could be quite high. Prehistoric resources considered to be critical are archeological sites of the Paleo-Indian Stage, particularly the Clovis and Folsom Periods, the Early Archaic Period of the Archaic Stage, and the Fremont Period of the Formative Stage. It also is true that our knowledge of the Pre-Clovis and Paleo Periods of the Paleo-Indian Stage, the Middle and Late Archaic periods and the Post-Formative Stage is incomplete and any resources assignable to these periods should be carefully managed to insure that their potential information is not lost.

Compliance with the various provisions of the National Historic Preservation Act (NHPA), the Archeological and Historic Preservation Act, 36 CFR 800 and draft Army Regulation AR 420.XX requires the identification, evaluation, and where practical and feasible, the positive management of significant prehistoric and historic archeological resources. Draft Army Regulation, AR 420.XX also requires that each U.S. Army Materiel Development and Readiness Command (DARCOM) installation develop and implement an Historic Preservation Plan (HPP). Consequently, a series of management recommendations are presented in this report. These recommendations are as follows:

1. An archival and historical review of the literature plus an intensive surface survey or inventory of four percent (33,636 acres, 13,612 hectares) of the surface area of the installation should be undertaken by a professional archeologist. It is estimated that the inventory program will range in cost between \$178,240 and \$223,400 in 1983 dollars.
2. The Pony Express Stations, Western Hot Springs and the ten archeological sites (42T0135, 136, 183, 184, 205, 206, 213, 214, 267, and 268) should be evaluated for inclusion in the National Register of Historic Places (NRHP). Estimated costs for this evaluation will range in cost between \$37,840 and \$47,300 in 1983 dollars.
3. In those areas where ground disturbing construction is scheduled, (i.e., Baker, Carr, Ditto, and English Village), a monitoring program should be established. It is estimated that such a program will cost between \$7500 and \$9400 in 1983 dollars.

If eligible resources are found during the course of survey or while monitoring, plans should be developed in consultation with the State Historic Preservation Officer (SHPO) and the Advisory Council of Historic Preservation (ACHP) to either avoid or to mitigate any adverse effect.

SECTION 8

CHAPTER 8.0 BIBLIOGRAPHY

- Adovasio, James M. 1980. Fremont: An Artifactual Perspective. (In) Fremont Perspectives (ed.) David B. Madsen Utah State Historical Society, Antiquities Section, Selected Papers 7(6):35-40.*
- Aikens, C.M. 1967. Excavations at Snake River Village and the Bear River No. 2 site. Univ. of Utah Anthropological Papers. No. 87, Salt Lake City.*
- _____. 1970. Hogup Cave. University of Utah Anthropological Papers. 93. Salt Lake City.*
- _____. 1976. Cultural Hiatus in the Eastern Great Basin? American Antiquity. Vol. 41, No. 4, pp. 543-548.*
- _____. 1978. The Far West. In Ancient Native Americans. edited by Jesse D. Jennings. Walt Freeman and Company, San Francisco.*
- Albee, Beverly. 1978. Checklist of Plants of Dugway Proving Ground; U.S. Army. Report to Dugway Proving Ground, 6 p.
- Allen, James B. and Ted J. Warner. 1971. The Gosiute Indians in Pioneer Utah. Utah Historical Quarterly 39:162-177.*
- Arnold, Brigham. 1978. Surface Evidence of Early Man in Arid Lands. (In) Early Man in America from a Circum-Pacific Perspective, (ed.) Alan L. Bryan. Occasional Papers of the Department of Anthropology, University of Alberta. No. 1.*
- Arrington, Leonard J. 1958. Great Basin Kingdom. Cambridge: Harvard University Press.
- Arrington, Leonard J. and Thomas G. Alexander. 1964. Sentinels on the Desert: The Dugway Proving Ground (1942-1963) and Desert Chemical Depot (1942-1955). Utah Historical Quarterly. 32:32-43.*
- Athearn, Robert G. 1971. Union Pacific Country. Chicago: Rand McNally and Company.*
- Baldrige, Kenneth W. 1971. Nine Years of Achievement: The Civilian Conservation Corps in Utah. Unpublished Ph.D. dissertation. Provo: Brigham Young University.
- Baum, Bernard. 1947. Dugway Proving Ground. Aberdeen: U.S. Army Chemical Corps.*
- Baumhoff, W.A. and R.F. Heizer. 1965. Postglacial Climate and Archeology in the Desert West. (In) The Quaternary of the United States. (eds.) J.E. Wright Jr., and D.G. Frey, Princeton University Press, Princeton.*

*References cited.

- Beardsley, R.K. 1956. Functional and Evolutionary Implications of Community Patterning. Society for American Archeology Memoir. Rev. 11. (ed.) Robert Wauchope a Special Publication of America Antiquity, Vol. 22(2), Part 2, pp. 129-157, Washington, D.C.*
- Beckwith, E.G. 1855. Report of Explorations For a Route for the Pacific Railroad on the Line of the Forty-First Parallel. Senate Exec. Doc. No. 78, 33rd Congress, 2nd Session, Washington, D.C.
- Bedwell, Stephen F. 1970. Prehistory and Environment of the Plural Rock Lake Area of South Central Oregon. Ph.D. Dissertation, University of Oregon, Eugene.*
- _____. 1973. Fort Rock Basin Prehistory and Environment. University of Oregon Books, Eugene.*
- Behle, William M. and Michael L. Perry. 1975. Utah Birds: Checklist, Seasonal and Ecological Occurrence Charts and Guide to Bird Finding. Salt Lake City, Utah: Utah Museum of Natural History, University of Utah.
- Berge, Dale L. 1980. Simpson Springs Station: Historical Archeology in Western Utah. Salt Lake City: Bureau of Land Management.
- Billington, Ray A. 1982. Westward Expansion. New York: MacMillian Company.*
- Bloss, Roy S. 1959. Pony Express: The Great Gamble. Berkeley: Howell-North.
- Bolen, Eric G. 1964. Plant Ecology of Spring Fed Salt Marshes in Western Utah. Ecological Monographs. 34(2): 143-166.*
- Bolke, K. E. and C. T. Sumison. 1978. Hydrologic Reconnaissance of the Fish Springs Flat Area, Tooele, Juab, and Millard Counties, Utah. Salt Lake City: State of Utah, Department of Natural Resources, Technical Publication No. 64.*
- Branson, F. A., R. F. Miller, and I. S. McQueen. 1967. Geographic Distribution and Factors Affecting the Distribution of Salt Desert Shrubs in the United States. Journal of Range Management. 20: 287-296.*
- Bright, Robert C. 1966. Pollen and Seed Stratigraphy of Swan Lake, Southeastern Idaho: It's Relation to Regional Vegetational History and to Lake Bonneville History. Tebiwa. 9(2): 1-47.*
- Brown, Merle. 1960. The Climate of Utah. In Climates of the States: Vol. II. Western States Including Alaska and Hawaii. Washington, D.C.: National Oceanic and Atmospheric Administration, U.S. Department of Commerce. 1974.*

*References cited.

- Bryan, Alan L. 1978. Smith Creek Cave. (In) The Archaeology of Smith Creek Canyon, Eastern Nevada, (ed.) Donald R. Toughy and Doris Rendall. Anthropological Papers of the Nevada State University. No. 17. Carson City.*
- Butler, B. Robert. 1978. A Guide to Understanding Idaho Archaeology: The Upper Snake and Salmon River County, 3rd ed. Idaho State Historic Preservation Office, Boise, Idaho.*
- Bureau of Indian Affairs. 1976. Memorandum to: Phoenix Area Director. Re: Results of Research Report on Goshute Judgement in Dockets 326-B and J before the Indian Claims Commission. Letter not published.*
- Bureau of Land Management. 1980. Class I Historic Overview For the Salt Lake District. MS. on file; Salt Lake District Office.*
- Carr, Stephen L. 1972. The Historical Guide to Utah Ghost Towns. Salt Lake City: Western Epics.*
- Carter, Kate B. 1960. Utah and the Pony Express. Salt Lake City: Pony Express Centennial Commission.
- Chamberlin, R. V. 1909. Some Plant Names of the Ute Indians. American Anthropologist. 11: 27-40.*
- Chamberlin, Ralph V. 1911. The Ethnobotany of the Gosiute Indians. Philadelphia: Academy of Natural Science Proceedings. Vol. 53, pp. 24-99.*
- . 1913. Place and Personal Names of the Gosiute Indians of Utah. Philadelphia: Reprinted from Proceedings of the American Philosophical Society. Vol. 52, No. 208, pp. 1-20.*
- Chapman, Arthur. 1932. The Pony Express. New York: A.L. Burt Company.
- Chase, D.M. 1958. He Opened the West. Cresnet City: Norte Triplicate Press.
- Clark, Leland L. 1975a. A 40,000-year-old Stone Industry on Lake Bonneville's Alpine Beach. Utah Archeology. Vol. 21, No. 1, pp. 1-5. Salt Lake City.*
- . 1975b. The Georphology of Stone Tools on Lake Bonneville's 40,000-year-old Alpine Beach. Utah Archeology. Vol. 21, No. 1, pp. 6-8. Salt Lake City.*
- Clyman, James. 1960. James Clyman, American Frontiersman. Portland: Champoege Press.*
- Cottam, Walter P. 1961. Our Renewable Wild Lands-A Challenge. Salt Lake City, Utah: University of Utah.

*References cited.

- Coulam, Nancy J. and Peggy R. Barnett. 1980. Paleoethnobotanical Analysis. (In) Sudden Shelter. (eds.) Jesse D. Jennings, Alan R. Schroedl, and Richard N. Holmer. pp. 171-195. Salt Lake City: University of Utah Anthropological Papers No. 103.*
- Crane, W.K. and J.L. Eames. 1950. Archeological Reconnaissance of Western Tooele and Box Elder Counties, Utah. Unpublished M.S., Department of Anthropology, University of Utah. Salt Lake City, Utah.*
- Cronquist, Arthur, Arthur H. Holmgren, Noel H. Holmgren, and James L. Reveal. 1972. Intermountain Flora: Vascular Plants of the Intermountain West, U.S.A. Volume One. New York: Hafner Publishing Company.*
- Curry, Donald R. and Steven R. James. 1982. Paleoenvironment of the Northeastern Great Basin and Northeastern Basin Rim Region: A Review of Geological and Biological Evidence. (In) Man and Environment in the Great Basin. (eds.) D. B. Madsen and J. E. O'Connell. pp 27-52. Washington, D.C.: Society for American Archeology Paper No. 2.*
- DeVoto, Bernard. 1943. The Year of Decision: 1846. Boston: Houghton-Mifflin Company.*
- Defa, Dennis Ray. 1979. A History of the Gosiute Indians to 1900. Unpublished Master's Thesis. Salt Lake City: Department of Anthropology, University of Utah.*
- Department of the Army. 1981. DARCOM Installation Activity Report. Washington, D.C.: U.S. Army.*
- Department of Interior, Bureau of Indian Affairs. United States Indian Field Service. Reports from Indian Agents: 1917, 1928, 1930, 1933.
- Department of Interior, Bureau of Indian Affairs. Gosiute Judgement in Dockets 326-B&J. 1975.*
- Durrant, Stephen D. 1952. Mammals of Utah: Taxonomy and Distribution. Lawrence, Kansas: University of Kansas Publications, Museum of Natural History.
- Eardley, A. J. 1955. Tertiary and Quaternary Geology of the Eastern Bonneville Basin. (In) The Guidebook to the Geology of Utah #10. Salt Lake City: Utah Geologic Society.*
- Egan, Howard. 1963. Gleaners of the Desert: How American Indians Lived in Submarginal Environment. (In) a Reader in General Anthropology. Compiled by Carleton S. Coon p. 46-61. New York: Holt, Rinehart and Winston.*
- Fautin, R. W. 1946. Biotic Communities of the Northern Desert Shrub Biome in Western Utah. Ecological Monographs. 16: 251-310.*

*References cited.

- Fike, Richard A. and John W. Headley. 1979. The Pony Express Stations of Utah, The Historical Perspective. Cultural Resources Series. (Utah) No. 2. Salt Lake City: Bureau of Land Management.*
- Fine, Lenore and Jesse A. Remington. 1972. The Corps of Engineers: Construction in the United States. U.S. Army in World War II. Washington, D.C.: U.S. Army.
- Flint, R. F. 1971. Glacial and Quaternary Geology. New York City: John Wiley and Son, Inc.*
- Floyd, William H. 1958. Phantom Riders of the Pony Express. Philadelphia: Dorrance & Company.
- Fowler, Catherine S. 1970. Great Basin Anthropology and Bibliography. Desert Research Institute, Social Sciences and Humanities Publication. No. 5. Reno: Desert Research Institute of the University of Nevada.*
- _____. 1982. Settlement Patterns and Subsistence Systems in the Great Basin: The Ethnographic Record in Man and the Environment in The Great Basin. Edited by David B. Madsen and James F. O'Connell. Washington, D.C.: Society of American Archeology. SAA Papers #2.*
- _____, and D.D. Fowler. 1971. Notes on the History of the Southern Paiutes and Western Shoshonis. Utah Historical Quarterly. 39:95-113.*
- Fowler, D.D. 1972. Great Basin Cultural Ecology. Desert Research Institute Publications in the Social Sciences. No. 8.*
- Frison, George C. 1978. Prehistoric Hunters of the High Plains. Academic Press. New York.*
- Gates, Joseph S. and Stacie A. Kruer. 1981. Hydrologic Reconnaissance of the Southern Great Salt Lake Desert and Summary of the Hydrology of West-Central Utah. Salt Lake City: State of Utah, Department of Natural Resources, Technical Publication No. 71.*
- Gillin, John P. 1936. Excavations of Nephi. M.S., Department of Anthropology. University of Utah, Salt Lake City.*
- _____. 1941. Archeological Investigations in Central Utah. Peabody Museum of American Archeology and Ethnology, Harvard University Paper. 17(2).*
- Goetzmann, William H. 1959. Army Exploration in the American West. New Haven: Yale University Press.*
- _____. 1966. Exploration and Empire: The Explorer and Scientist in the Winning of the American West. New York: Alfred A. Knopf.*
- Graber, D. 1973. Jedediah Smith, Fur Trader From Ohio. Stockton: University of the Pacific.

*References cited.

- Grady, J. 1980. Environmental Factors in Archeological Site Locations, Piceance Basin, Colorado. Cultural Resources Series. No. 49, Bureau of Land Management, Denver, Colorado.*
- Grantsville and Shambip, Soil Conservation District. 1976. Conservation History of Tooele County. Tooele, Utah.*
- Grayson, Donald K. 1982. Toward a History of Great Basin Mammals During the Past 15,000 Years. (In) Man and Environment in the Great Basin. (eds.) David B. Madsen and James F. O'Connell. pp. 82-101. Washington, D.C.: Society for American Archeology Papers No. 2.*
- Greeley, Horace. 1860. An Overland Journey From New York to San Francisco in the Summer of 1859. New York: C.M. Seaton, Barker & Company.*
- Green, D.F. 1961. Archaeological Investigations at the G.M. Hinkley Farm Site. Utah County, Utah, 1956-1960. Brigham Young University Press, Provo.*
- Gunnerson, James H. 1962. A Fluted Point Site in Utah. American Antiquity. Vol. 21, No. 4, pp. 412-414. Washington, D.C.*
- Haggett, Peter. 1965. Locational Analysis in Human Geography. Edward Arnold, London:193.*
- Hall, Carrol D. 1947. Donner Miscellany: 41 Diaries. San Francisco: Book Club of California.
- Hall, E. R. 1946. Mammals of Nevada. Berkeley: University of California Press.
- Harper, K. T. and G. M. Alder. 1970. The Macroscopic Plant Remains of the Deposits of Hogup Cave, Utah, and Their Paleoclimatic Implications. (In) Hogup Cave. (ed.) C. Melvin Aikins. pp. 215-240. Salt Lake City: University of Utah Anthropological Papers No. 93.*
- Harris, Robert and Jeremy Paxman. 1982. A Higher Form of Killing: The Secret Story of Chemical and Biological Warfare. New York: Hill and Wang.
- Heizer, R.F. and A.D. Krieger. 1956. The Archaeology of Humbolt Cave, Churchill County, Nevada. University of California Publications in American Archaeology and Ethnology. No. 47. Berkeley.*
- ____ and L.K. Harper. 1970. Archeology and the Prehistoric Great Basin Lacustrine Subsistence Regime as seen from Love Lock Cave, Nevada. Contributions of the University of California Archeological Research Facility. No. 10. Berkeley.*

*References cited.

- Hester, T.R. 1973. Chronological Ordering of Great Basin Prehistory. Contributions of the University of California Archeological Research Facility. No. 17.*
- and R.F. Heizer. 1973. Review and Discussion of Great Basin Projectile Points: Fauescural Chronology. Archeological Research Facility. Department of Anthropology, Berkeley.
- Hintze, L. F. 1975. Geologic Highway Map of Utah. Provo, Utah: Brigham Young University Geology Studies Special Publication 3.*
- Hoffman, Berney. 1934. Grim Journey. Minton, Balch & Company.
- Hogan, Patrick. 1980. The Analysis of Human Coprolites From Cowboy Cave. (In) Cowboy Cave. (ed.) Jesse D. Jennings. Appendix IX, pp 201-211. Salt Lake City: University of Utah Anthropological Papers No. 104.*
- Hollon, W. Eugene. 1966. The Great American Desert Then and Now. New York Oxford University Press.*
- Holmer, Richard N. 1978. A Mathematical Typology for Archaic Projectile Points of the Eastern Great Basin. Unpublished Ph.D. dissertation, Department of Anthropology. University of Utah, Salt Lake City.*
- Hood, James W. and F. Eugene Rush. 1965. Water-Resource Appraisal of the Snake Valley Area, Utah and Nevada. Salt Lake City: State of Utah, Department of Natural Resources, Technical Publication No. 14.*
- and K. M. Waddell. 1968. Hydrologic Reconnaissance of Skull Valley, Tooele County, Utah. Salt Lake City: Utah Department of Natural Resources, Technical Publication No. 18.*
- Houghton, Eliza P. 1911. The Expedition of the Donner Party. New York: A.C. McClury and Company.
- Humphrey, Robert L. and D. Stanford, eds. 1979. Pre-Llano Cultures of the Americans: Paradoxes and Possibilities. The Anthropological Society of Washington, Washington, D.C.*
- Hunt, A.P. and D. Turner. 1960. Early Man Sites near Moab, Utah. American Antiquity. Vol. 26, No. 1, pp. 110-117. Washington, D.C.*
- Inman, Henry. 1898. The Great Salt Lake Trail. Norwood: Norwood Press.
- Irving, Washington. 1961. The Adventure of Captain Bonneville. Norman: University of Oklahoma.
- Irwin-Williams, C. 1968. The Reconstruction of Archaic Culture History in the Southwestern United States. (In) Archaic Prehistory in the Western United States. Symposium of the Society for American Archaeology, Santa Fe Eastern New Mexico Univ., Contributions in Anthropology Vol. 1, No. 3.*

*References cited.

- _____. H. Irwin, G. Agogino, and C.V. Haynes, Jr. 1973. Hell Gap: Paleo-Indian Occupation on the High Plains. Plains Anthropologist. Vol. 18(59), pp. 40-53.
- James, Steven R. 1980. Cultural Resource Narrative. Salt Lake District, Part I Prehistory. M.S. on file at Bureau of Land Management Office. Salt Lake District Office, Salt Lake City.*
- Janetski, Joel C. 1981. Ethnohistory/Ethnography of the Elka and Ely Districts. (In) Prehistory, Ethnohistory, and History of Eastern Nevada. A Cultural Resources Summary of the Elko and Ely Districts; (ed.) Steven R. James, pp. 149-210. Cultural Resource Series. No. 3. Bureau of Land Management.*
- Jennings, J.D. 1957. Danger Cave. University of Utah Anthropological Papers. 27.*
- _____. 1964. The Desert West. (In) Prehistoric Man in the New World. (eds.) Jesse D. Jennings and Edward Norbeck, pp. 149-174. University of Chicago Press, Chicago.*
- _____. 1968. The Prehistory of North America. McGraw-Hill, New York.*
- _____. 1974. Prehistory of North America. second edition. McGraw-Hill, New York.*
- _____. 1978. Prehistory of Utah and the Eastern Great Basin. University of Utah Anthropological Papers. 98.*
- _____, Elmer R. Smith, and Charles E. Dibble. 1959. Indians of Utah: Past and Present. Home Study Development. Salt Lake City: University of Utah.*
- Judd, Neil W. 1917. Archaeological Reconnaissance in Western Utah. Smithsonian Misc. Collection. 66(17).*
- Kelley, Charles. 1969. Salt Desert Trails. Salt Lake City: Western Epics.
- King, Thomas F. 1980. Treatment of Archeological Properties: A Handbook. Endorsed by the Advisory Council on Historic Preservation. Washington, D.C.
- Knudson, Ruthann, David J. Fee, Steven E. James. 1983. A Work Plan for the Development of Archeological Overviews and Management Plans for Selected U.S. Department of the Army DARCOM Facilities. Final Report No. 1 submitted to the National Park Service, U.S. Department of Interior, Washington, D.C. Under Contract CX-0001-2-0050.
- Krieger, Alex D. 1964. Early Man in the New World. (In) Prehistoric Man in the New World. (eds.) Jesse D. Jennings and Edward Norbeck, pp. 23-81. University of Chicago Press, Chicago.*

*References cited.

- Lamb, Sidney M. 1958. Linguistic Prehistory of the Great Basin. International Journal of American Linguistics. Vol. 24, No. 2, pp. 95-100. Baltimore.*
- Lindsay, LaMar W. 1976. Unusual or Enigmatic Stone Artifacts: Pots, Pipes, Paints, and Pendants from Utah. Antiquities Section Selected Papers. Vol. 2, No. 8. Utah State Historical Society, Salt Lake City.*
- . 1980. Pollen Analysis of Cowboy Cave Cultural Deposits. (In) Cowboy Cave. (ed.) Jesse D. Jennings. pp. 213-224. Salt Lake City: University of Utah Anthropological Paper No. 104.
- McCarthy, Joe. 1974. The Lincoln Highway. American Heritage. 25:32-37, 89.*
- McCordock, R. Stanley. 1947. Demobilization. Aberdeen: U.S.A. Chemical Corps.
- Madsen, David B. 1975. Dating Paiute-Shoshoni Experience in the Great Basin. Numic American Antiquity 40:82-86.*
- . 1979. Prehistoric Occupation Patterns, Subsistence Adaptations, And Chronology In The Fish Springs Area, Utah. (In) Archeological Investigations in Utah at Fish Springs, Clay basin, Northern San Rafael Swell, Southern Henry Mountains. (eds.) David B. Madsen and Richard E. Fike. Salt Lake City: Bureau of Land Management, Utah Cultural Resource Series 12.*
- (ed.) 1980. Fremont Perspectives. Utah State Historical Society, Antiquities Section, Selected Papers 7(16).*
- . 1982. Get It Where the Gettin's Good: A Variable Model of Great Basin Subsistence and Settlement Based on Data From the Eastern Great Basin. (In) Man and Environment in the Great Basin, (eds.) David B. Madsen and J.F. O'Connell. Society for American Archeology Papers. No. 2.*
- and Michael S. Berry. 1975. A Reassessment of Northeastern Great Basin Prehistory. American Antiquity. 40:391-405.*
- and James F. O'Connell (editors). 1982. Man and Environment in the Great Basin. Society for American Archeology Papers. No. 2.*
- Madsen, Jim. 1980. Updated Priority Lists of Paleontologically Sensitive Formations In Utah. Salt Lake City: Division of State History Memorandum.*
- Malouf, Carling. 1940. The Gosiute Indians. Archeology and Ethnology Papers. No. 3. Salt Lake City: Museum of Anthropology, University of Utah.*

*References cited.

- _____. 1951. The Gosiute Indians. Unpublished Master's Thesis. Salt Lake City: University of Utah Anthropology Department.*
- _____. 1966. Ethnohistory in the Great Basin (In) The Current Status of Anthropological Research in the Great Basin. 1964, (eds.) Warren L. d'Azevedo, Wilbur A. Davis, Don D. Fowler, and Wayne Suttles, pp. 1-38. Reno: Desert Research Institute.*
- Marwitt, J.P. 1968. Pharo Village, University of Utah Anthropological Papers. No. 91, Salt Lake City.*
- _____. 1970. Median Village and Fremont Culture Regional Variation. University of Utah Anthropological Papers. 95.*
- Mehring, P. J., Jr. 1977. Great Basin Late Quaternary Environments and Chronology. (In) Models and Great Basin Prehistory. (ed.) Don Fowler. pp. 113-167. Reno, Nevada: Desert Research Institution Publications in the Social Sciences No. 12.
- Mercer, Mildred A., ed. 1961. History of Tooele County. Salt Lake City: Daughters of Utah Pioneers.*
- Mifflin, M. D. and Wheat, M. M. 1979. Pluvial Lakes and Estimated Pluvial Climates of Nevada. Reno, Nevada: Nevada Bureau of Mines and Geology, Bull. 94, University of Nevada.*
- Miller, David E. n.d. The Donner Road Through the Great Salt Lake Desert. Salt Lake City: Utah State Historical Society.
- Miller, G. H. 1982. Report of Current Activities. Boulder, Colorado: Ammino Acid Geochronology Laboratory, Institute of Arctic and Alpine Research of the Department of Geological Sciences, University of Colorado.*
- Miller, Wick R. 1966. Anthropological Linguistics in the Great Basin. (In) "Current Status of Anthropological Research in the Great Basin: 1964, (eds.) W.L. d'Azevedo, W.A. Davis, D.D. Fowler, and W. Suttles. Desert Research Publications in the Social Sciences. No. 1, pp. 75-112. Reno.*
- Moore, W. J. and M. L. Sorensen. 1979. Geologic Map of the Tooele 1° by 2° Quadrangle, Utah. Washington, D.C.: U.S.G.S. Map I-1132.*
- Moratto, M.J. 1975. On the Concept of Archaeological Significance. Paper presented at the Annual Northern California meeting of the Society for California Archaeology, Fresno.*
- Morgan, Dale. 1954. Jedediah Smith and His Maps of the American West. San Francisco: California Historical Society.
- _____. 1953. Jedediah Smith and the Opening of the West. Indianapolis: Bobbs-Merrill Company.*

*References cited.

- Neihardt, J.G. 1924. The Spendid Wayfarring. New York: MacMillian Company.
- Paul, Rodman W. 1963. The Mining Frontiers of the Far West, 1848-1880. New York: Holt, Rinehart and Winston.*
- Pickford, G. D. 1932. The Influence of Continued Heavy Grazing and of Promiscuous Burning on Spring-Fall Ranges in Utah. Ecology. 13:159-171.
- Pinkham, C., L.D. King, D.A. Gauthier, G.T. Crane, H.E. Stark, A.P. Adams, P.E. Carlson, and G.L. Choules. 1979. Installation Environmental Impact Assessment for United States Army Dugway Proving Ground, Dugway, Utah. Dugway: Department of the Army, United States Army Materiel Development and Readiness Command. Environmental and Life Science Division.*
- Poll, Richard E., Thomas G. Alexander, E.E. Campbell, and David E. Miller. 1978. Utah's History. Provo: Brigham Young University Press.*
- Price, Sara Sue. 1952. A Comparison of Gosiute Material Culture and the Archaeology of Western Utah. An unpublished Master's Thesis, Department of Anthropology. Salt Lake City: University of Utah.*
- Public Domain: Today's Pioneering Must Be Planned for National Defense and Domestic Security. 1941. Survey Graphic. 30:72-78.
- Reagan, Albert B. 1934a. Some notes on the History of the Uinta Basin in Northeastern Utah to 1850. Utah Academy of Sciences, Arts, and Letters. Vol. II, pp. 55-64.*
- _____. 1934b. The Gosiute (Goshute), or Shoshone-Goship Indians of the Deep Creek Region in Western Utah. Proc. Utah Acad. of Sciences, Arts, and Letters. 11:43-54.*
- Reinfield, Fred. 1966. Pony Express. New York: MacMillian Company.
- Rudy, Jack R. 1953. An Archeological Survey of Western Utah. University of Utah Antropological Papers. 12.*
- Schiffer, M.B. and G.J. Gumerman, eds. 1977. Conservation Archaeology: A Guide for Cultural Resource Management Studies. New York: Academic Press.*
- Schroedl, A.R. 1979. A Selected Bibliography of Utah Archeology. University of Utah Anthropological Papers. 102.*
- Scovill, D.H. G.J. Gordon, and K.M. Anderson. 1972. Guidelines for the Preparation of Statements of Environmental Impact on Archaeological Resources. Arizona Archaeological Center, Tucson, AZ.*
- Schubert, Frank N. 1980. Vanguard of Expansion: Army Engineers in the Trans-Mississippi West, 1819-1879. Washington, D.C.: Government Printing Office.*

*References cited.

- Sharrock, Floyd W. and Edward G. Keane. 1962. Carnegie Museum Collection From Southeast Utah. University of Utah Anthropological Papers. No. 57, Glen Canyon Series No. 16.*
- _____. and John P. Marwitt. 1967. Excavations at Nephi, Utah, 1965-1966. University of Utah Anthropological Papers. No. 88, Salt Lake City.*
- Simpson, J.H. 1976. Report of Explorations Across The Great Basin of the Territory of Utah for a Direct Wagon Route From Camp Floyd to Genoa, in Carson Valley in 1859. Washington, D.C.: Government Printing Office.*
- Smith, A.J. 1965. Men Against the Mountains. New York: The John Day Company.
- Smith, Elmer R. 1938. University of Utah Archaeological Expedition, Summer 1938. Report to the President of the University of Utah. M.S. Department of Anthropology, University of Utah, Salt Lake City.*
- _____. 1942. Early Man in the Great Salt Lake Area. Mineralogical Society of Utah New Bulletin. Vol. 13, No. 2, pp. 27-32.*
- Smith, Woddell, F. 1960. The Story of the Pony Express. San Francisco: Hesperian House.
- Spencer, Robert and Jesse D. Jennings (et.al.). 1977. The Native Americans. pp. 184-201. New York: Harper & Row.*
- Stegner, Wallace. 1942. Mormon Country. New York: Duell, Sloan and Pearce.*
- Stephens, J. L. and C. T. Sumison. 1978. Hydrologic Reconnaissance of the Dugway Valley-Government Creek Area, West Central Utah. Salt Lake City: Utah Department of Natural Resources Technical Publication No. 59.*
- Steward, Julian. H. 1931. Archaeological Discoveries at Kanosh in Utah. El Palacio. Vol. 30(8):121-130.*
- _____. 1933. Early inhabitants of Western Utah, part I; Mammals and House Types. University of Utah Bulletin. Vol. 23, No. 7.*
- _____. 1936. Pueblo Material Culture in Western Utah. University of New Mexico Bulletin. No. 287, Anthropology Series 1(3).*
- _____. 1937. Ancient Caves of the Great Salt Lake Region. Bureau of American Ethnology Bulletin 116.*
- _____. 1940. Native Cultures of the Intermontane (Great Basin) Area. Bureau of American Ethnology Bulletin 100. Washington: Government Printing Office.*

*References cited.

- _____. 1943. Culture Element Distributions: XXIII Northern and Gosiute Shoshoni. Berkeley: University of California, Anthropological Records. Vol. 8, No. 3, pp. 263-392.*
- _____. 1970. Basin Plateau Aboriginal Sociopolitical Groups. Reprinted. Salt Lake City: University of Utah Press. (Originally published, 1938, Washington, D.C.: Government Printing Office.)*
- Stewart, George R. 1936. Ordeal by Hunger. New York: Henry Holt and Company.
- Stewart, George, W. P. Cottam, and Selar S. Hutchings. 1940. Influence of Unrestricted Grazing on Northern Salt Desert Plant Associations in Western Utah. J. Agric. Research. 60(5): 289-316.*
- Stewart, Omer C. 1965. The Shoshoni of the Great Basin in The Native Americans. (eds.) Robert F. Spencer and Jesse D. Jennings, pp. 273-282. New York: Harper and Row.*
- _____. 1966. "Tribal Distributions and Boundaries in the Great Basin (In) The Current Status of Anthropological Research in the Great Basin. 1964. (eds.) Warren L. d'Azevedo, Wilbur A. Davis, Don D. Fowler, and Wayne Suttles, pp. 167-238. Reno: Desert Research Institute.*
- _____. 1982. Indians of the Great Basin; A Critical Bibliography. Published for the Newbury Library. Bloomington: Indiana University Press.*
- Stoffle, Richard W. and Henry F. Dobyns, editors. 1982. Utah Indians Comment on the Intermountain Parvich Project, Utah Section, Intermountain - Adelanto Bipole I. Transmission Line Ethnographic Native American Resources. Report submitted by Applied Urban Field School, University of Wisconsin. Kenosha: Parkside to Applied Conservation Technology, Inc.*
- Stookey, Walter. 1950. Fatal Decision. Salt Lake City: Desert Book Company.
- Stuart, Mark. 1981. A Revised Summary of Weber County, MS, Utah State Historic Society Antiquities Section. Salt Lake City.
- Sullivan, M.S. 1936. Jedediah Smith, Trader and Trail Breaker. New York: Press of the Pioneers.
- Taylor, D.C. 1957. Two Fremont Sites and their Position in Southwestern Prehistory. University of Utah Anthropological Papers. No. 29 Salt Lake City.*
- Thomas, David H. 1972. A computer simulation model of Great Basin Shoshonean Subsistence and Settlement Patterns. (In) Models in Archeology. (ed.) D.L. Clark, Methuen, London.*

*References cited.

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AN ARCHEOLOGICAL OVERVIEW AND MANAGEMENT PLAN FOR THE
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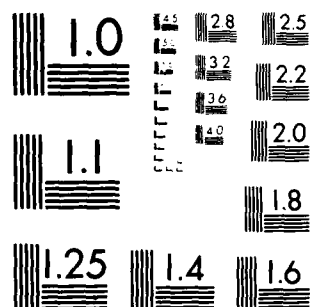


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- _____. 1973. An Empirical Test for Steward's Model of Great Basin Settlement Patterns. American Antiquity. 38:155-175.*
- Tisdale, E. W. and M. Hironaka. 1981. The Sagebrush-Grass Region: A Review of the Ecological Literature. Moscow, Idaho: Idaho Forestry, Wildlife, and Range Experiment Station, Bulletin No. 33.*
- Tripp, George W. 1966. A Clovis Point from Central Utah. American Antiquity. Vol. 31, No. 3, pp. 435-436. Washington, D.C.*
- _____. 1967. Bill Mobely Does it Again! Utah Archeology. Vol. 13, No. 1, p. 16, Salt Lake City.*
- Van Devander, Thomas R., and W. Geoffrey Spaulding. 1979. Development of Vegetation and Climate in the Southwestern United States. Science. 204:701-710.*
- Vest, E. D. 1962. Biotic Communities in the Great Salt Lake Desert. Salt Lake City: University of Utah, Division of Biology, Institute of Bio. Res., Ecology and Epizoology Series 73.*
- Walters, Robert E. (ed). 1982. Utah Bird Latilong Distribution. Salt Lake City: Division of Wildlife Resources.
- Warren, Claude N. 1967. The San Diequito Complex: A Review and Hypothesis. American Antiquity. 32:168-185.*
- _____, and Anthony J. Ranere. 1968. Outside Danger Cave: A Review of Early Man in the Great Basin. (In) Early Man in North America: Symposium of the Southwestern Anthropological Association, San Diego, 1968, (ed.) C. Irwin-Williams. Eastern New Mexico University Contributions in Anthropology. Vol. 1, No. 4.*
- Willey, Gordon R., and Phillip Phillips. 1958. Method and Theory in American Archeology. University of Chicago Press, Chicago.*
- Wilson, LeMoyne, M.E. Olsen, T.B. Hutchings, A.R. Southard, and A.J. Erickson. 1975. Soils of Utah. Logan, Utah: Utah State University Agricultural Experiment Station Bulletin No. 492.*
- Winter, Joseph C. 1973. The Distribution and Development of Fremont Maize Agriculture: Some Preliminary Interpretations. American Antiquity. 38:439-451.*
- Wright, Gary A. 1978. The Shoshonean Migration Problems. Plains Anthropologist. Vol. 23, pp. 113-137.*
- Yanovsky, Elias. 1936. Food Plants of the North American Indians. Washington, D.C.: U.S.D.A. Miscellaneous Publications No. 237.

*References cited.

Young, James A., Raymond A. Evans, and J. Major. 1972. Alien Plants in the Great Basin. Journal of Range Management. 25:194-201.*

_____, R. A. Evans, and R. F. Eckert, Jr. 1981. Environmental Quality and the Use of Herbicides on Artemisia/Grasslands of the U.S. Intermountain Area. Agriculture and Environment. 6:53-61.*

*References cited.

APPENDIX A

APPENDIX A

APPENDIX A CLASSIFICATION METHODS FOR SITE AND LANDFORM TYPES

Classification methods used to describe site type and landform type (Table 4-2) are drawn from the Intermountain Antiquities Computer System (IMACS) User Guide (Tables A-1 and A-2) currently in use in the state of Utah. For Dugway Proving Ground, landform and site types were taken directly from the site forms on file in the Office of the State Archeologist, State of Utah.

Table A-1. LANDFORM NAMES FOR DARCOM ARCHEOLOGICAL OVERVIEWS AND MANAGEMENT PLANS

Geographic Reference	Primary Landform	Primary Position	Secondary Landform	Secondary Position	On-Site Content
Desert West*	Mountain Hill Tableland/Mesa Ridge Valley Plain (upland) Canyon Coast/Shoreline	Top/Creek/Peak Edge Slope Toe/Foot/Bottom/ Mouth Saddle/Pass Bench/Ledge Rimrock Interior	Alluvial Fan Alcove/Rock Shelter Arroyo Basin Cave Cliff Delta Detached Monolith Dune Floodplain Ledge Mesa/Butte Playa Portable Geological Plain Ridge/knoll Rockshelter Slope Terrace/Bench Talus Slope Island Spring Mound/Bog Valley Cutbank Riser	Top/Crest/Peak Edge Slope Toe/Foot/Bottom/ Mouth Interior Step Riser Patterned Ground Face (i.e., Cliff Face Saddle/Pass	Fan Talus Dune Stream Terrace Playa Shore Feature, Extinct Lake Shore Feature, Existing Lake Alluvial Plain (Canyon, Valley Fill) Colluvium Moraine Flood Plain Marsh Landslide/Slump Delta Desert Pavement Outcrop Stream Bed Aeolian None (Rock Art, No Soil) Residual

*Intermountain Antiquities Computer System (IMACS) Users Guide: Instruction and Computer Codes for use with the IMACS Form. Univ. of Utah, Bureau of Land Management, U.S. Forest Service. 1982.

Table A-2. RESOURCE TYPE NAMES FOR THE DARCOM ARCHEOLOGICAL OVERVIEWS AND MANAGEMENT PLAN

Prehistoric Components	Historic Components	
	Themes	Structure/Function
Agricultural fields	Agriculture and Ranching (AR)	
Bedrock mortars	Commercial (C)	Barn
Burial	Domestic (D)	Barracks
Burial mound	Education (ED)	Bridge
Butchering station	Exploration (EX)	Bulkhead
Camp	Government (political, economic aspects (G))	Cabin
Cemetery	Manufacturing craft (MC)	Cairn
Fieldhouse	Manufacturing, industrial (MI)	Cemetery
Fortification	Military (MT)	Church
Fortified village	Recreation (RC)	Dam
Habitation site	Religious (RL)	Ditch
Irrigation ditch/dam/system	Transportation and Communication (TC)	Dock
Kill site		Dump
Limited activity area		Farm
Lithic workshop		Fire tower
Medicine wheel		Flume/raceway
Midden		Fort
Mound		Fortification
Plant gathering site		Granary
Quarry		House
Road		
Rock art (pictography, petroglyph)		
Rock circles		
Scarred tree		
Tipi rings		
Trail		
Village		
		Lean-to
		Mill
		Mine shaft
		Monument
		Quarry
		Pipeline
		Ranch
		Railroad bed/trestle
		Road
		Shed/garage
		Springhouse
		Tramway
		Trestle
		Town
		Village
		Wall
		Well/cistern
		Windmill

APPENDIX B

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APPENDIX B RESOURCE LOCATIONAL DATA

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Table B-1. LOCATIONAL DATA, KNOWN AND POTENTIAL ARCHEOLOGICAL RESOURCES ON THE DUGWAY PROVING GROUND

Site Number	UTM			Legal Reference			USGS Quad Map	CR
	Northing	Easting	Ref.	Township	Range	Section		

No UTM's or legal references were attempted since most of the 7.5 minute quads are lacking the appropriate notations from which to calculate legal and UTM locations.

All known sites have site numbers assigned and their approximate locations are plotted on Figure 5-1 indicating areas of high archeological potential.

Copies of site forms with whatever locational data they contain are included in the supporting data forwarded separately to Dugway Proving Ground.

DATE
FILME