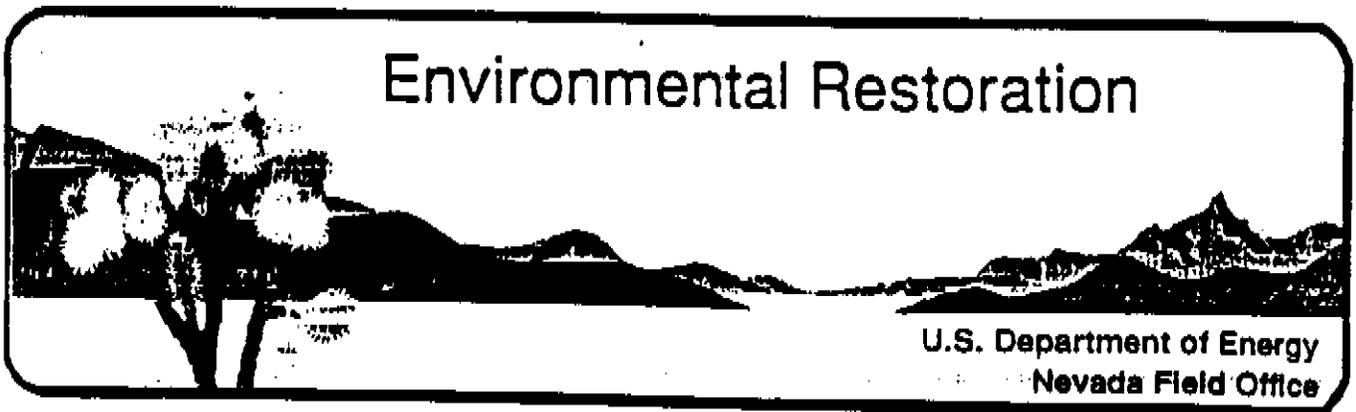


Review of Environmentally Sensitive Resources at Off-Site Locations

**Nevada Test Site
Nevada**

March 1993



Environmental Restoration

**U.S. Department of Energy
Nevada Field Office**

Review of Environmentally Sensitive Resources at Off-Site Locations

Prepared for:

**U.S. Department of Energy
Nevada Field Office
Las Vegas, Nevada**

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**Work Performed Under Contract
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March, 1993

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List of Acronyms

AEC	Atomic Energy Commission
ANSA	Alaska Native Claims Settlement Act
BLM	U.S. Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CNTA	Central Nevada Test Area
COE	U.S. Army Corps of Engineers
CX	Categorical Exclusion
DIGS	U.S. Department of the Interior Geological Survey
DOC	U.S. Department of Commerce
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy Nevada Operations Office
DOI	U.S. Department of the Interior
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FICWD	Federal Interagency Committee for Wetland Delineation
FSSC	Fleet Surveillance and Support Command
ft	Feet
FWD	U.S. Fish and Wildlife Division
FWS	U.S. Fish and Wildlife Service
L	Liters
m	Meters
NAC	Nevada Administrative Code
NEPA	National Environmental Policy Act
NPS	U.S. National Parks Service
NRS	Nevada Revised Statute
NTS	Nevada Test Site
RI/FS	Remedial Investigations and Feasibility Studies
SGZ	Surface Ground Zero
USAF	United States Air Force
USDA	U.S. Department of Agriculture

1.0 Introduction

Remedial investigations and feasibility studies (RI/FS) will be conducted for the Nevada Test Site (NTS) off-site locations. The seven NTS off-site locations to be investigated are:

- Armitka Island Test Site, Alaska
- Rio Blanco Gas Stimulation Test Site, Colorado
- Rulison Gas Stimulation Test Site, Colorado
- Central Nevada Test Area, Nevada
- Shoal Test Site, Nevada
- Gasbuggy Gas Stimulation Test Site, New Mexico
- Gnome-Coach Test Site, New Mexico.

The level of documentation required by the National Environmental Policy Act (NEPA) and the Department of Energy (DOE) regulations implementing the NEPA for these studies will be a Categorical Exclusion (CX) if the requirements listed in 10 C.F.R. § 1021, Appendix A and Subpart D of Appendix B are met. The CX to be applied for this activity is 10 C.F.R. § 1021, Subpart D (3.1):

Site characterization and environmental monitoring, including siting, construction, operation, and dismantlement or closing (abandonment) of characterization and monitoring devices and siting, construction, and operation of a small-scale laboratory building or renovation of a room in an existing building for sample analysis. Activities covered include, but are not limited to, site characterization and environmental monitoring under CERCLA and RCRA. Specific activities include, but are not limited to:

- (a) Geological, geophysical (such as gravity, magnetic, electrical, seismic, and radar), geochemical, and engineering surveys and mapping, including the establishment of survey marks;*
- (b) Installation and operation of field instruments, such as stream-gauging stations or flow-measuring devices, telemetry systems, geochemical monitoring tools, and geophysical exploration tools;*
- (c) Drilling of wells for sampling or monitoring of groundwater or the vadose (unsaturated) zone, well logging, and installation of water-level recording devices in wells;*
- (d) Aquifer response testing;*

- (e) *Installation and operation of ambient air monitoring equipment;*
- (f) *Sampling and characterization of water, soil, rock, or contaminants;*
- (g) *Sampling and characterization of water effluents, air emissions, or solid waste streams;*
- (h) *Installation and operation of meteorological towers and associated activities, including assessment of potential wind energy resources;*
- (i) *Sampling of flora or fauna; and*
- (j) *Archaeological, historic, and cultural resource identification in compliance with 36 CFR part 800 and 43 CFR part 7.*

To be considered for CX status, the proposed activities must specifically adhere to the classes of actions listed in 10 C.F.R. § 1021, Subpart D, Appendix B (1-3), and not adversely affect environmentally sensitive resources discussed in 10 C.F.R. § 1021, Subpart A, Appendix B (4) (i-vii).

Environmentally sensitive resources include property of historical, archaeological, or architectural significance; threatened, endangered, or candidate species; floodplains and wetlands; federal- and state-designated areas; prime agricultural lands; special sources of water; and tundra, coral reefs, and rainforests. In addition, DOE actions may not be categorically excluded if it is likely that an uncontrolled or unpermitted release of hazardous substances or pollutants may occur.

This report has been prepared to determine if environmentally sensitive resources or hazardous substances or pollutants are present at the sites and may, therefore, preclude the option of categorically excluding RI/FS activities from more extensive NEPA review and documentation. The remainder of this chapter defines hazardous substances and pollutants and each category of the listed environmentally sensitive resources presented in 10 C.F.R. § 1021, Subpart D, Appendix B. The following chapters present information concerning whether hazardous substances or pollutants or environmentally sensitive resources are likely to exist at each site. The final chapter summarizes the results for all sites and recommends the scope of reconnaissance survey to be conducted at each site.

1.1 Hazardous, Contaminated, or Polluted Sites

Hazardous substances, pollutants, and contaminants are defined in 10 C.F.R. § 1021.104 as:

Hazardous substances means a substance identified within the definition of hazardous substances in section 101 (14) of CERCLA (42 U.S.C. 9601.101 (14)). Radionuclides are hazardous substances through their listing under section 112 of the Clean Air Act (42 U.S.C. 7412) (40 C.F.R. § 61, subpart H).

Pollutant means a substance identified within the definition of pollutant in section 101 (33) of CERCLA (42 U.S.C. 9601.101 (33)).

Contaminant means a substance identified within the definition of contaminant in section 101 (33) of CERCLA (42 U.S.C. 9601.101 (33)).

DOE's regulations implementing NEPA allow certain RI/FS activities to be categorically excluded if the activities would not introduce or cause the inadvertent or uncontrolled movement of hazardous substances as defined in Section 101 (14) of CERCLA, pollutants or contaminants as defined by Section 101 (33) of CERCLA, or non-native organisms.

1.2 Environmentally Sensitive Resources

1.2.1 Property of Historic, Archaeological, or Architectural Significance

10 C.F.R. § 1021, Subpart D, Appendix B (4)(i) defines this category as "property of historic, archaeological, or architectural significance designated by federal, state or local governments, or property eligible for listing on the National Register of Historic Places." Property is defined as a site, building, structure, or object. Property eligible for the National Register must meet one or more of the following criteria:

Criterion A: Property that have made a significant contribution to the broad patterns of our history

Criterion B: Property that are associated with the lives of persons significant in our past

Criterion C: Property that are architecturally significant

Criterion D: Property that have yielded information important in prehistory or history

Properties listed are generally those that achieved significance over fifty years ago, although properties that achieved significance less than 50 years ago are "eligible only if they are of 'exceptional importance' or if they are integral parts of districts that are eligible for listing in the National Register," (DOI, n.d.). According to the National Historic Preservation Act (36 C.F.R. § 60.4), a property is significant when "the quality of significance in American history, architecture, archaeology, 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 when the aforementioned criteria are met.

1.2.2 Threatened, Endangered, or Candidate Species

The Endangered Species Act (ESA) and its corresponding amendments prohibit any federal agency from conducting or supporting activities that might lead to the extinction of plants and animals. Threatened, endangered, or candidate species and their habitat are environmentally sensitive resources identified in 10 C.F.R. § 1021, Subpart D, Appendix B (4)(ii) as "Federally-listed threatened or endangered species or their habitat (including critical habitat), Federally-proposed or candidate species or their habitat, or state listed endangered or threatened species or their habitat." Endangered, threatened, and candidate species and critical habitat are defined as:

endangered species: Any species which is in danger of extinction throughout all or a significant part of its range; other than a species of the class Insecta when determined by the Secretary of Interior to constitute a pest whose protection under the provisions of the ESA would present an overwhelming and overriding risk to man. (DOE, 1991)

threatened species: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. (DOE, 1991)

candidate species: One which has appeared to merit consideration for addition to the List of Endangered and Threatened Wildlife. Three categories of candidate species exist:

category 1: Sufficient information on threats and vulnerability is available to support a proposal to add the species to the List of Endangered and Threatened Wildlife.

category 2: Insufficient biological information is available to support a proposal to add species to the List of Endangered and Threatened Wildlife.

category 3: Three distinct subclassifications exist for this category:

3A: extinct

3B: invalid taxa

3C: Includes those that are not subject to any identifiable threats and/or taxa that are more abundant or widespread than was previously believed.

critical habitat: The specific areas within a geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of the ESA, on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection. (DOE, 1991)

The population size and trends, biology, range, threats, and vulnerability of a species are all considered in determining the status of a species.

The Nevada State Wildlife Statutes and Regulations, Nevada Revised Statute (NRS) 501.105-.110; Nevada Administrative Code (NAC) 503.010-.080; the Nevada State Vegetation Statutes and Regulations, NRS 501.105, 527.050, 527.100, 527.260, and 527.270; and NAC 517.010-.020 provide for the protection of wildlife and flora and establish provisions if species need to be removed, captured, or destroyed during an approved activity.

1.2.3 Floodplains and Wetlands

Floodplains and wetlands are environmentally sensitive resources listed in 10 C.F.R. § 1021, Subpart D, Appendix B (4)(iii). Floodplains are defined in the 10 C.F.R. § 1022.4 as:

The lowlands adjoining inland and coastal waters and relatively flat areas and floodprone areas of offshore islands including, at a minimum, that area inundated by a 1 percent or greater chance flood in any given year. The base floodplain is defined as the 100 year (1.0 percent) floodplain. The critical action floodplain is defined as the 500 year (0.2 percent) floodplain.

Wetlands are defined in the 10 C.F.R. § 1022.4 as:

Those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wetlands generally include swamps, marshes, bogs, and similar areas, such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds. The U.S. Environmental Protection Agency (EPA) and other federal agencies regulate the filling of open waters and disturbance of wetlands. The EPA has adopted the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (FICWD, 1989) as the technical basis for delineating wetlands. This manual was prepared by the Federal Interagency Committee for Wetland Delineation (FICWD) consisting of representatives from the U.S. Army Corps of Engineers (COE), EPA, the U.S. Fish and Wildlife Service (FWS), and the U.S. Department of Agriculture (USDA), Soil Conservation Service (SCS). In accordance with this methodology, the following three parameters are diagnostic of wetlands: (1) the land is dominated by hydrophytes, (2) the substrate is undrained hydric soil, and (3) the substrate is saturated with groundwater or flooded for a significant part of the growing season each year. All three parameters must be present in order for an area to be identified as wetland. Hydrophyte and hydric soils are defined as:

hydrophyte: Any plant growing in water, soil, or on a substrate, that is at least periodically deficient in oxygen as a result of excessive water content. (FICWD, 1989)

hydric soils: Soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in a major part of the root zone (USDA, 1987). Soils are considered hydric when they are (1) somewhat poorly drained and have a seasonal high water table less than 0.2 meters (m) from the surface; or (2) poorly drained or very poorly drained and have a seasonal high water table less than 0.30-0.46 m from the surface. This high water table must be present for a week or more during the growing season. Soils that are ponded or flooded for long or very long durations during the growing season are also classified as hydric. All organic soils (histosols) or mineral soils with a histic epipedon are considered hydric soils (FICWD, 1989).

1.2.4 Federal- and State-Designated Areas

Federal- and state-designated areas are environmentally sensitive resources specifically listed in 10 C.F.R. § 1021, Subpart D, Appendix B (4)(iv) as "Federal- and state-designated wilderness areas, national parks, national natural landmarks, wild and scenic rivers, state and Federal wildlife refuges, and marine sanctuaries." Public and private parties that control the rights to each site are also addressed in this report.

1.2.5 Prime Agricultural Lands

Prime agricultural land is an environmentally sensitive resource listed in 10 C.F.R. § 1021, Subpart D, Appendix A (4)(v). Prime agricultural lands contain soils that (1) meet specified state land-capability classes, (2) are irrigated, and (3) do not flood. Land-capability classifications primarily address those soils suitable for longtime sustained use for cultivated crops and for those soils that are not. Soils that are suitable are grouped according to their potential capability to sustain production of common cultivated crops that do not require specialized site conditioning and site treatment. Unsuitable soils are grouped according to their potential capability to produce permanent vegetation and according to their risks of soil damage if mismanaged (Klingebiel and Montgomery, 1961).

1.2.6 Special Sources of Water

Special sources of water are environmentally sensitive resources defined in 10 C.F.R. § 1021, Subpart D, Appendix B (4)(vi) as "sole-source aquifers, well head protection areas, and other water sources that are vital in a region."

1.2.7 Tundra, Coral Reefs, and Rainforests

Tundra, coral reefs, and rainforests, as listed in 10 C.F.R. § 1021, Subpart D, Appendix B (vii), are not applicable for any of the sites currently under investigation with the exception of tundra occurring on the Amchitka Island Test Site in Alaska.

2.0 Alaska Project Site

2.1 Amchitka Island Test Site

The Amchitka Island Test Site is located in the Aleutian Chain on the southernmost island of the Rat Island Group (Figure 2-1). This test site was developed to test the following three high-yield underground nuclear detonation projects (U.S. Congress, 1989; DRI, 1988).

- Project LONG SHOT, detonated October 29, 1965, was part of the Vela Uniform program for the Department of Defense. This program was designed to improve the capability to detect, identify, and locate underground nuclear explosions.
- Project MILROW, detonated October 2, 1969, was a seismic calibration test to determine Amchitka Island's potential to withstand a subsequent test of the Spartan Anti-Ballistic Missile warhead (Project CANNIKIN).
- Project CANNIKIN, detonated November 6, 1971, was conducted to verify the capabilities of the Spartan Anti-Ballistic Missile warhead. It was the highest-yield underground nuclear test ever conducted by the United States.

The site was closed on December 17, 1986, to all visitations (DRI, 1988). The U.S. Navy, the FWS, and civilian contractors working for the government are the only exceptions to this Federal Register regulation.

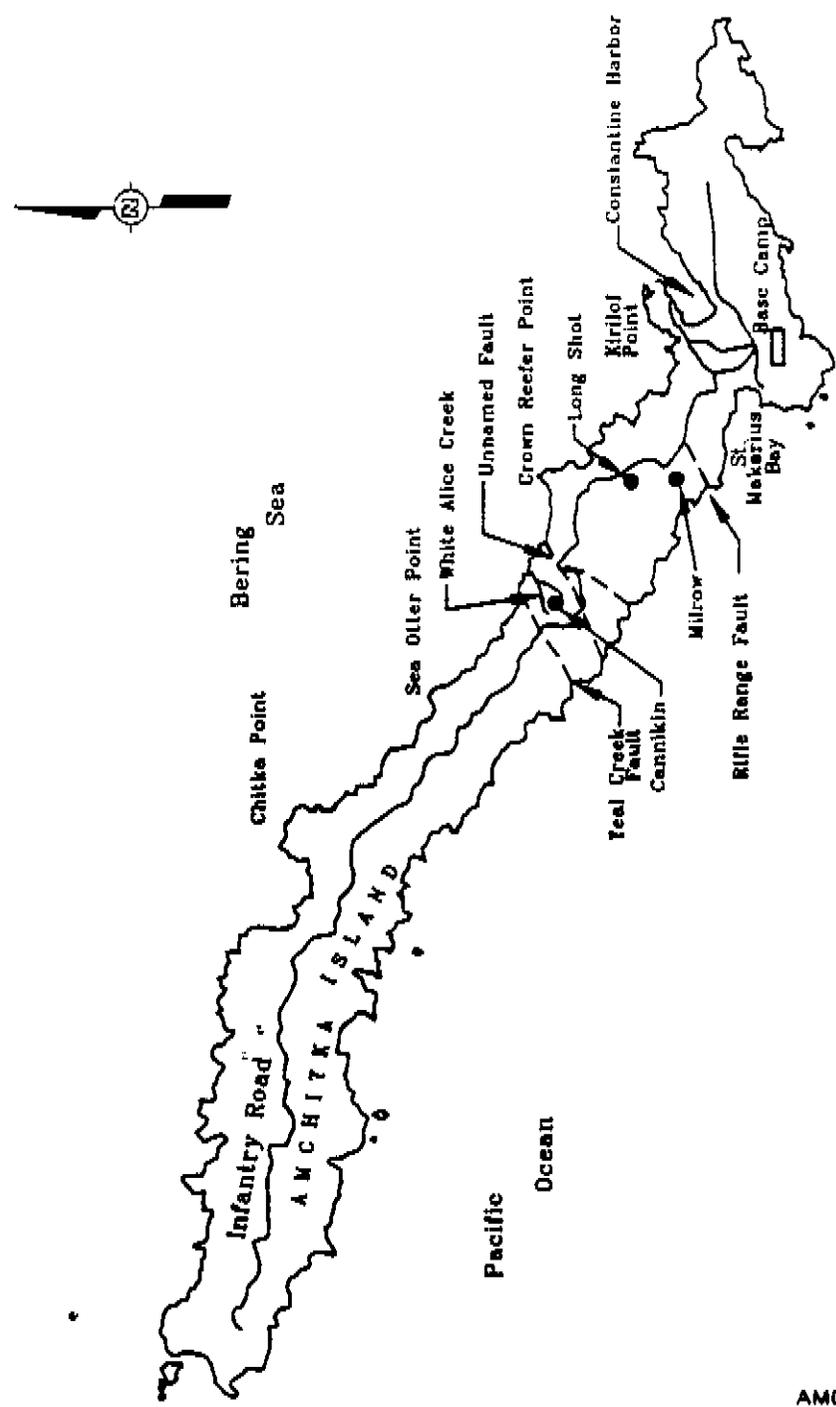
2.1.1 Hazardous, Contaminated, or Polluted Sites

Various hazardous, polluted, and contaminated sites have been reported to exist on Amchitka Island. Four potential hazardous waste sites in particular were identified during a site visit and reported in the *Preliminary Assessment Report* (FSSC, 1991) as:

- **Drum Disposal Area:** This site is located on the northwest end of the island and consists of several hundred exposed drums of petroleum products. Site contamination is expected because many of the drums are severely corroded (Figure 2-2).
- **Top Camp:** Top Camp is located on Infantry Road at the 45 kilometers (km) mark. It is an abandoned camp that has several corroded 55-gallon drums that are believed to contain petroleum products (Figure 2-2).

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SCALE 1" = 5 MILES



(DRI, 1988)

FIGURE 2-1
 AMCHITKA ISLAND, ALASKA,
 SHOWING MAJOR FAULTS AND
 THE LONG SHOT, MILROW,
 AND CANNIKIN EVENT SITES.

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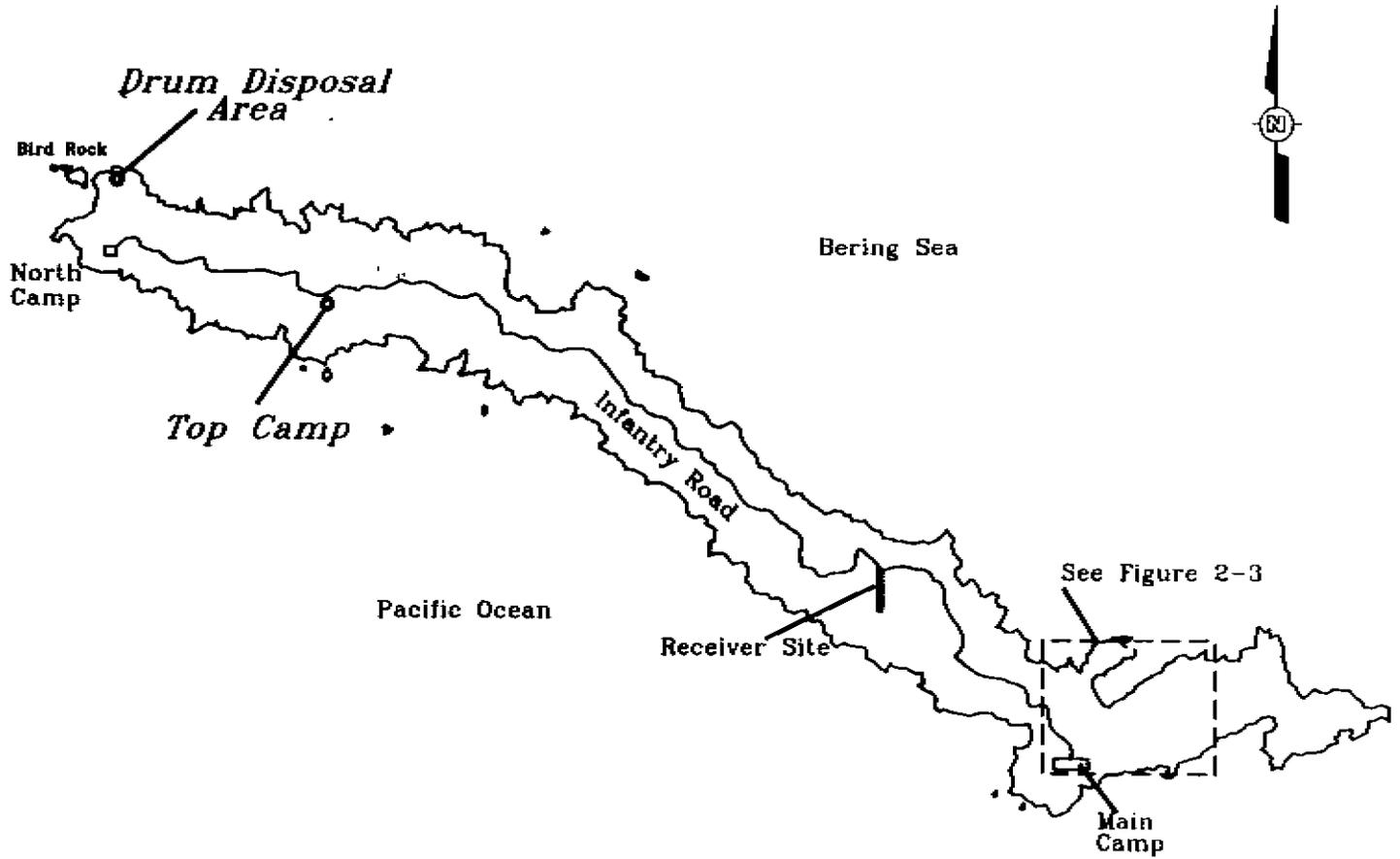


(PSSC, 1991)



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FIGURE 2-2
DRUM DISPOSAL AREAS
PREPARED FOR
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NEVADA TEST SITE



- Petroleum Contaminated Harbor, Constantine Harbor: The soil at this location has been contaminated with diesel fuel or gasoline. The site potentially contains lead and aromatic volatile organic compounds (Figure 2-3).
- Ground Discharge: Ground discharge was observed to be exuding from an embankment along the road off Fox Runway. The substance appeared to have an oily texture (Figure 2-3).

Other sites that meet these criteria include an unexploded ordnance disposal area, scrap metal dumps, vehicle and ammunition burial sites, asbestos dumps, trash dumps, and napalm-tainted soil (FSSC, 1991) (Figures 2-3, 2-4, 2-5).

2.1.2 Property of Historic, Archaeological, or Architectural Significance

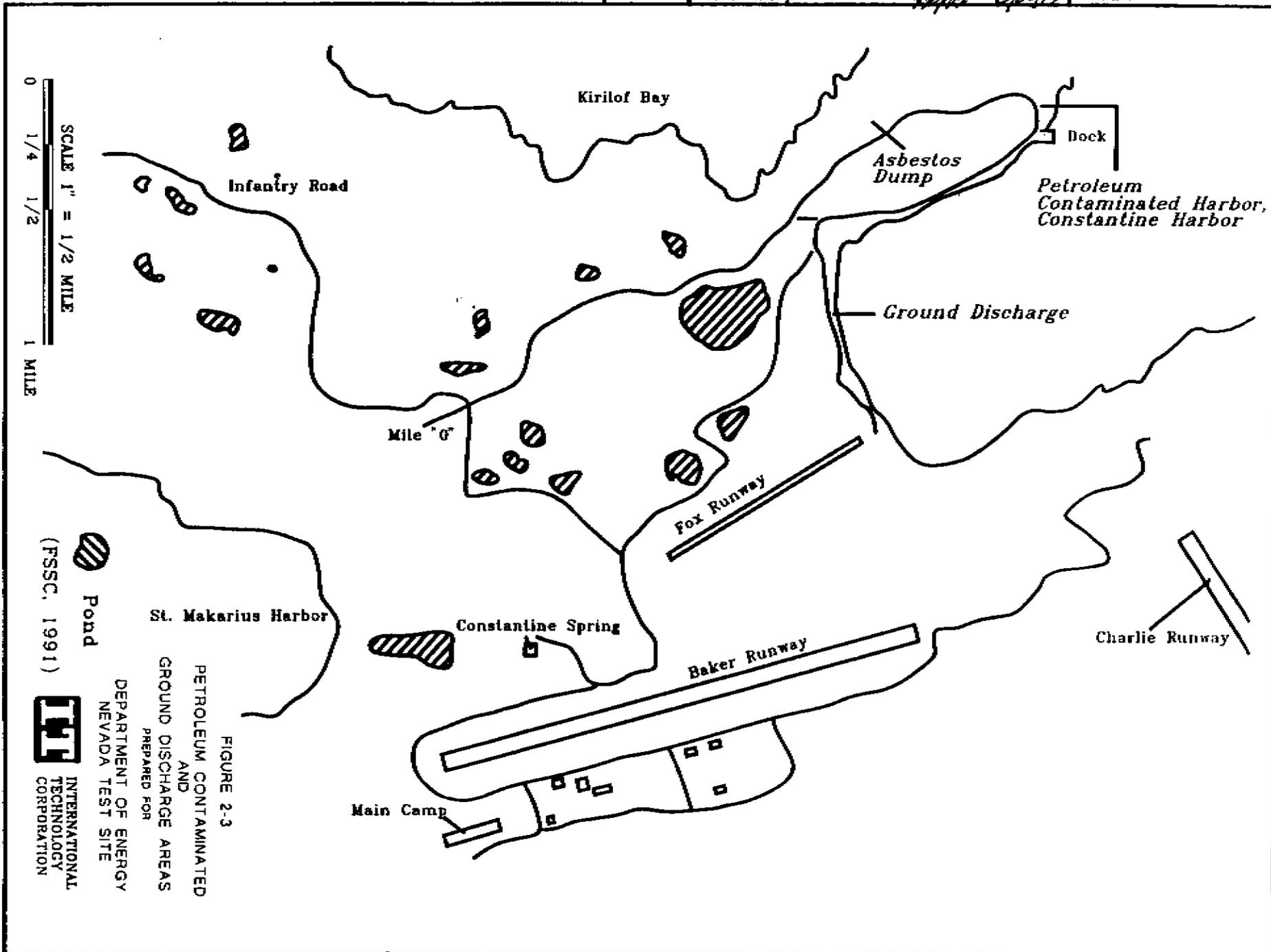
According to the State of Alaska Department of Natural Resources, Office of History and Archaeology, there have been over 90 archaeological sites recorded on Amchitka Island (Dale, 1993, personal communication). Amchitka Island is the traditional home of the Aleut people, a prehistoric people who inhabited the island from at least 500 B.C. and subsisted primarily by hunting and gathering of marine resources. The Aleut population has decreased in numbers, but is still in existence at four communities elsewhere in the Aleutian Islands (Holmes, 1992, personal communication).

The historic period began in 1741 with the Russian "discovery" of the Aleutian Islands. By 1849, Amchitka Island was virtually deserted. In 1913, the Aleutian Islands were set aside as the Aleutian Wildlife Refuge, which was later changed to the Alaska Maritime National Wildlife Refuge. There was a small repopulation of Amchitka by Aleuts in the 1920s and 1930s for the purpose of fox farming. From 1942 until the present, Amchitka has been utilized solely for defense and communications research purposes by the U.S. Army (World War II), the U.S. Navy, the Atomic Energy Commission (AEC) and, subsequently, the DOE. Amchitka remains a part of the Alaska Maritime National Wildlife Refuge under the jurisdiction of the FWS.

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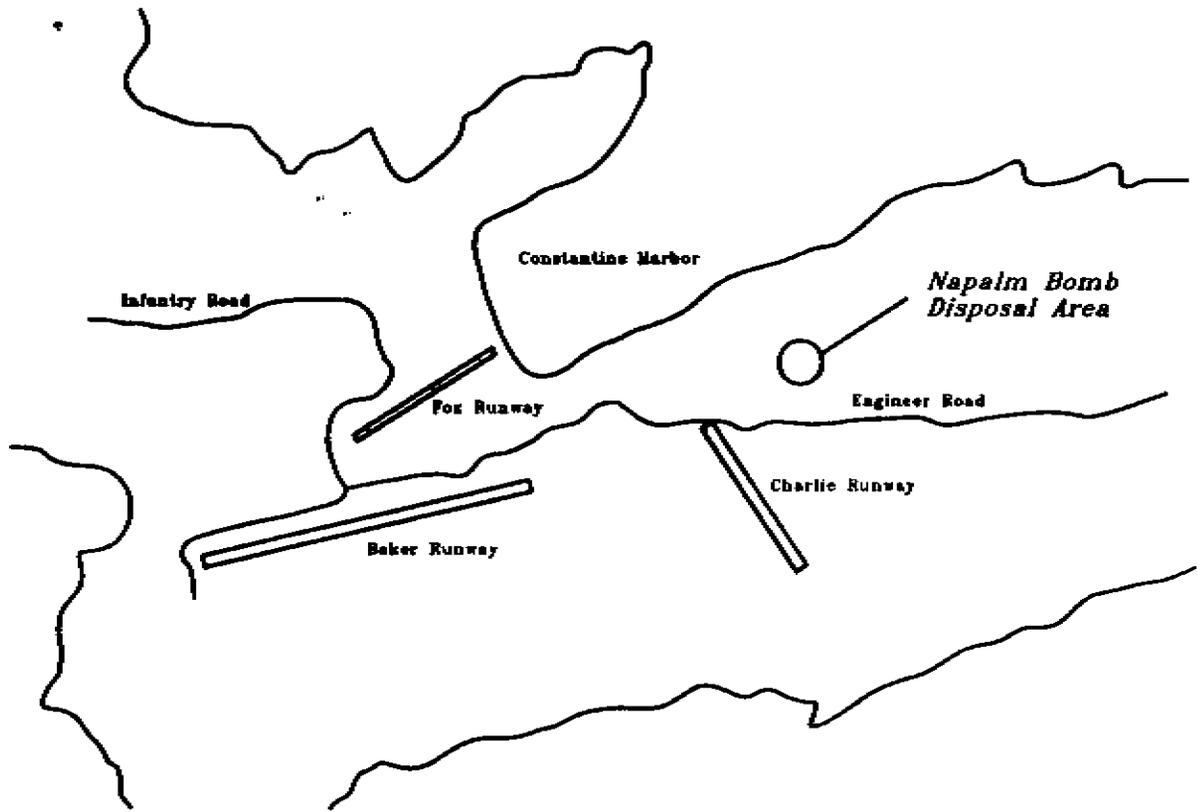


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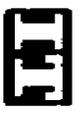
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(FSSC, 1991)



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DEPARTMENT OF ENERGY NEVADA TEST SITE

FIGURE 2-4
 NAPALM BOMB DISPOSAL AREA
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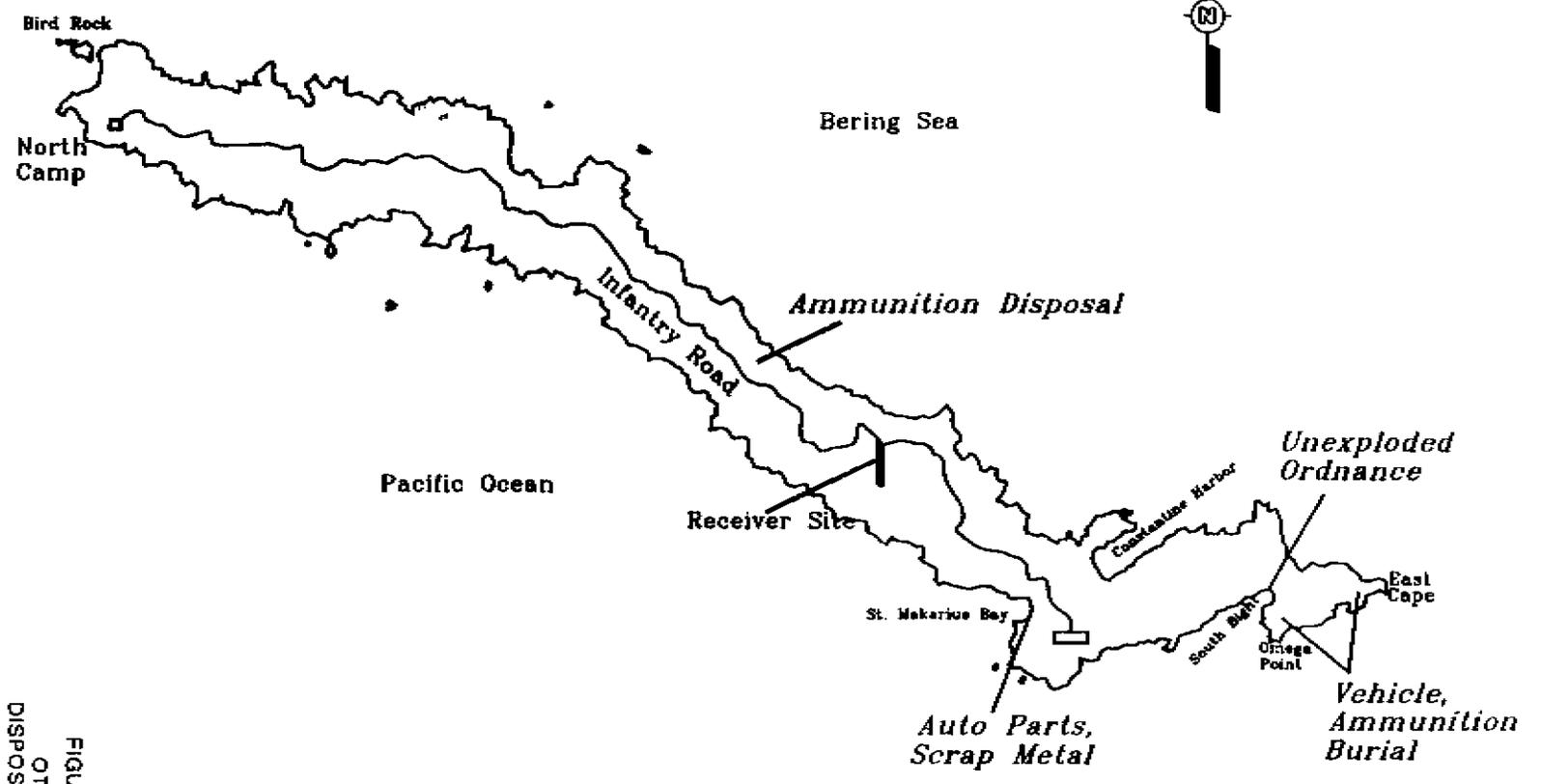
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SCALE 1" = 5 MILES

0
5
10 MILES



(FSSC, 1991)



INTERNATIONAL TECHNOLOGY CORPORATION

DEPARTMENT OF ENERGY NEVADA TEST SITE

PREPARED FOR

OTHER DISPOSAL AREAS

FIGURE 2-5

The sites that remain on Amchitka Island can be categorized as follows (based on McCartney, 1977; Merritt, 1977):

- Prehistoric Aleut (pre-1741)
- Historic Period Aleut/possible Russian (post-1741)
- Historic Aleut/American (1930s)
- World War II Japanese and American (1940s)
- Post-War American ("Cold War" era) (1950s to present).

The prehistoric and historic Aleut sites are concentrated along the coastline, whereas the majority of the World War II and post-war sites are located in the island's interior.

Numerous prehistoric and historic Aleut sites have been recorded. There is a 1930s Aleut graveyard still intact on the island. Under the Alaska Native Claims Settlement Act (ANCSA) of 1971, the Aleut Corporation selected all of the Aleut sites on Amchitka Island to be eligible for investigation (Diters, 1992, personal communication). Some of the World War II structures are still standing and may be considered significant. In addition, the State of Alaska considers any "Cold War" era sites to be of potential significance; this includes all of the AEC activities and the communication (microwave) sites. The World War II and AEC materials constitute the historic "Amchitka Island District" (Dale, 1993, Personal Communication).

Consequently, the entire Amchitka Island should be considered a culturally sensitive area. Consultation with the State of Alaska Office of History and Archaeology, the FWS, the Aleut Corporation in Anchorage, Alaska, and possibly the Aleut Council at Atka, Alaska, must be conducted prior to any remediation activities.

2.1.3 Threatened, Endangered, and Candidate Species

Four animal species and one candidate plant species that may occur on Amchitka Island meet the criteria of this category (FWS, 1992a; Anderson, 1993, personal communication). Of the four animal species, only the Steller sea lion uses the island on a seasonal basis for rookeries. The rest remain off-shore.

The Short-tailed albatross (*Dionedia albatrus*) and the Aleutian Canada goose (*Branta canadensis*) are listed as endangered and threatened vertebrates, respectively, by the Ecological Services, U.S. Fish and Wildlife Division, in Anchorage, Alaska. The Steller sea

lion (*Eumetopias jubatus*) is listed as a threatened marine animal by the National Marine Fisheries Service, and the Steller's eider (*Polysticta stelleri*) is identified as a category 1 candidate species (vertebrate) by the Ecological Services, U.S. Fish and Wildlife Service, in Anchorage, Alaska (FWSa, 1992).

The Short-tailed albatross does not nest on Arnchitka Island, although it uses the off-shore waters for feeding (Anderson, 1993, personal communication).

The Aleutian Canada goose does not nest on the island. This species uses the island during migration and occasionally during summer months (Anderson, 1993, personal communication).

Steller sea lions use Arnchitka Island for rookeries during the spring and summer months. The rookeries occur within a buffer zone located approximately 0.8 km on land and 5 km at sea (Figures 2-6 and 2-7). This species also uses several haulout areas on Arnchitka. These are not shown on the maps and are not affected by the RI/FS (Boone, 1993, personal communication).

The Steller's eider does not breed on Arnchitka Island. This species uses the near-shore waters for protection in winter (Anderson, 1993, personal communication).

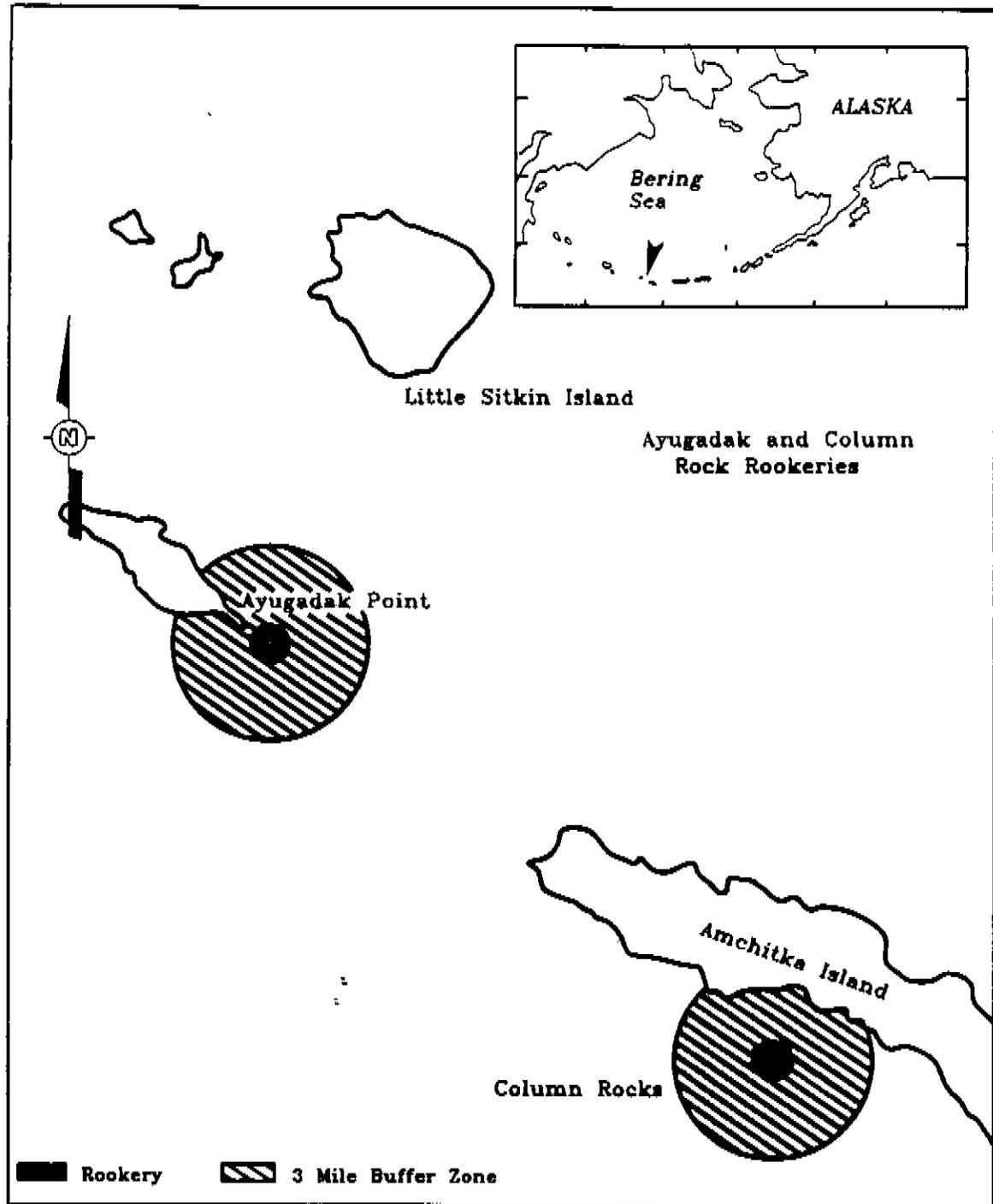
Aleutian wormwood (*Artemisia aleutica* Hultén) is a category 2 candidate plant species found on Kiska and Rat Islands. This species has not been found on Arnchitka Island, although it may occur (Murray and Lipkin, 1987; Anderson, 1993, personal communication).

2.1.4 Floodplains and Wetlands

Wetland surveys have not been conducted for Arnchitka Island. Consultation with the FWS's Regional Wetlands Coordinator in Anchorage, Alaska, should be conducted prior to any remediation activities.

Floodplain information was not available from the Floodmap Distribution Center. A survey should be conducted prior to RI/FS to delineate floodplains and wetlands, if present at the site, and recommendations made of any findings. In addition, the soil maps published for

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52°00'00" N

51°40'00" N

178°30'00" E

178°00'00" E

FIGURE 2-6
 STELLER SEA LION
 ROOKERIES
 PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE

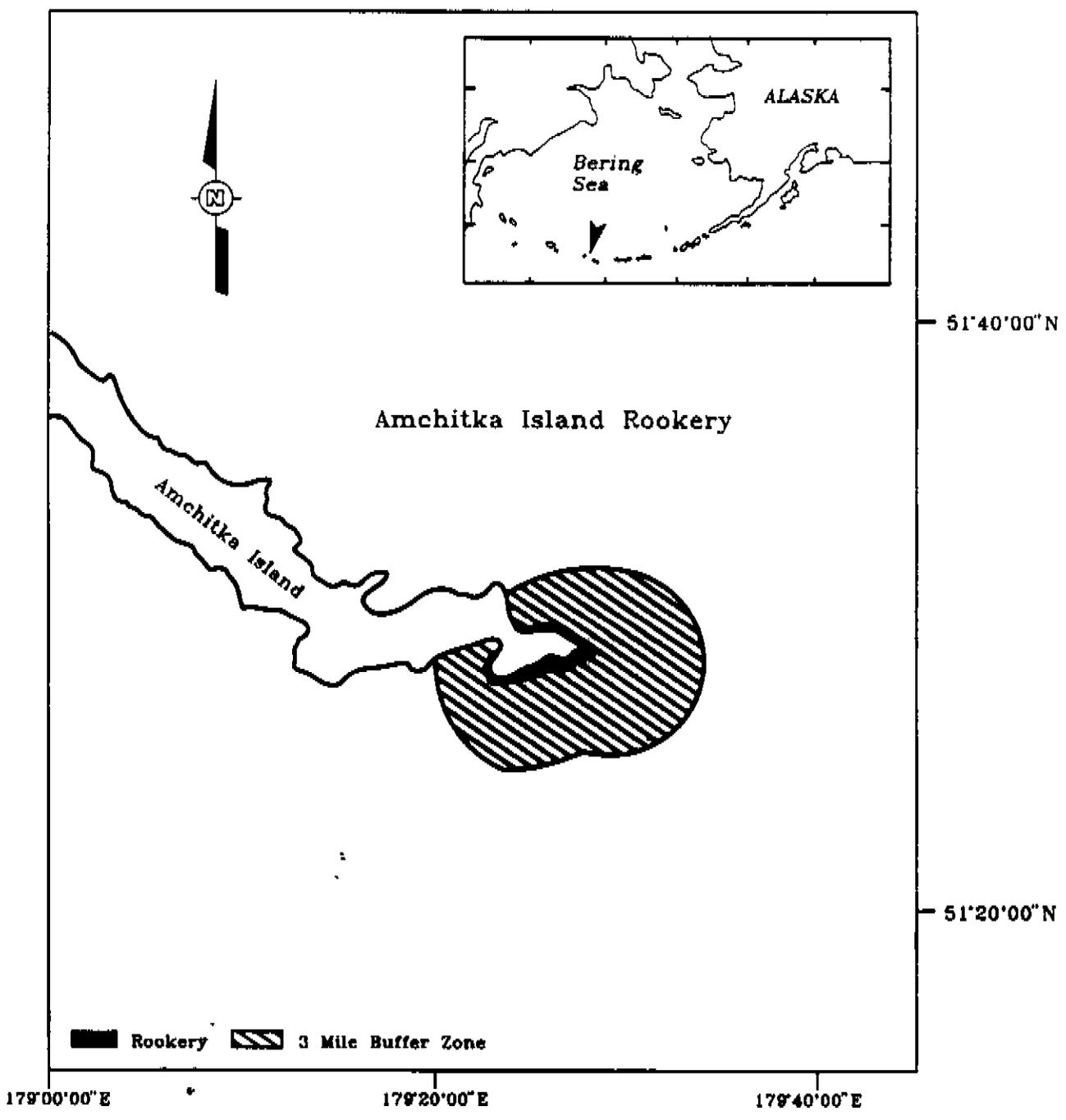
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(DOC, 1990)



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FIGURE 2-7
 STELLER SEA LION
 ROOKERY
 PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE

NOT TO SCALE

(DOC, 1990)



Amchitka should be consulted, if available, to determine the presence of hydric soils within the Amchitka Island Test Site.

2.1.5 Federal- and State-Designated Areas

The Amchitka Island Test Site is part of the Alaska Maritime National Wildlife Refuge, which encompasses approximately 200 islands (Figure 2-8). The refuge was established to protect migratory birds, marine mammals, and their habitats (FWS, 1990). This site meets no other criteria under this category (FWS, 1990; BLM, 1990; NPS 1991; and ADNR, 1992), and according to the Presidential Executive Order Number 1733 dated March 3, 1913:

Establishment of this reservation shall not interfere with the use of the Islands for lighthouse, military, or naval purposes . . .

2.1.6 Prime Agricultural Lands

No areas within the Amchitka Island Test Site meet this criteria.

2.1.7 Special Sources of Water

No sources of water meet these criteria. Two aquifer systems, shallow and deep, occur here. Water for the various streams, ponds, and lakes are provided by the shallow groundwater reservoir and salt spray from the adjacent ocean (DOD, 1991). Potable water is supplied from surface impoundments or springs (Mellington, 1992).

2.1.8 Tundra, Coral Reefs, and Rainforests

Most of the landscape of the island consists of subarctic maritime tundra, which can be further divided into two distinct tundra designations: lowland tundra and upland tundra. Lowland tundra is comprised of the wettest terrestrial communities to the driest of the lowland communities. The upland tundra offers better drainage (Amundsen, 1977) (Figure 2-9).

2.1.9 Other

No Indian Reservations encompass the Amchitka Island site.

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- 1 Alaska Maritime
- 2 Alaska Peninsula
- 3 Arctic
- 4 Becharof
- 5 Innoke
- 6 Izembek
- 7 Kanuti
- 8 Kenal
- 9 Kodiak
- 10 Koyukuk
- 11 Nowitna
- 12 Selawik
- 13 Tetlin
- 14 Togiak
- 15 Yukon Delta
- 16 Yukon Flats

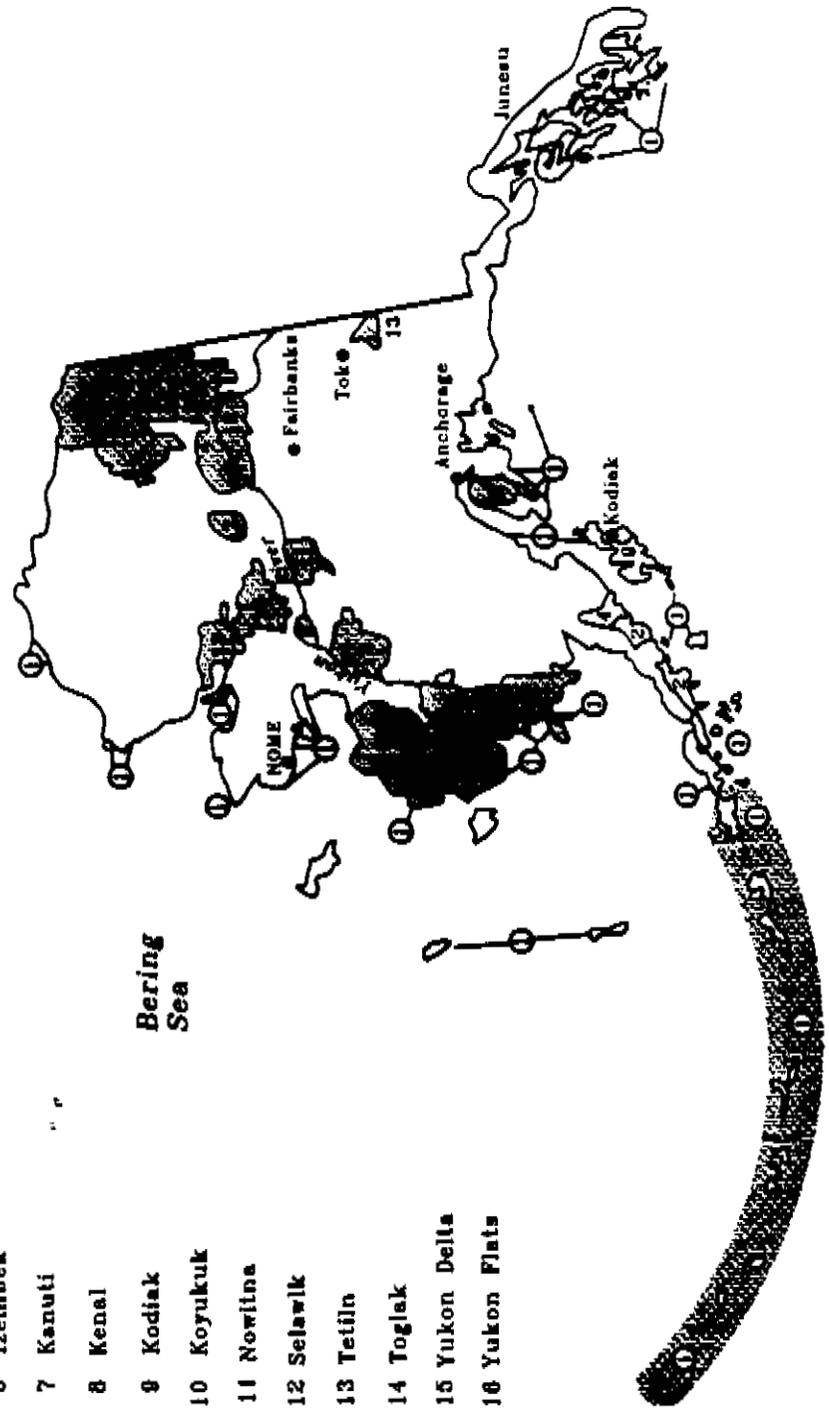
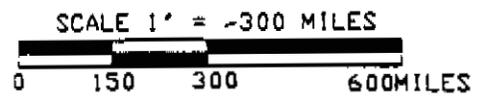


FIGURE 2-8
 NATIONAL WILDLIFE REFUGES
 IN ALASKA

PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE

(PLICA, n.d.)



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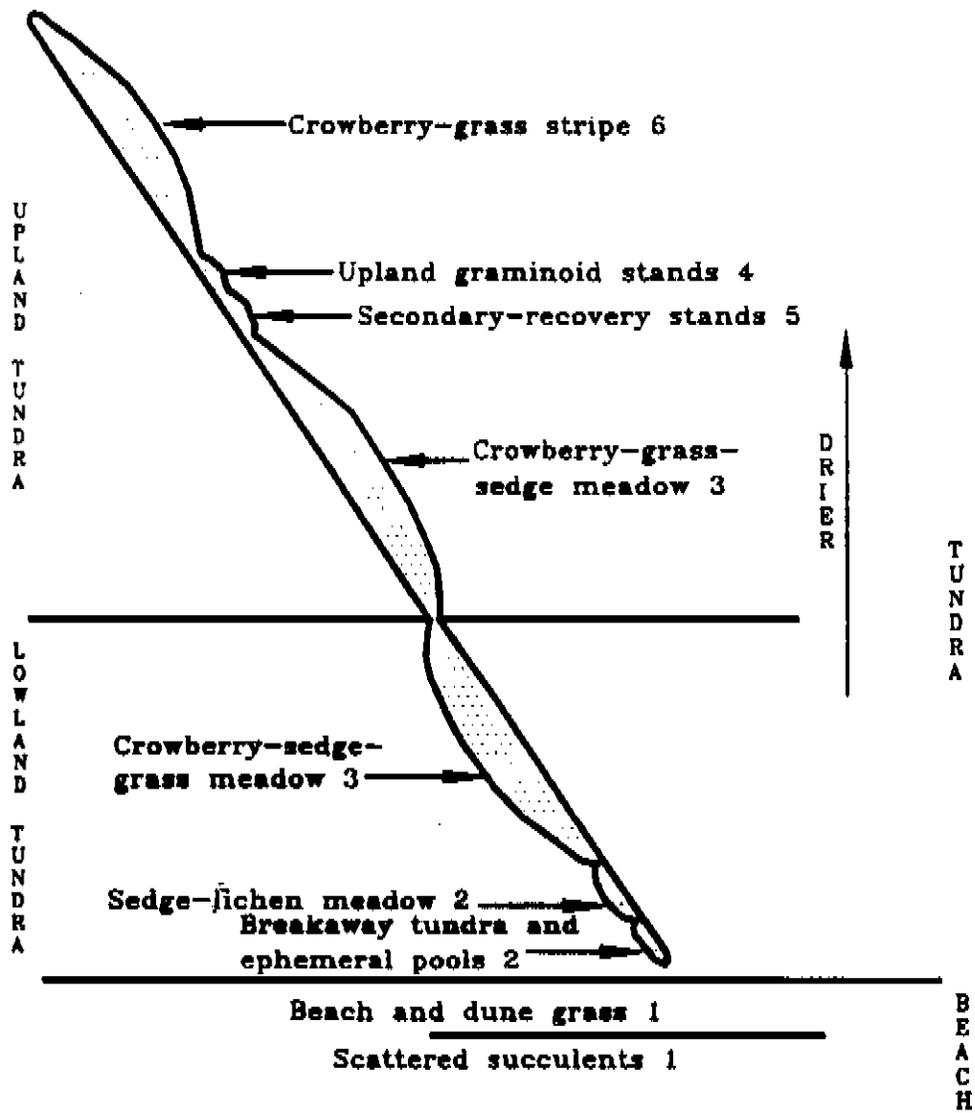


FIGURE 2-9
 LOWLAND AND
 UPLAND TUNDRA
 PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE



(AMUNDSEN, 1977)

All marine mammals are protected under the Marine Mammal Protection Act of 1972. Marine mammals associated with Amchitka Island include the Sea otter and three seal species, Harbor seal, Northern Fur seal, and Steller sea lion. Sea otters (*Enhydra lutris*) inhabit the coastline and are relatively abundant. The Harbor seal (*Phoca vitulina*) and the Northern Fur seal (*Callorhinus ursinus*) are found throughout the Aleutian Islands, of which Amchitka Island is a part. The Steller sea lion, as mentioned previously, is listed as a threatened species (FSSC, 1991).

3.0 Colorado Project Sites

3.1 Rio Blanco Gas Stimulation Test Site

The Rio Blanco Gas Stimulation Test Site is located approximately 14 km west of Rio Blanco, in northwestern Colorado (Figure 3-1). It was one of three joint government-industry experiments under the Plowshare Program designed to develop peaceful uses of nuclear explosions. Under this program, the economic feasibility of stimulating the flow of natural gas by fracturing rock formations with underground nuclear explosions was studied. On May 17, 1973, three almost simultaneous nuclear explosions were detonated under Project RIO BLANCO. Explosions occurred at 1779.4 m, 1898.9 m, and 2038 m respectively. Project testing and data evaluation continued through June 1976 (U.S. Congress, 1989; DRI, 1988).

3.1.1 Hazardous, Polluted, or Contaminated Sites

The hazardous, polluted, or contaminated materials reported to have occurred at the Rio Blanco site include scrap metal, combustible cardboard, wood, paper, and radiologically contaminated sludge and liquids resulting from the decontamination process. The liquid wastes from these processes consisted of the steam condensate from the drip pan sump of the steam cleaner, and in situ system solutions.

All waste has either been burned (combustible wastes), vaporized (some liquid waste), or solidified, barreled, and shipped for off-site storage (sludges). Some liquid waste was injected into the Fawn Creek government number 1 well-water disposal zone. The well was later cemented (DOE/NV, 1978) (Figure 3-2).

3.1.2 Property of Historic, Archaeological, or Architectural Significance

According to the Colorado Historical Society Office of Archaeology and Historic Preservation, two cultural-resources survey projects have been conducted within the vicinity of the Rio Blanco Gas Stimulation Test Site (Rio Blanco County, T3S, R98W, Section 14). Three sites, two archaeological and one historic, were recorded in Section 14 as a result of the survey projects. Two of the sites were recorded as potentially eligible for inclusion in the National Register of Historic Places. Because the entire section has not been surveyed for cultural resources, there is a possibility that as yet unidentified cultural resources exist within the project area.

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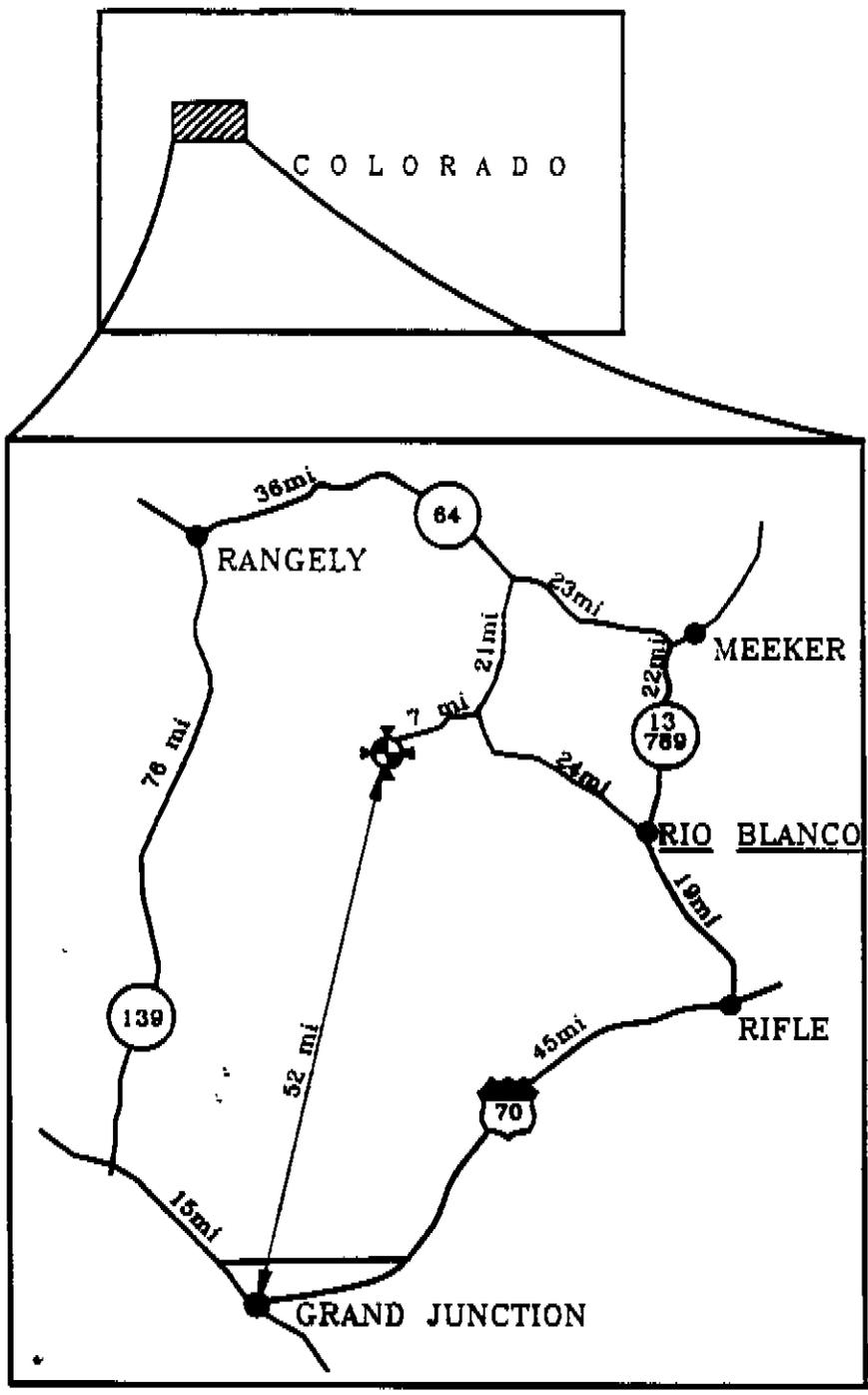


FIGURE 3-1
 PROJECT RIO BLANCO
 SITE LOCATION MAP
 PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE



NOT TO SCALE

(DRI, 1988)

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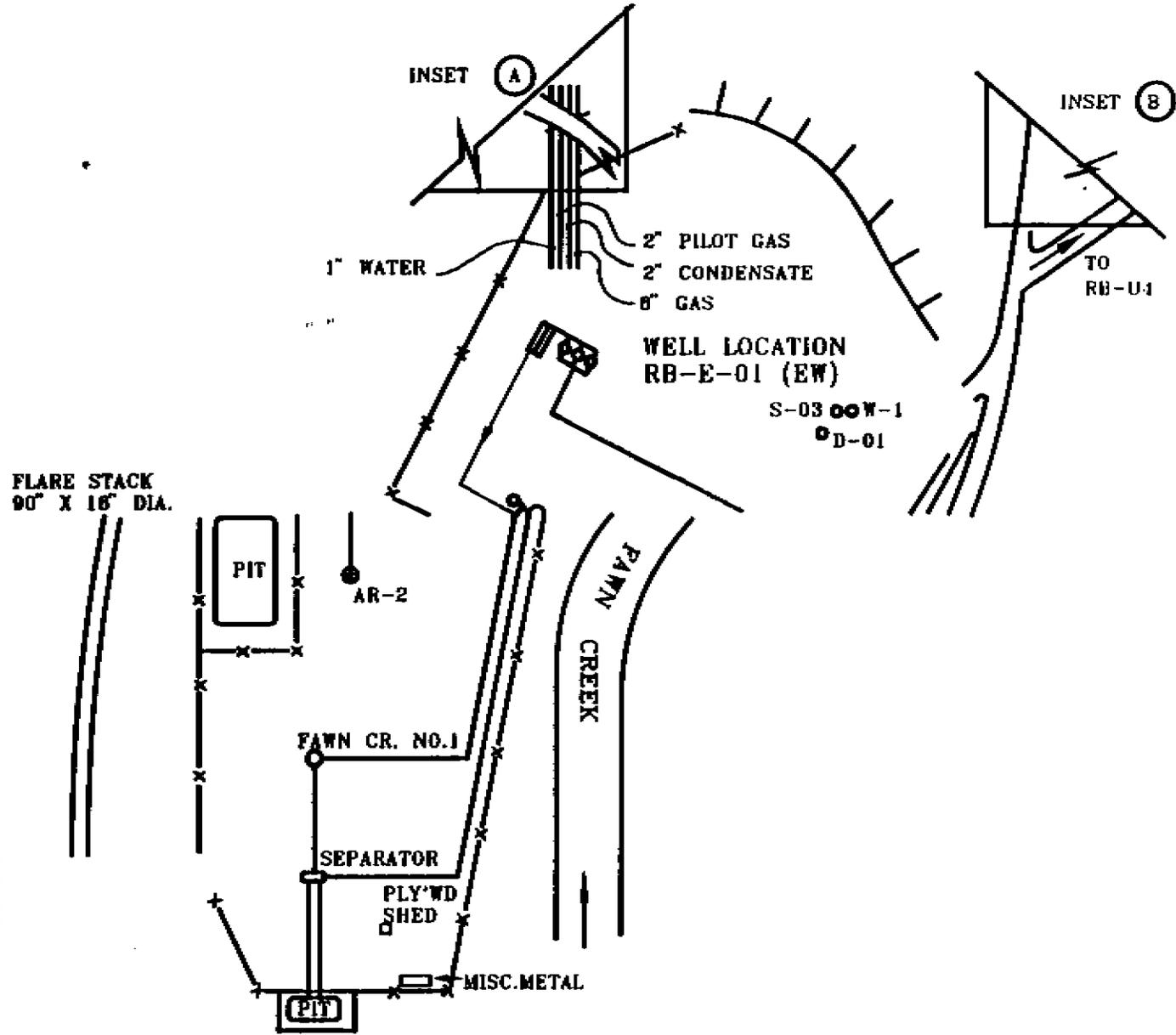


FIGURE 3-2
PROJECT RIO BLANCO
WASTE SITE LOCATIONS
PREPARED FOR
DEPARTMENT OF ENERGY
NEVADA TEST SITE

(DRI, 1988)



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TECHNOLOGY
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The following cultural periods are known to exist in northwest Colorado (Grady, 1984; Mehls, 1982):

- PaleoIndian Stage: 10,000 B.C. to 5500 B.C.; big game hunters; represented by a limited number of surface finds of projectile points (i.e., stone spear or dart tips).
- Archaic Stage: 5500 B.C. to A.D. 400; hunter-gatherer lifestyle; sites typically occur as open lithic scatters or rock shelters; appearance of pit houses; Archaic sites outnumber sites affiliated with other cultural periods.
- Formative Stage: A.D. 400 to 1200; known as the Fremont culture; development of bow and arrow; appearance of cultigens; introduction of masonry structures and ceramics; presence of rock art.
- Protohistoric Stage: A.D. 1200 to 1880; Ute/Shoshone tradition; hunting and gathering lifestyle; acquisition of horse; use of ceramics and bow and arrow; construction of wickiup structures; presence of rock art; numerous sites present in western Colorado. The Ute Indians were removed to reservations in Utah and southern Colorado by the 1880s.
- Euro-American Period: A.D. 1776 to present; includes Spanish exploration, fur trade, mining, railroad expansion, ranching and farming, and oil shale development.

Considering the number and distribution of sites across the landscape of northwestern Colorado (Grady, 1984), it is unlikely that the Rio Blanco test site contains a large number of prehistoric or historic sites within its boundaries.

It is unlikely that the Rio Blanco test site would be considered a culturally sensitive area; however, consultation with the State of Colorado Office of Archaeology and Historic Preservation and the Bureau of Land Management (BLM) district office in Craig, Colorado, should be conducted prior to remediation activities.

3.1.3 Threatened, Endangered, and Candidate Species

Six animal species meet the criteria for this category; however, the existence of these species at the Rio Blanco Gas Stimulation Test Site has not been verified.

The Peregrine falcon (*Falco peregrinus*) and the Bald eagle (*Haliaeetus leucocephalus*) are both federal and state listed endangered species. The Loggerhead shrike (*Lanius*

ludovicianus), Black tern (*Chlidonias niger*), White-faced ibis (*Plegadis chihi*), and Northern goshawk (*Accipiter gentilis*) are all listed as federal category 2 candidate species.

The Peregrine falcon is identified as a resident (breeder), although the breeding months are not specified. Its breeding habitats are limber pine, spruce-fir, lodgepole pine, bristlecone pine, pine, Douglas fir, pinyon-juniper, riparian transition and riparian highland (CDNR, 1993).

The Bald eagle is a winter visitor. Its winter habitats include riparian lowlands (and lake edges), riparian transition, riparian highland, streams and rivers, and sagebrush (of mountain shrubs) (CDNR, 1993).

The Loggerhead shrike is identified as a resident (breeder) whose breeding season includes June and July. Its breeding habitat includes shortgrass plains, mountain meadow-parkland (wet/dry), Cholla cactus grassland, sagebrush-rabbit-brush (of shrub steppe), greasewood-sagebrush or saltbrush, sagebrush (of mountain shrubs), mountain mahogany (of mountain shrubs), riparian lowland (on lake edges), riparian transition and pinyon-juniper (CDNR, 1993).

The Black tern is a migrant. It inhabits lakes, reservoirs, marshes, bogs and wet hummocks during migration (CDNR, 1993).

The White-faced ibis is also a migrant, although its migratory habitats are not found in the Rio Blanco test site (CDNR, 1993).

The Northern goshawk is a resident (breeder) whose breeding season includes June, July, and August. Its breeding habitats are limber pine, spruce-fir, lodgepole pine, pine, ponderosa pine, Douglas fir, pinyon-juniper, riparian transition, riparian lowland (and lake edges), and riparian highland (CDNR, 1993).

No sensitive plant species information was available. A site survey should be conducted to identify threatened, endangered and candidate plants within the Rio Blanco test site prior to RI/FS.

3.1.4 Floodplains and Wetlands

Wetland surveys have not been conducted for the Rio Blanco site; however, this area is scheduled to be surveyed through the FWS in the summer of 1993, and the final report submitted within eighteen months to two years thereafter. Consultation with the FWS's Regional Wetland coordinator in Denver, Colorado, should be conducted prior to any remediation.

The Rio Blanco test site is located in floodprone areas near Black Sulphur, Eureka, and Fawn Creeks (FEMA, 1990a). A survey should be conducted prior to RI/FS to delineate floodplains and wetlands, if present at the site, and recommendations made of any findings. In addition, the soil maps published for Rio Blanco County should be consulted to determine the presence of hydric soils within the Rio Blanco test site.

3.1.5 Federal- and State-Designated Areas

No areas within the Rio Blanco site meet these criteria (BLM, 1980 and 1986; USGS, 1987). The BLM and private landowner(s) control the surface rights (Wycoff, 1992).

3.1.6 Prime Agricultural Lands

Two soil types exist at this site:

- Rentsac Channery loam
5-50 percent slope
land capability class VIIc
- Glendive fine sandy loam,
land capability class IIIe (if irrigated) or IVe (if nonirrigated).

Glendive fine sandy loam is prime farmland if it is irrigated and does not flood. These conditions do not exist; therefore, neither of these soil types constitute prime agricultural land (Carlson, 1993, personal communication).

3.1.7 Special Sources of Water

No water sources within this site are vital in the region. No available records indicate that a sole-source aquifer or a well-head protection area exist here.

3.1.8 Tundra, Coral Reefs, and Rainforests

No areas within the Rio Blanco site meet these criteria.

3.1.9 Other

No Indian Reservations encompass this site (BLM, 1980).

A monument exists that states (DOE/NV, 1978):

No excavation, drilling and/or removal of subsurface materials to a true vertical depth of 1,500 feet is permitted within a radius of 100 feet of this surface location, nor any similar excavation, drilling and/or removal of subsurface materials between the true vertical depths of 1,500 feet and 7,500 feet is permitted within a 600 foot radius of this surface location in the NW quarter of the NW quarter, Section 14, Township 3 South, Range 98 West, 6th Principal Meridian, Rio Blanco County, Colorado, without U.S. Government permission

U.S. Energy Research and Development Administration, September 1976

3.2 Rulison Gas Stimulation Test Site

The Rulison Gas Stimulation Test Site is located approximately 23 km southwest of Rifle, in west-central Colorado (Figure 3-3). It was the second of three joint government-industry gas-production stimulation experiments under the Plowshare Program designed to develop peaceful uses of nuclear explosions. Under the Plowshare Program, the economic feasibility was studied of stimulating the flow of natural gas by fracturing rock formations with underground nuclear explosions. On September 10, 1969, Project RULISON commenced by detonating a single underground nuclear explosion (U.S. Congress, 1989; DRI, 1988).

Project testing and data evaluation continued through April 1971. The site underwent cleanup from July 10 through July 25, 1972 to remove all extraneous materials and equipment not required for gas production (DRI, 1988). Unrestricted use of the site surface is not permitted.

3.2.1 Hazardous, Polluted, or Contaminated Sites

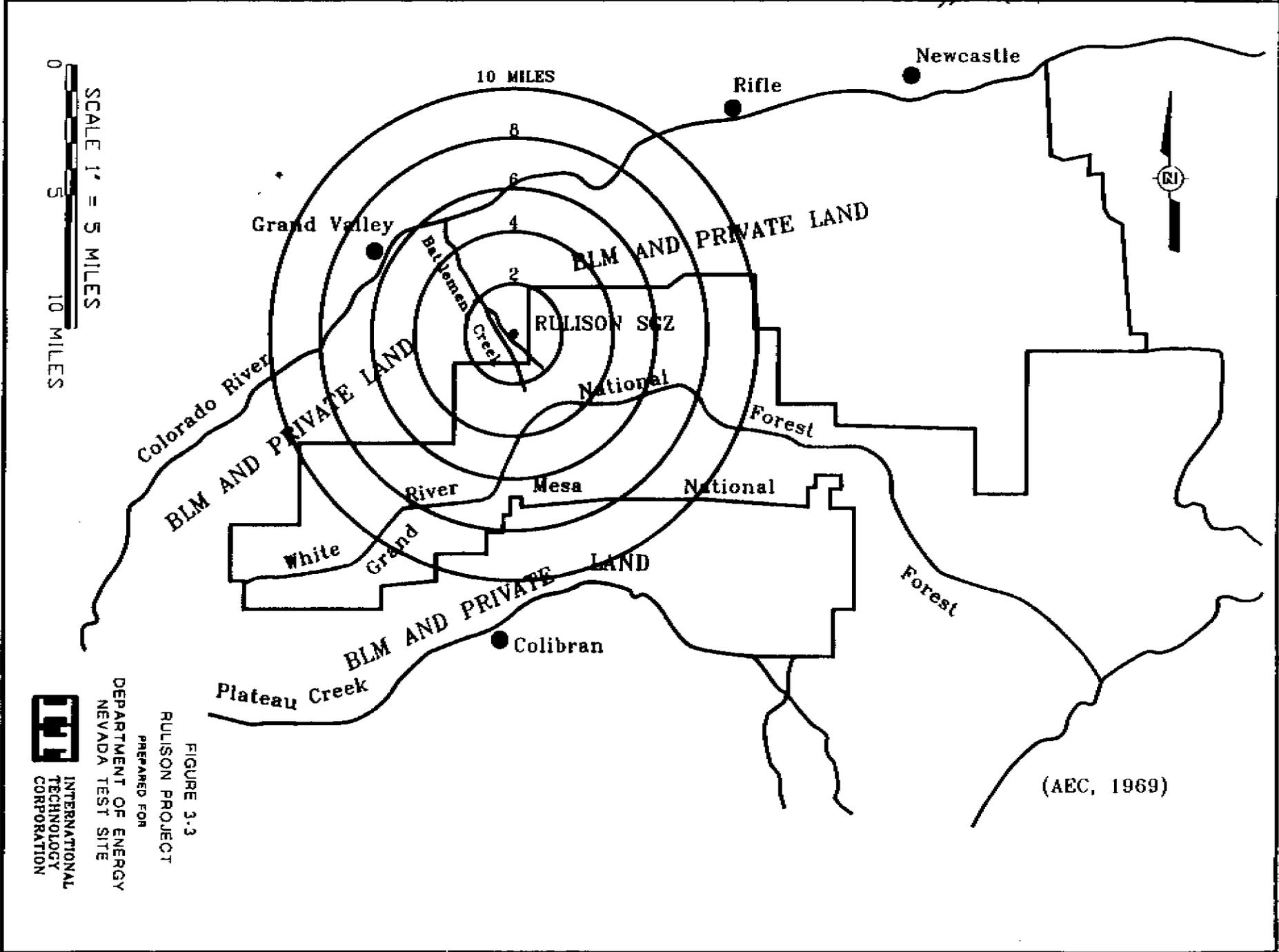
The only known contaminants released during the underground nuclear explosion were gases resulting from the gas-production phase of Project RULISON (DOE/NV, 1984a). Some

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(AEC, 1969)

contaminated items remained on-site upon the completion of the site cleanup conducted in 1972 (AEC, 1973) (Figure 3-4):

- three 210-barrel liquid (water) holding tanks
- three-phase separator connected to the R-EX well line.

3.2.2 Property of Historic, Archaeological, or Architectural Significance

The Colorado Historical Society Office of Archaeology and Historic Preservation has two cultural resource survey projects recorded for the Rulison Gas Stimulation Test Site area (Garfield County, T7S, R95W, Section 25). One historic cabin and "cow camp" site has been recorded in Section 25. The site was recorded as needing field data in order to determine its potential eligibility for inclusion in the National Register of Historic Places. Because the entire section may not have been surveyed, it is possible that as yet unidentified cultural resources exist within the project area.

The cultural traditions potentially represented in the vicinity of the Rulison test site are essentially the same as those described for the Rio Blanco test site (Subsection 3.1.2); there are some variations in dates (Reed, 1984):

- PaleoIndian Stage (10,000 to 5500 B.C.)
- Archaic Stage (5500 B.C. to A.D. 500)
- Formative Stage (A.D. 500 to 1200)
- Protohistoric/Historic Stage (A.D. 1200 to 1881)
- Euro-American Period (1776 to present).

The number and distribution of sites across the landscape recorded to date in west-central Colorado (Reed, 1984) indicate that the number of prehistoric or historic sites within the boundaries of the Rulison test site would not be high. The test site itself is marked by a monument and brass plaque demonstrating the site's historic significance. (The site is not listed in the National Register of Historic Places.)

Other than the significance of the site as an early gas-stimulation site, the site would probably not be considered a culturally sensitive area. The "cow camp" and cabin in Section 25 may or may not meet any of the criteria for the quality of "significance" according to the National Park Service; however, consultation with the State of Colorado Office of Archaeology and

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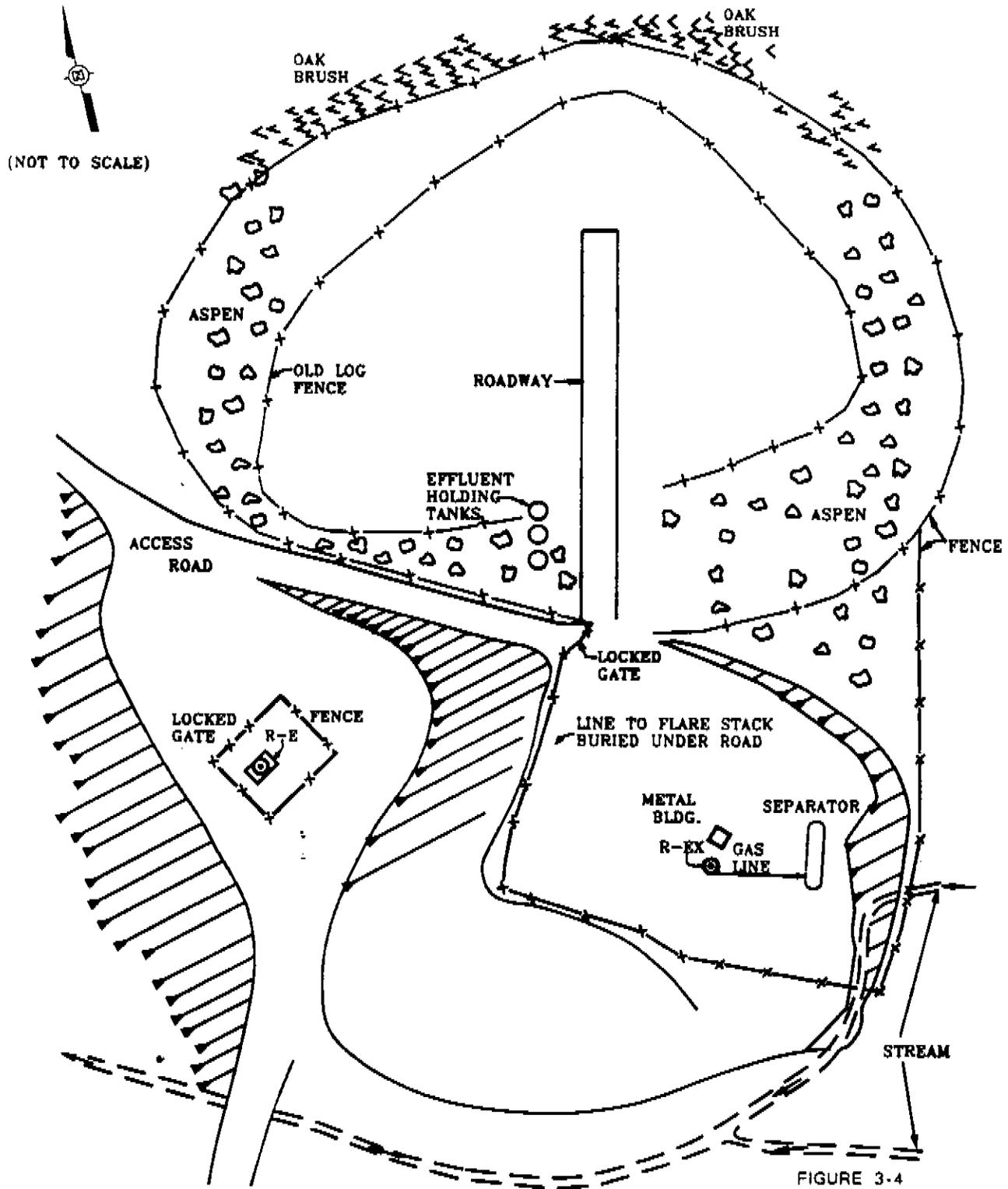


FIGURE 3-4
 RULISON SITE
 AFTER 1972 SITE CLEANUP
 PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE

NOTE:
 WELLHEAD EQUIPMENT, SEPARATOR, DRIP PANS, EFFLUENT TANKS AND TWO METAL BUILDINGS REMAIN ON SITE AS OF AUGUST 1973.



Historic Preservation and the BLM district office in Grand Junction, Colorado, should be conducted prior to remediation activities.

3.2.3 Threatened, Endangered, or Candidate Species

Five animal species meet the criteria for this category; however, the existence of these species at the Rulison Gas Stimulation Test Site has not been verified.

The Peregrine falcon (*Falco peregrinus*) and the Bald eagle (*Haliaeetus leucocephalus*) are both listed as federal and state endangered species. The Black tern (*Chlidonias niger*), White-faced ibis (*Plegadis chihi*), and Northern goshawk (*Accipiter gentilis*) are all listed as federal category 2 candidate species.

The Peregrine falcon is identified as a breeder, although the breeding months are not specified. Its breeding habitats are limber pine, spruce-fir, lodgepole pine, bristlecone pine, ponderosa pine, Douglas fir, pinyon-juniper, riparian transition and riparian highland (CDNR, 1993).

The Bald eagle is a resident (breeder) whose breeding season includes April, May, June, and July. Its breeding habitat is riparian transition (CDNR, 1993).

The Black tern is a migrant. It inhabits lakes-reservoirs, and marshes, bogs and wet hummocks during migration (CDNR, 1993).

The White-faced ibis is also a migrant, although its migratory habitats are not found in the Rulison test site (CDNR, 1993).

The Northern goshawk is a resident (breeder) whose breeding season includes June, July, and August. Its breeding habitats are limber pine, spruce-fir, lodgepole pine, bristlecone pine, ponderosa pine, douglas fir, pinyon-juniper, riparian transition, riparian lowland (and lake edges), and riparian highland (CDNR, 1993).

No sensitive plant species information was available. A site survey should be conducted to identify threatened, endangered and candidate plants within the Rulison test site prior to RI/FS.

3.2.4 Floodplains and Wetlands

Wetland surveys have not been conducted for the Rulison site, although this area is scheduled to be surveyed through the FWS in the summer of 1993, and the final report submitted within eighteen months to two years thereafter. Consultation with the FWS's Regional Wetland coordinator in Denver, Colorado, should be conducted prior to any remediation.

The "Flood Insurance Rate Map" for Garfield County, Colorado (FEMA, 1986) does not depict floodprone areas around the Rulison site, although a more detailed map was not available for verification. A survey should be conducted prior to RI/FS to delineate floodplains and wetlands, if present at the site, and recommendations made of any findings. In addition, the soil maps published for Garfield County would be consulted to determine the presence of hydric soils within the Rulison test site.

3.2.5 Federal- and State-Designated Areas

No areas within the Project Rulison site meet these criteria (BLM, 1980 and 1986; USGS, 1987). The Rulison site is located a few miles outside of the White River National Forest and approximately 14 km north of the Grand Mesa National Forest (AEC, 1969) (Figure 3-3). The BLM and private landowners control the surface rights for this site (Wycoff, 1992).

3.2.6 Prime Agricultural Lands

Two soil types exist at this site:

- Bucklon-Inchau loams
25-50 percent slope
land capability class VIIIs
- Cochetopa loam
9-50 percent slope
land capability class VIIIs.

Neither of these soil types constitutes prime agricultural land (Carlson, 1993, personal communication).

3.2.7 Special Sources of Water

No water sources within this area are vital in the region. The Project RULISON site is located near the East Fork of Battlement Creek. The main portion of Battlement Creek is

located a few hundred feet west of the Rulison site and is separated from the site by a low ridge (AEC, 1969). Battlement Creek is used in part to irrigate land downstream from the Rulison site (USGS, 1970).

Groundwater resources consist of surficial deposits, such as floodplain deposits, fan gravel, and terrace. These deposits are reportedly "the only sources of usable ground water near the Rulison site" (USGS, 1970). No available records indicate the existence of a sole-source aquifer or a well-head protection area at this site.

3.2.8 Tundra, Coral Reefs, and Rainforests

No areas within the Rulison test site meet these criteria.

3.2.9 Other

No Indian Reservations encompass the Rulison test area (BLM, 1980).

A monument exists that states (AEC, 1973):

No excavation, drilling, and/or removal of subsurface materials to a depth of 12,450 feet is permitted within Lot 11, NE 1/4 SW 1/4 of Section 25, Township 7 South, Range 95 West, 6th Principal Meridian, Garfield County, Colorado, without U.S. Government permission.

U.S. Atomic Energy Commission and the Department of the Interior

4.0 Nevada Project Sites

4.1 Central Nevada Test Area

The Central Nevada Test Area (CNTA) is located approximately 92 km northeast of Tonopah, in south-central Nevada (Figure 4-1). The CNTA was developed as an alternate test area to the NTS for high-yield underground nuclear tests. On January 9, 1968, Project FAULTLESS was conducted as a ground-motion calibration test, producing a yield between 200 and 1000 kilotons. The site was studied extensively by various government agencies and contractors and decommissioned in 1973 (U.S. Congress, 1989; DRI, 1988).

4.1.1 Hazardous, Contaminated, or Polluted Sites

The hazardous, polluted, or contaminated sites for this area consist of (DRI, 1988):

- **Runoff Ditch:** This site is located 3.0 m southwest of emplacement well UC-1 and post-shot hole PS-2. The runoff ditch reportedly contains concentrations of lead (Figure 4-1).
- **Central Mud Pit:** The central mud pit is located southeast of UC-1 and was a disposal pit for drilling mud (Figure 4-2). It is covered with a "dried oily-looking crust" that reportedly contains concentrations of chromium and 2-butanone. During a March 1993 site visit the pit was observed to contain free water.

4.1.2 Property of Historic, Archaeological, or Architectural Significance

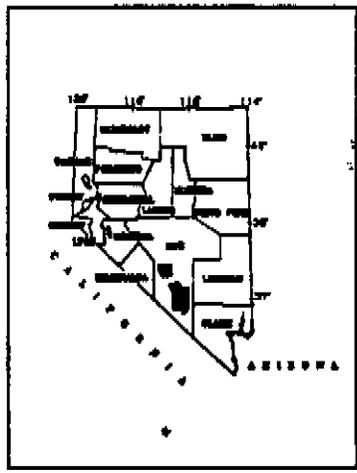
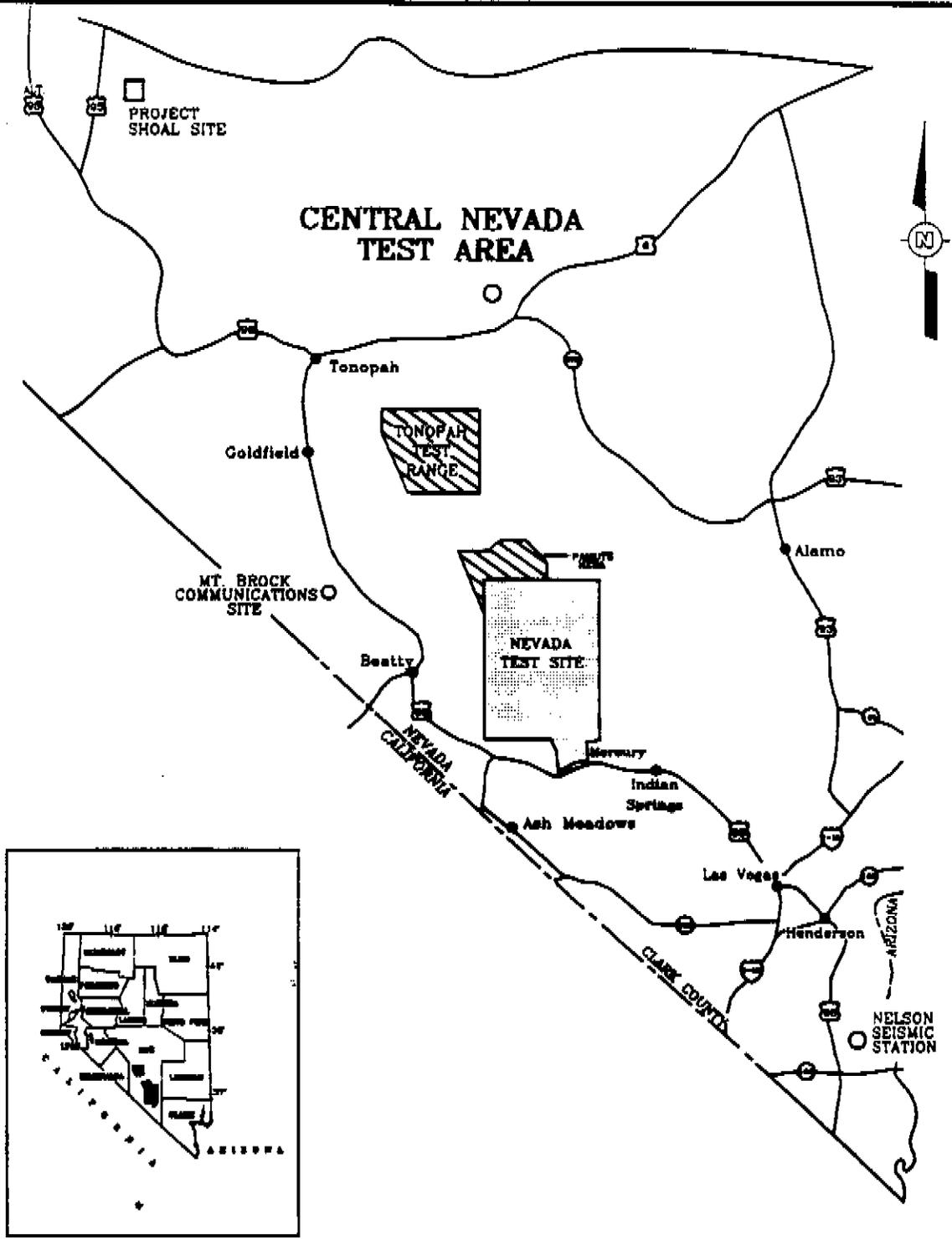
Information to be provided by Desert Research Institute.

4.1.3 Threatened, Endangered, or Candidate Species

Thirteen species meet the criteria for this category; however, the existence of these species at the CNTA has not been verified.

Of the thirteen species, one is a threatened species and the remaining are all category 2 candidate species. The Railroad Valley springfish (*Crenichthys nevadae*) is the only identified threatened species. The twelve remaining sensitive species include two mammals, six birds, one fish, and three plants. The candidate mammals are the Pygmy rabbit (*Brachylagus idahoensis*) and the Spotted bat (*Euderma maculatum*). The candidate birds include the Northern goshawk (*Accipiter gentilis*), the Ferruginous hawk (*Buteo regalis*), the Black tern (*Chlidonias niger*), the Western least bittern (*Ixobrychus exilis hesperis*), the

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LEGEND

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-  DOE WITHDRAWAL.

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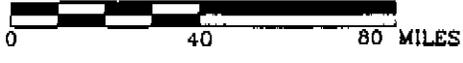


FIGURE 4-1
 CENTRAL NEVADA
 TEST AREA LOCATION
 PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE



(DRI, 1991)

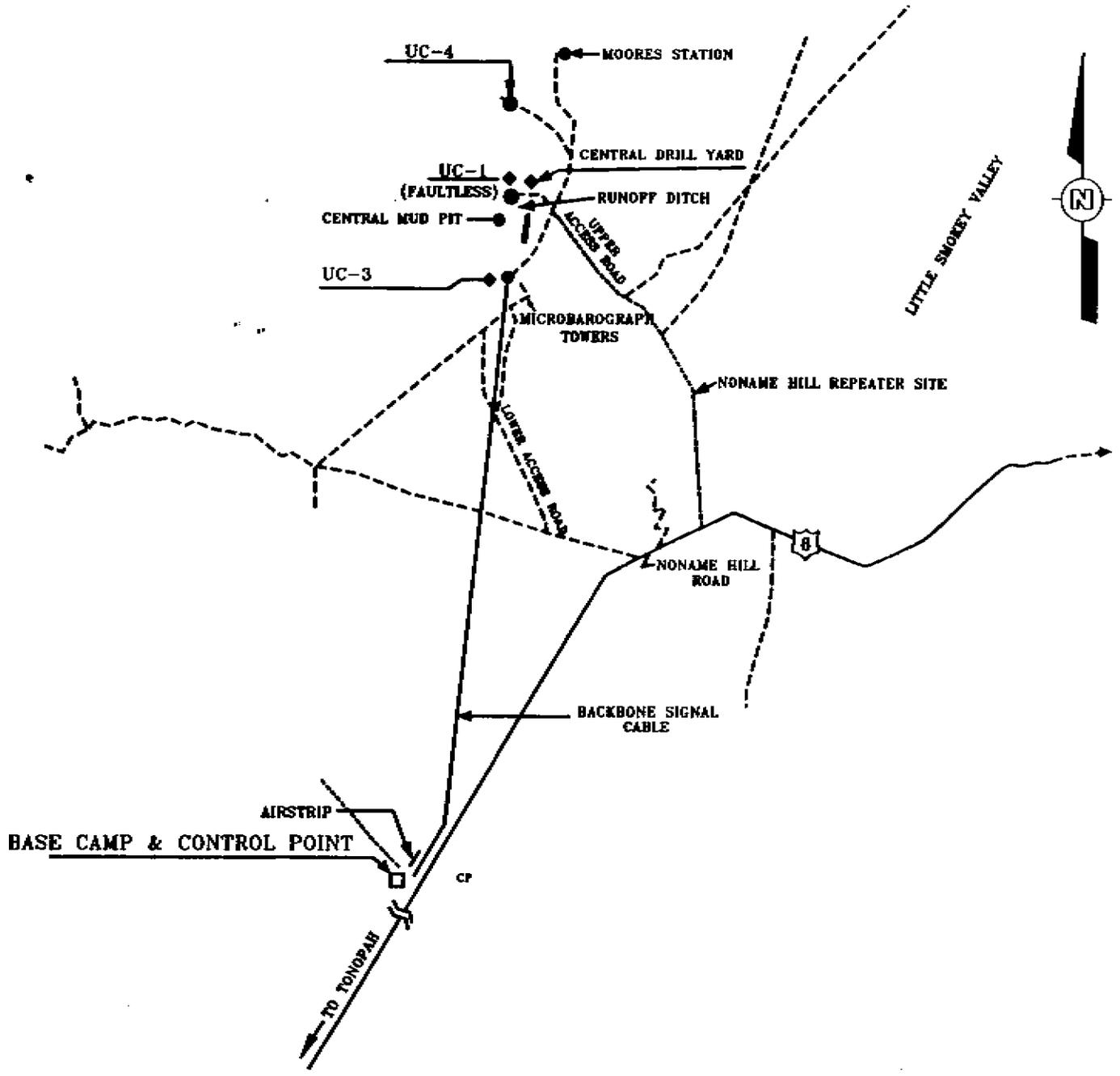
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4-3

NOT TO SCALE



(DRI, 1988)



FIGURE 4-2
SURFACE
HAZARDOUS WASTE SITES.
PREPARED FOR
DEPARTMENT OF ENERGY
NEVADA TEST SITE

Loggerhead shrike (*Lanius ludovicianus*), and the White-faced ibis (*Plegadis chihi*). The candidate fish is the Fish Lake Valley tui chub (*Gila bicolor* ssp.), and the candidate plants are the Eastwood's milkweed (*Asclepias eastwoodiana*), Sanicle biscuitroot (*Cympoterus ripleyi* var. *saniculoides*), and the Jone's globe-mallow (*Sphaeralcea caespitosa*) (FWS, 1993a).

Species distinctions (e.g. breeder, migrant, winter visitor) and habitat information were not available for the sensitive animal species.

4.1.4 Floodplains and Wetlands

Wetland surveys have not been conducted for the area around the CNTA, although it is scheduled to be surveyed in the future. Consultation with the FWS's Regional Wetland coordinator in Portland, Oregon, should be conducted prior to any remediation.

The CNTA is located in floodprone areas near Hot Creek, Sand Springs, and Moores Creek (FEMA, 1990b). A survey should be conducted prior to RI/FS to delineate floodplains and wetlands, if present at the site, and recommendations presented of any findings. In addition, the soil maps published for Nye County should be consulted to determine the presence of hydric soils within the CNTA.

4.1.5 Federal- and State-Designated Areas

No areas within the CNTA meet these criteria. The BLM, the United States Air Force (USAF), and the DOE control portions of this area with the BLM controlling the majority (DRI, 1988).

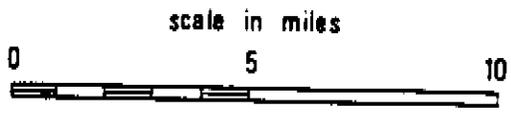
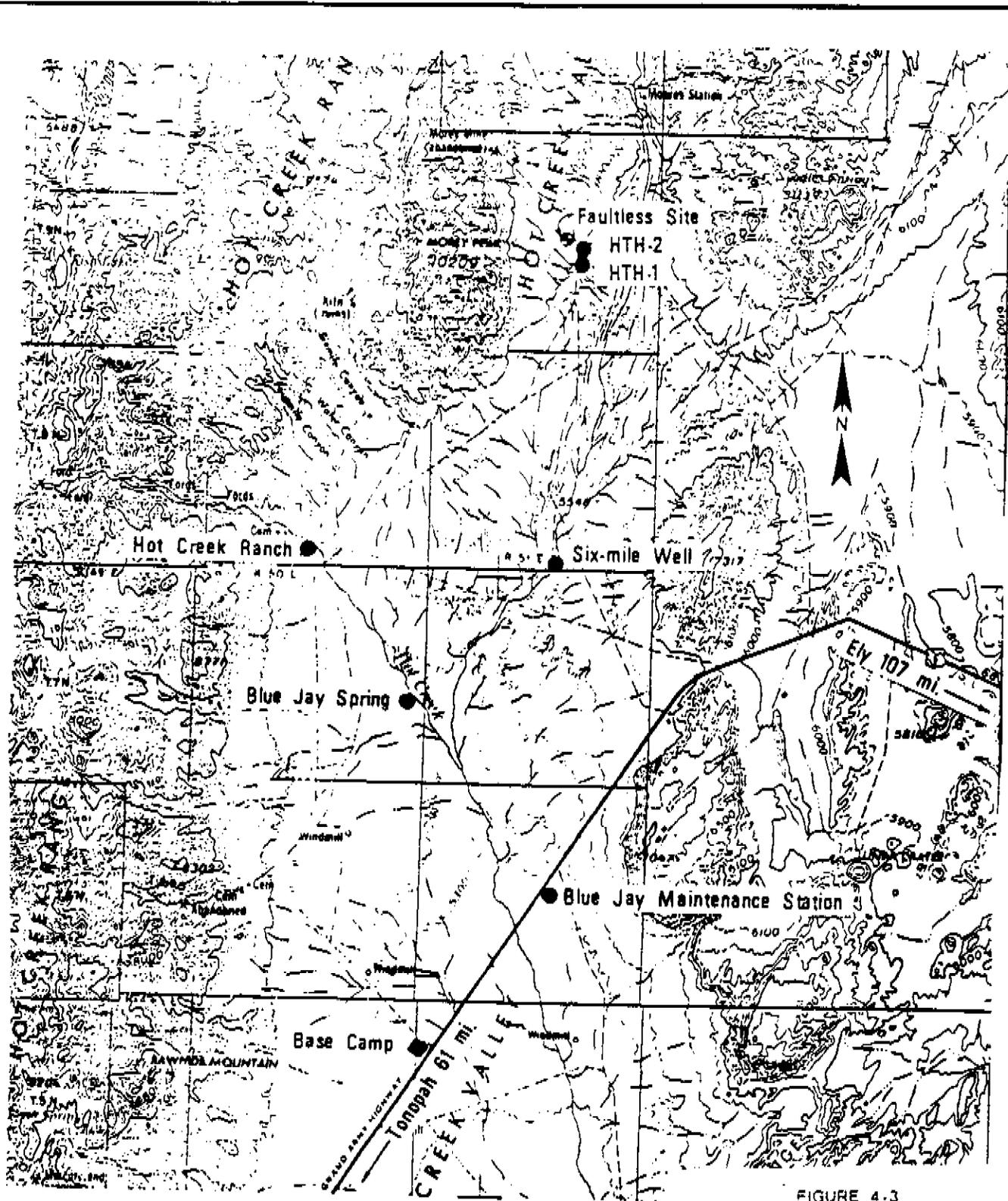
4.1.6 Prime Agricultural Lands

No areas within the CNTA constitute prime agricultural land as irrigation water is not available (Hughes, 1992, personal communication).

4.1.7 Special Sources of Water

No water sources within this area are vital in the region. Groundwater resources are approximately 152 m below the surface. The recharge area for these resources is at Hot Creek Range, located to the west and northwest of Hot Creek Valley (Figure 4-3). No available records indicate that a sole-source aquifer or a well-head protection area exist here.

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● Water sampling points

FIGURE 4.3
 HOT CREEK VALLEY
 PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE

(AEC.1974)



4.1.8 Tundra, Coral Reefs, and Rainforests

No areas within the CNTA meet these criteria.

4.1.9 Other

No Indian Reservations encompass this area.

A monument exists that states (AEC, 1974):

A nuclear detonation was conducted below this spot at a depth of 3,200 feet. The device, with a yield of less than one megaton was detonated to determine the environmental and structural effects that might be expected should subsequent higher yield underground nuclear tests be conducted in this vicinity. No excavation drilling and/or removal of materials is permitted without U.S. Government approval within a horizontal distance of 3,300 feet from the surface ground zero location (Nevada state coordinates N1, 414, 340 and E629,000, Nye County, Nevada.) Any reentry into U.S. Government drill holes within this horizontal restricted area is prohibited.

4.2 Shoal Test Site

The Shoal Test Site is located approximately 48 km southeast of Fallon, Nevada (Figure 4-4). The site is comprised of a 10 km² area around the surface ground zero (SGZ). Project SHOAL was part of the Vela Uniform program, the purpose of which was to increase understanding of the man-made seismic-wave characteristics generated by man-made explosions. The event was cosponsored by the Department of Defense and the AEC. Deactivation of the site commenced almost immediately after the detonation, with all equipment removed by January 31, 1964 (U.S. Congress, 1989; DRI, 1988). A permanent concrete slab was sealed over the cavity, and all other boreholes were permanently sealed (DOE/NV, 1984b).

4.2.1 Hazardous, Polluted, or Contaminated Sites

Contaminated soil and cuttings resulting from the post-shot drilling activities were combined with clean soil and buried. The contaminants in this soil consisted of short-lived radioisotopes of iodine and xenon that have since decayed below detectable limits. Some details of the Shoal test are classified so information for this category may be incomplete (DRI, 1988).

4.2.2 Property of Historic, Archaeological, or Architectural Significance

Information to be provided by Desert Research Institute.

4.2.3 Threatened, Endangered, or Candidate Species

Eleven species meet the criteria for this category; however, the existence of these species at the Shoal Test Site has not been verified. The eleven sensitive species include two mammals, seven birds, one invertebrate, and one plant. The candidate mammals are the Pygmy rabbit (*Brachylagus idahoensis*), and the Spotted bat (*Euderma maculatum*). The candidate birds include the Ferruginous hawk (*Buteo regalis*), the Western snowy plover (*Charadrius alexandrinus nivosus*), the Black tern (*Chlidonias niger*), the Western least bittern (*Ixobrychus exilis hesperis*), the Loggerhead shrike (*Lanius ludovicianus*), the Mountain quail (*Oreortyx pictus*), and the White-faced ibis (*Plegadis chihi*). The candidate invertebrate and plant include Hardy's Aegialian scarab beetle (*Aegialia hardyi*) and the Nevada oryctes (*Oryctes nevadensis*), respectively (FWS, 1993b).

The species distinctions (e.g. breeder, migrant, winter visitor), and habitat information were not available for the sensitive animal species.

4.2.4 Floodplains and Wetlands

Wetland surveys have been conducted for the Shoal site. Wetland information for the Shoal site is pending a response from the National Wetlands Inventory Division. Consultation with the FWS's Regional Wetland coordinator in Portland, Oregon, should be conducted prior to any remediation.

The "Flood Insurance Rate Map" for Churchill County, Colorado (FEMA, 1989) does not depict floodprone areas around the Shoal Test Site, and floodplains are not expected.

4.2.5 Federal- and State-Designated Areas

No areas within the Shoal site meet these criteria. It is part of the Sand Springs Range, and the BLM controls the rights to the area (DRI, 1988).

4.2.6 Prime Agricultural Lands

No areas within the Shoal Test Site constitute prime agricultural land as irrigation water is not readily available (Hughes, 1992, personal communication).

4.2.7 Special Sources of Water

No water sources within this area are vital in the region. No permanent bodies of water occur here, and groundwater resources exist approximately 296 m below the land surface (DOE/NV, 1984b). No available records indicate that a sole-source aquifer or a well-head protection area exists here.

4.2.8 Tundra, Coral Reefs, and Rainforests

No areas within the Shoal Test Site meet these criteria.

4.2.9 Other

No Indian Reservations encompass this area.

5.0 New Mexico Project Sites

5.1 Gasbuggy Gas Stimulation Test Site

The Gasbuggy Gas Stimulation Test Site is located approximately 88 km east of Farmington in north-central New Mexico (Figure 5-1). It was the first of three joint government-industry experiments under the Plowshare Program designed to develop peaceful uses of nuclear explosions. Through these experiments, the economic feasibility of stimulating the flow of natural gas by fracturing rock formations with underground nuclear explosions was studied. Project GASBUGGY was detonated on December 10, 1967, with subsequent tests performed in 1968, 1969, and 1973. The land is now used primarily for cattle grazing (U.S. Congress, 1989; DRI, 1988).

5.1.1 Hazardous, Polluted, or Contaminated Sites

The hazardous, polluted, or contaminated materials reportedly at the site consist of:

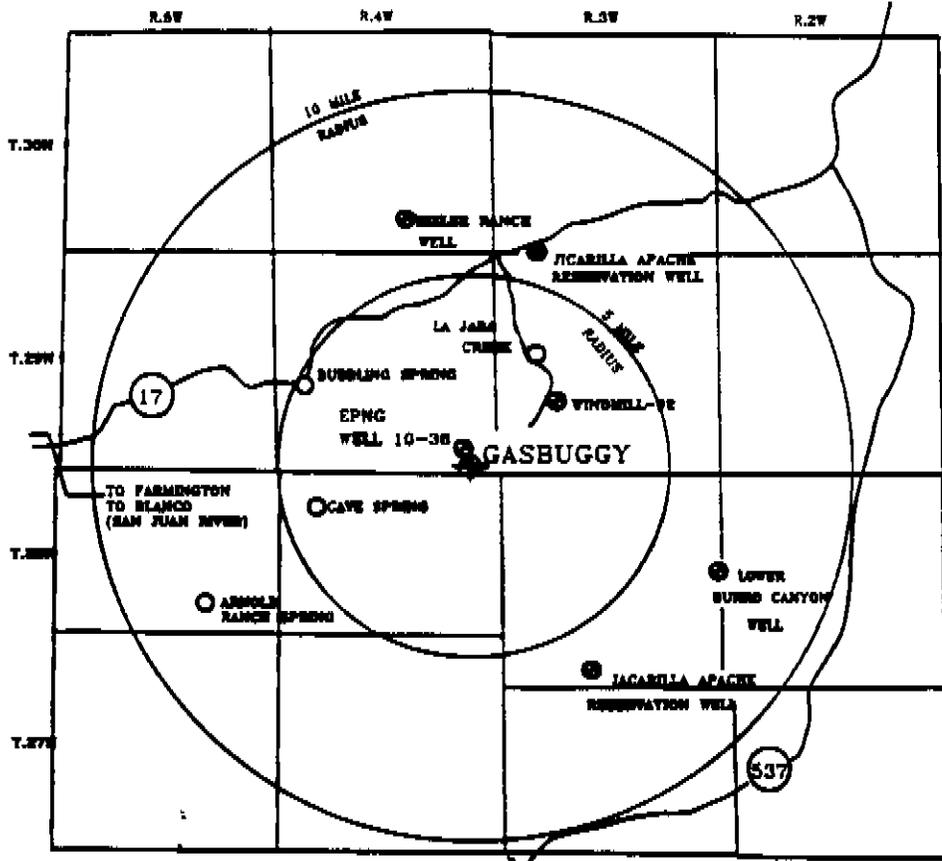
- septic tanks that were installed for the GASBUGGY project and have been backfilled and left in place (DOE/NV, 1982) (Figure 5-2)
- a mixture of mud, water, and paraffin that was buried on site (DOE/NV, 1982)
- natural gas products that are located in the natural gas-producing Pictured Cliffs sandstone formations (DOE/NV, 1986)
- a deep monitoring well with an increasing level of tritium (Wycoff, 1992).

No radioactive material was buried during the clean-up operation for Project GASBUGGY (DOE/NV, 1982).

5.1.2 Property of Historic, Archaeological, or Architectural Significance

The State of New Mexico Office of Cultural Affairs Historic Preservation Division reports that over 100 cultural resources survey projects have been conducted within an approximate 16 km radius of the Gasbuggy Gas Stimulation Test Site (Rio Arriba County, T29N, R4W, Section 36). Within Section 36, nine sites have been recorded. Of these, eight of the sites are prehistoric (primarily Anasazi culture), and one site is Anglo/Euro-American (post-1945 time period). The status of all nine sites for eligibility for inclusion in the National Register of Historic Places was recorded as "unknown." Although it appears that the majority of

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- WELL
- SURFACE SAMPLING POINTS.

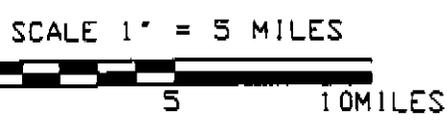


FIGURE 5-1
 GASBUGGY GAS STIMULATION
 TEST SITE LOCATION
 PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE

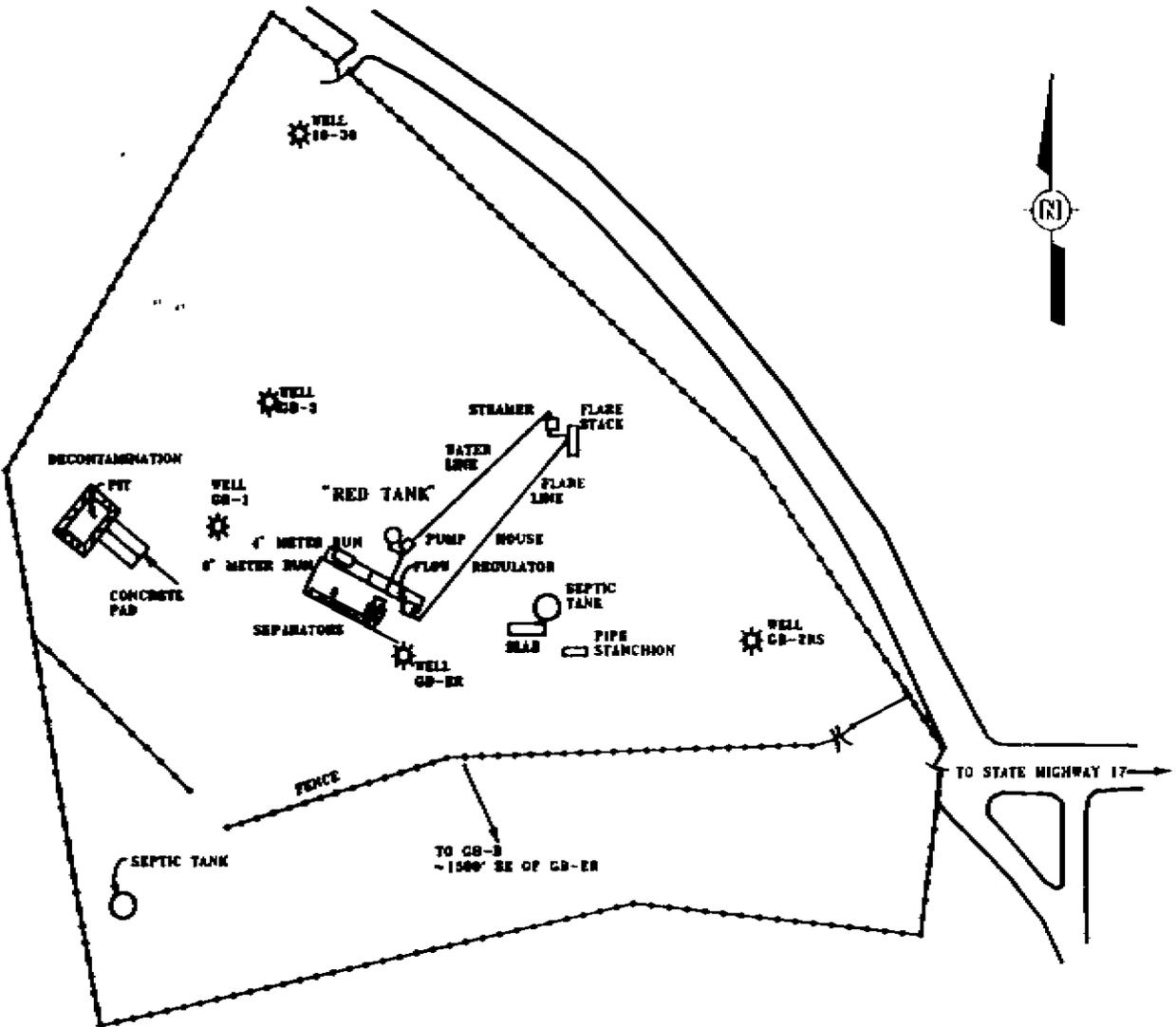
(DOE/NV, 1982)



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SCALE 1" = 150 FEET
 0 150 300 FEET



(DOE/NV, 1982)



FIGURE 5-2
 PROJECT GASBUGGY
 WASTE SITES
 PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE

Section 36 has been surveyed for cultural resources, it is possible that as yet unidentified cultural resources exist within the project area.

The Gasbuggy test site lies in a physiographic and cultural area known as the Upper San Juan basin, not far from what is commonly referred to as the "Four Corners" area. The cultural stages generally accepted for the Upper San Juan Basin are as follows (Eddy, 1972; Eddy et al., 1984). (Dates in brackets are those commonly used for the Anasazi Chaco culture area that is located to the southwest of the Gasbuggy site [Sebastian, 1992].)

- **PaleoIndian Stage:** 10,000 B.C. to circa (ca.) 3000 B.C. [10,000 to 5500 B.C.]; assumed to be present; not well-documented.
- **Archaic Stage:** 3000 B.C. to A.D. 1 [5500 B.C. to A.D. 400]; known as Desert Culture or Oshara tradition; probably influenced by western-based Archaic cultures (present-day Arizona and California); hunting and gathering lifestyle; extensive distribution of Archaic sites south of the San Juan River (Irwin-Williams, 1973).
- **Formative Stage:** A.D. 1 to 1100 [A.D. 400 to 1300]; known as the Anasazi or Pueblo tradition; sedentary lifestyle; pit houses, agriculture, basketry, ceramics, rock art, and masonry architecture occur; exhibits influences from Mogollon culture in southern New Mexico; can be divided into two periods with subperiods:
 - **Basketmaker I, II, III**
 - **Pueblo I through V.**
- **Protohistoric/Historic Stage:** ca. A.D. 1600 to present; Navajo tradition (includes Apache); originally nomadic hunters and farmers; later sheep herders; acquisition of horse, use of ceramics. The Jicarilla Apache Indians were relegated to the nearby reservation in northwestern New Mexico first in 1880 and then allowed to settle there permanently in 1887 (Tiller, 1983).
- **Euro-American Period:** A.D. 1541 to present; includes Spanish exploration, fur trade, and ranching.

The Gasbuggy test site is located within one-quarter mile of three recorded sites. The distribution of nine sites across the entire Section 36 would indicate that the Gasbuggy test site is not a culturally sensitive area; however, the Upper San Juan Basin is recognized as a culturally rich area for prehistoric Anasazi sites. Also, the proximity of the Jicarilla Apache Reservation (less than one mile away) must be considered in the event that ceremonial or plant and animal resource procurement sites exist in the area. Consultation with the State of

New Mexico Historic Preservation Division, the U.S. Forest Service (Kit Carson National Forest) office in Taos, New Mexico, and the Jicarilla Apache Tribal Council should be conducted prior to any remediation activities.

5.1.3 Threatened, Endangered, or Candidate Species

One species meets the criteria for this category; however, the existence of this species at the Gasbuggy Gas Stimulation Test Site has not been verified, and candidate species information was not available.

The Bald eagle (*Haliaeetus eucocephalus*) is a federal and state listed endangered species. Its key habitat areas include winter roost and concentration areas, as found in Chama Valley, near the test site (NMDGF, n.d.).

No sensitive plant information was available. A site survey should be conducted to identify threatened, endangered, and candidate plants within the Gasbuggy test site prior to RI/FS activities.

5.1.4 Floodplains and Wetlands

No wetland regions are reportedly located at the Gasbuggy area (EMNRD, 1991). The "Flood Insurance Rate Map" for Rio Arriba County, New Mexico (FEMA, 1989) does not depict floodprone areas around the Gasbuggy Gas Stimulation Test Site, although a more detailed map was not available for verification. A survey should be conducted prior to RI/FS to delineate floodplains and wetlands, if present at the site, and recommendations made of any findings. In addition, the soil maps published for Rio Arriba County should be consulted to determine the presence of hydric soils within the Gasbuggy test site.

5.1.5 Federal- and State-Designated Areas

No areas within the Gasbuggy Gas Stimulation Test Site meet these criteria (FWS et al., 1992b; BLM, 1989 and 1991). The Gasbuggy site is located within the Carson National Forest, and the BLM controls the surface rights (Wycoff, 1992).

5.1.6 Prime Agricultural Lands

Prime agricultural land information was not available as this site is out of the jurisdiction of the Soil Conservation Service Chama field office, and the office that maintained the soil information for this area could not be determined. The Gasbuggy test site should be surveyed for prime agricultural land prior to RI/FS.

5.1.7 Special Sources of Water

No water sources located at this site are vital in the region. The Project GASBUGGY site is located approximately 32 km away from the San Juan River and 37 km away from the Navajo Dam (AEC, 1971). No appreciable ground or surface water reportedly occurs within the area (DOE/NV, 1986). No available records indicate the existence of a sole-source aquifer or a well-head protection area at this site.

5.1.8 Tundra, Coral Reefs, and Rainforests

No areas within the Gasbuggy test site meet these criteria.

5.1.9 Other

No Indian Reservations encompass the Gasbuggy site, although the Jicarilla Apache Indian Reservation is located a few miles away (FWS et al., 1992b).

5.2 Gnome-Coach Test Site

The Gnome-Coach Site is located approximately 50 km southeast of Carlsbad, in southeastern New Mexico (Figure 5-3). This site hosted Project GNOME, a multipurpose experiment that explored underground nuclear explosions for peaceful purposes.

Project GNOME was detonated on December 10, 1961. This test was conducted to evaluate the effects of a nuclear explosion in a salt medium. Project COACH, scheduled to follow Project GNOME, was cancelled after reviewing the data obtained from Project GNOME (U.S. Congress, 1989; DRI, 1988). The site underwent restoration in 1960 and 1969, and again in the summer of 1979.

5.2.1 Hazardous, Polluted, and Contaminated Sites

Scrap metal and material located on the Gnome site were reportedly removed in 1979. Contaminated soil and debris from the operational areas were reportedly removed around

1979. High-level radioactivity is believed to exist below the land surface at five locations (DRI, 1988) (Figure 5-3):

- Gnome-Coach main shaft
- emplacement drift and shot-point room for the COACH project
- emplacement and re-entry drifts for the GNOME project
- the detonation melt-zone and cavity of the GNOME site
- groundwater near wells USGS 4 and USGS 8 at the western edge of Section 34.

5.2.2 Property of Historic, Archaeological, or Architectural Significance

The State of New Mexico Office of Cultural Affairs Historic Preservation Division has reported that two cultural resources survey projects have been conducted in the vicinity of the Gnome-Coach Site SGZ (Eddy County, T23S, R30E, Section 34). The Historic Preservation Division has on record for Section 34 three prehistoric sites and one historic (post-1945) site: the Gnome Site. Only one of the prehistoric sites was recorded as eligible for inclusion in the National Register of Historic Places. The other three sites were recorded as "unknown." It does not appear that any cultural resources surveys have been conducted in the parking and observation area of the site (Section 10). Because neither the entire Section 34 nor Section 10 have been surveyed for cultural resources, there is a possibility that unidentified cultural resources exist within the project area.

Sites in southeastern New Mexico are generally classified by the following stages (Sebastian and Larralde, 1989):

- **PaleoIndian Stage:** 10,500 B.C. to 5500 B.C.; big game hunters; isolated projectile point (spear or dart tip) finds.
- **Archaic Stage:** 5500 B.C. to A.D. 600-900; hunting and gathering lifestyle.
- **Formative Stage:** A.D. 900 to 1540; known as Ceramic period; probably Jornada Mogollon culture; development of ceramics, pit houses (rare in southeastern New Mexico); primarily hunting and gathering lifestyle in project area.
- **Historic Period:** Since A.D. 1500 to present; includes Spanish exploration, Anglo settlement, ranching, mining, and oil and gas development.

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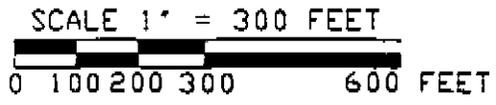
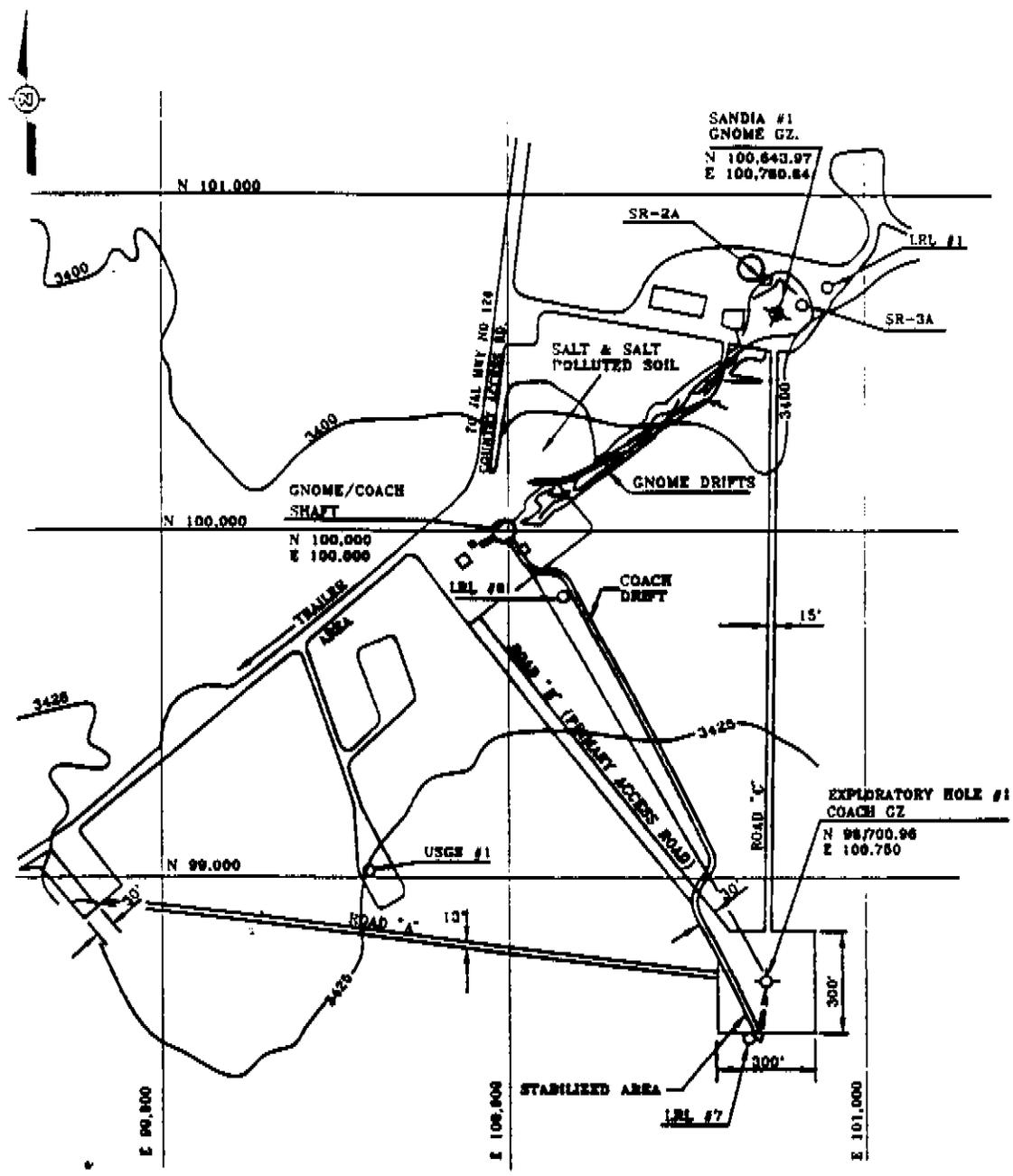


FIGURE 5-3
PROJECT GNOME-COACH SITE
PREPARED FOR
DEPARTMENT OF ENERGY
NEVADA TEST SITE

(DOE/NV. 1979)



It does not appear that the Gnome-Coach Site is located in a particularly sensitive area for cultural resources. Mogollon culture pit houses are a rare occurrence in the vicinity of the site. Consequently, the discovery of such a structure would be of significance. Prior to any remediation activities, consultation with the State of New Mexico Historic Preservation Division and the BLM district office in Roswell, New Mexico, should be conducted.

5.2.3 Threatened, Endangered, or Candidate Species

Three species meet the criteria for this category; however, the existence of these species at the Gnome-Coach Test Site has not been verified, and candidate species information was not available.

The Aplomado falcon (*Falco femoralis*), the Peregrine falcon (*Falco peregrinus*), and the Least tern (*Sterna antillarum*) are all federal and state listed endangered species.

The Aplomado falcon was suspected to breed in Eddy County during the 1960s and later, although its existence here has not been confirmed. The Peregrine falcon and the Least tern are known to occur less than regularly in Eddy County, although regular occurrence was likely during the 1960s and later.

5.2.4 Floodplains and Wetlands

No wetland regions are reportedly located at the Gnome-Coach site (EMNRD, 1991). The "Flood Insurance Rate Map" for Eddy County, New Mexico (FEMA, 1989) does not depict floodprone areas around the Gnome-Coach Test Site, although a more detailed map was not available for verification. A survey should be conducted prior to RI/FS to delineate floodplains and wetlands, if present at the site, and recommendations made of any findings. In addition, the soil maps published for Eddy County should be consulted to determine the presence of hydric soils within the Gnome-Coach site.

5.2.5 Federal- and State-Designated Areas

No areas within the Gnome-Coach Test Site meet these criteria (FWS et al., 1992b; BLM, 1989 and 1991). This site is located approximately 14 km east of the Pecos River, which is listed as a wild and scenic river (BLM, 1989). The BLM controls the surface rights for the site.

5.2.6 Prime Agricultural Lands

One soil type exists at this site:

Kermit-Berino fine sand
0-3 percent slope
land capability class VIIIe-3.

This soil type does not constitute prime agricultural land (Walker, 1992, personal communication).

5.2.7 Special Sources of Water

No water sources within this site are vital in the region. Principal aquifers are depicted in (Figure 5-4). No available records indicate that a sole-source aquifer or a well-head protection area exists here.

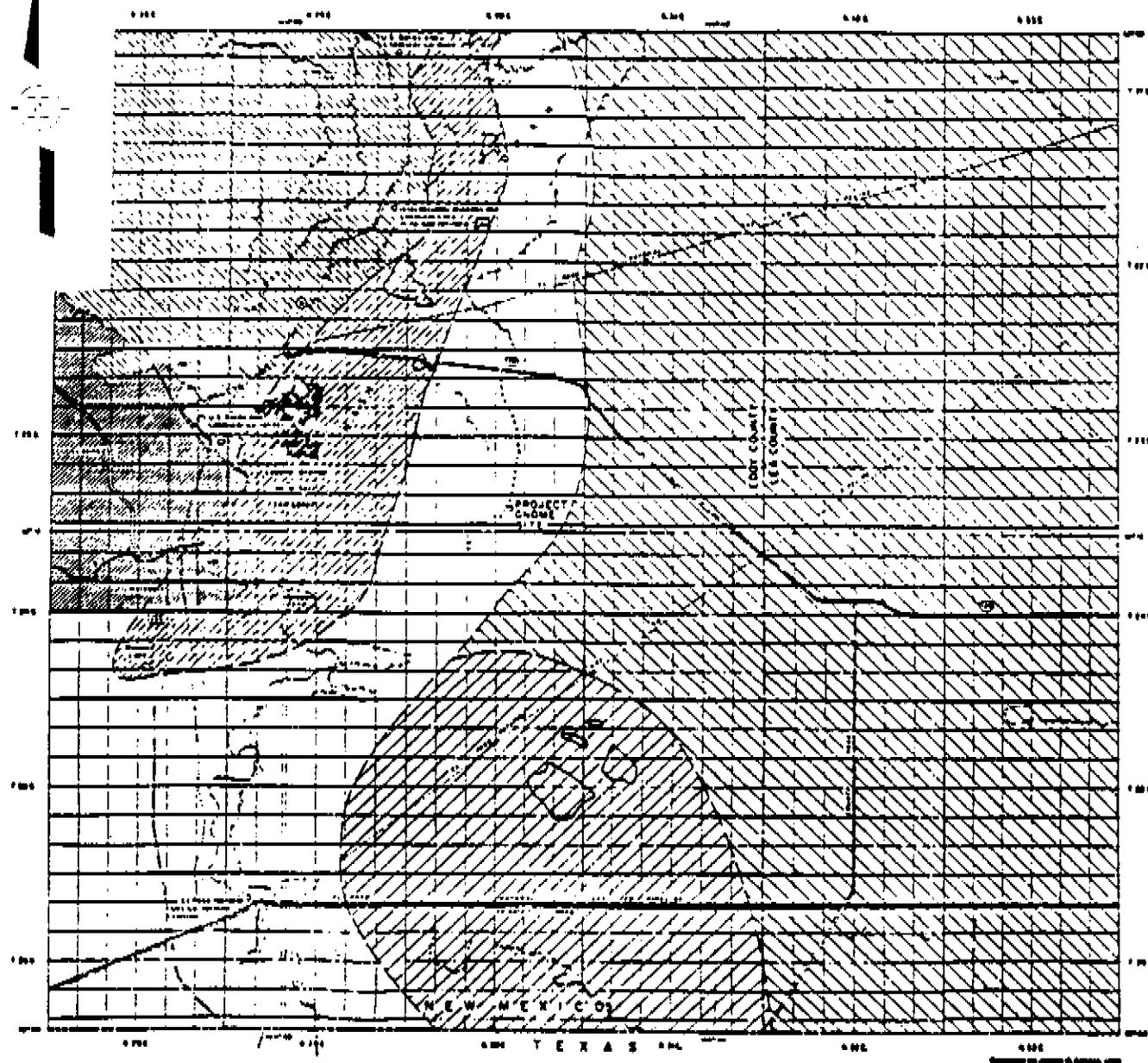
5.2.8 Tundra, Coral Reefs, and Rainforests

No areas within the Gnome-Coach Test Site meet these criteria.

5.2.9 Other

No Indian Reservations encompass the Gnome-Coach site.

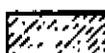
GEOHYDROLOGY OF PROJECT GNOME SITE, NEW MEXICO



Scale from base of map 1:50,000
 Contour interval 100 feet
 Contour interval 1000 feet

0 5 10 MILES

EXPLANATION

-  Wells obtain water from rocks of Permian age or locally from sand of Pleistocene(?) age or alluvium
-  Wells obtain water from sand of Tertiary or Quaternary age
-  Wells obtain water from sandstone of Triassic age or locally from sand and gravel of Tertiary or Quaternary age
-  Wells obtain water from alluvium
-  Area of brine sealer of Permian age
-  Wells obtain water from rocks of Permian age or locally from alluvium

Area boundary

FIGURE 5-4
 GENERAL DISTRIBUTION OF WATER-BEARING FORMATIONS IN THE PROJECT GNOME AREA

PREPARED FOR
 DEPARTMENT OF ENERGY
 NEVADA TEST SITE

 INTERNATIONAL TECHNOLOGY CORPORATION

(DOE, 1982)

DRAWN BY: N. BEHN, J. L. ...

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6.0 Summary

Available information for NEPA-regulated pertinent classes of actions and environmentally sensitive resources for the seven NTS off-site locations has been reviewed and summarized in Table 6-1. Based on this information, nearly all of the RI/FS for these sites can be conducted without adversely affecting the pertinent classes of action and environmentally sensitive resources, if these activities are scheduled and sited accordingly. All seven sites will require surveys for cultural and sensitive resources prior to conducting RI/FS; therefore, the determining scheduling factor for the preliminary surveys at each location will be dependent on the weather and accessibility of each site, and the seasonal activities of the sensitive species. The preliminary survey for the Amchitka Island Test Site will require the greatest amount of preliminary siting and scheduling activities mainly because Amchitka Island maintains tundra, and it is part of the Maritime National Wildlife Refuge. Also, naval support at this site will cease in the fall of 1993. With these criteria in mind, site surveys for each off-site location will coincide with the EPA environmental monitoring schedule. The Colorado and New Mexico sites should be surveyed in June 1993, and the Amchitka Island Test Site should be surveyed in August 1993. The EPA environmental monitoring activities for the Nevada sites have been completed for 1993; therefore, the Nevada site surveys should be scheduled around those scheduled for the Colorado, New Mexico and Alaska sites. Consultation with the appropriate state and federal agencies for each of the seven sites is strongly recommended to update the information reported in this document and to verify existing information prior to conducting any remediation activities.

**Table 6-1
Classes of Action and Environmentally
Sensitive Resources for Seven NTS
Off-Site Locations**

	Hazardous, Contaminated, or Polluted Sites	Property of Historic, Archaeological or Architectural Significance	Threatened, Endangered, and Candidate Species	Floodplains and Wetlands	Federal- and State- Designated Areas	Prime Agricultural Land	Special Sources of Water	Tundra, Coral Reefs, and Rainforests	Other
Amchitka Island Test Site	P1	P2	P1	I	P2	N	N	P2	P1
Rio Blanco Gas Stimulation Test Site	P1	N3	P2	P2	N	N	N	N	P1
Rulison Gas Stimulation Test Site	P1	N3	P2	N3	N	N	N	N	P1
Central Nevada Test Area	P1	I	P2	P2	N	N	N	N	P1
Shoal Test Site	N3	I	P2	I	N	N	N	N	N
Gasbuggy Gas Stimulation Test Site	P1	N3	P2	N3	N	I	N	N	N
Gnome-Coach Test Site	P1	N3	P2	N3	N	N	N	N	N

P - Present

N - Not Present

I - Information Incomplete/Unavailable

1 - Activities can be sited or scheduled to avoid adversely affecting this class of action/resource.

2- Adverse affects to this class of action/resource may or may not be avoided through siting or scheduling activities. More information is needed.

3 - Available information indicates that no class of action/resource occurs at the site, although entire site has not been surveyed/verification has not been accomplished.

7.0 References

AEC. See U.S. Atomic Energy Commission.

Alaska Department of Natural Resources, March 1992, "Alaska State Parks" map.

Amundsen, C. C., 1977, "Terrestrial Plant Ecology," in *The Environment of Amchitka Island, Alaska*, Merritt, M. L., and R. G. Fuller, eds., Technical Information Center, Energy Research and Development Administration.

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