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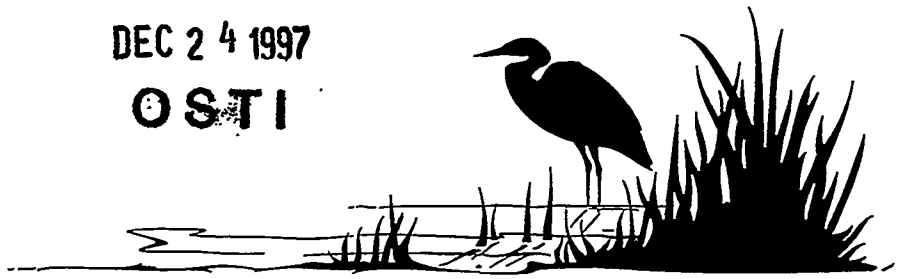
NEVADA TEST SITE WETLANDS ASSESSMENT



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NEVADA TEST SITE WETLANDS ASSESSMENT

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ACRONYMS

BN	Bechtel Nevada
CWA	Clean Water Act
DOE/NV	U.S. Department of Energy, Nevada Operations Office
DRI	Desert Research Institute
EA	Environmental Assessment
EGIS	Ecosystem Geographic Information System
EIS	Environmental Impact Statement
EMAC	Environmental Monitoring and Compliance Program
EPA	U.S. Environmental Protection Agency
FAC	Facultative wetland plants that occur in wetlands between 33 to 67% of the time
FACU	Facultative upland plants that occur in wetlands less than 33% of the time
FACW	Facultative wetland plants that occur in wetlands greater than 67 to 99% of the time
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
GPS	Global Positioning System
ITIS	Integrated Technical Information System
NEPA	National Environmental Policy Act
NTS	Nevada Test Site
NWI	National Wetland Inventory
OBL	Obligatory wetland plants that occur in wetlands greater than 99% of the time
PDOP	Precision Dilution of Perception
RMP	Resource Management Plan
TDS	Total Dissolved Solids
TIRC	Technical Information Resource Center
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Service
UTM	Universal Transverse Mercator

EXECUTIVE SUMMARY

Twenty-five natural sources of water on the U.S. Department of Energy's (DOE) Nevada Test Site (NTS) were visited from June 1996 through January 1977. These water sources included 15 springs, 5 seeps, 4 tank sites (natural rock depressions that catch and hold surface runoff), and 1 ephemeral playa pond. They are rare, localized habitats on the NTS that are important to regional wildlife and to isolated populations of water-tolerant plants and aquatic organisms. One purpose of the site visits was to identify those water sources which may be classified as "jurisdictional wetlands" and "waters of the United States" regulated under the Clean Water Act of 1977 (CWA). Section 404 of the CWA authorizes the U.S. Army Corps of Engineers (USACE) to issue permits for the discharge of dredged or fill material into waters of the United States, including wetlands. No field investigations on the NTS have been conducted in the past to identify those natural water sources which would be protected as rare habitats and which may fall under regulatory authority of the CWA.

This report identifies 16 NTS natural water sources that may be classified by the USACE as jurisdictional wetlands and 8 that may be classified as waters of the United States. Foreknowledge of these classifications will expedite project planning. If DOE proposes to impact jurisdictional wetlands or waters of the United States, a Section 404 CWA permit from USACE will be required. This report also identifies and summarizes previous studies of NTS natural water sources; describes the known physical, chemical, and biological features of these water sources; and identifies the current DOE management practices related to the protection of NTS wetlands.

Water sources on the NTS which were excluded as study sites were those created and sustained by artificial means. They include, for example, ponds adjacent to water wells that would dry up if the wells were shut down. Treatment ponds and lagoons also are not considered waters of the United States, and were excluded as study sites.

The method used to delineate wetland boundaries at each study site on the NTS was the Routine Wetland Determination method described in the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987). This method is used to delineate jurisdictional wetlands based on the presence of field indicators for three parameters: (1) hydrophytic (water tolerant) vegetation, (2) wetland hydrology, and (3) hydric soils. Data collected at each study site included a description of the wetland field indicators present at each site, the location and size of each wetland, observed wildlife usage, and photographs. At selected sites, cursory physical and chemical water quality data were also collected.

Sixteen of the 25 NTS water sources surveyed met the three required criteria to be considered jurisdictional wetlands. They included Cane Spring, Captain Jack Spring, Cottonwood Spring, Coyote Spring, Gold Meadows Spring, John's Spring, Oak Spring, Reitmann Seep, Tippipah Spring, Topopah Spring, Twin Spring, Wahmonie Seep 1, Wahmonie Seep 2, Wahmonie Seep 3, Whiterock Spring, and the vegetated margins of Yucca Playa Pond.

Nine study sites had unvegetated pools of water which did not meet the criteria for jurisdictional wetlands, but which may be classified as waters of the United States. They include cave pools at four spring sites (Cane, Tippipah, Tub, and Whiterock springs), the pools of water in natural rock depressions at four sites (Ammonia Tanks, Fortymile Canyon Tanks, Rock Valley Tank, and Tongue Wash Tank), and the periodically inundated area of Yucca Playa Pond, the ephemeral pond that holds surface runoff from Yucca Lake playa.

All 16 of the study sites that may be classified as jurisdictional wetlands had field indicators for hydrophytic vegetation. Twenty-three species of plants had 10 percent or greater absolute cover at one or more study sites. These dominant species were used in determining if field indicators for hydrophytic vegetation were present at a site. Seventeen of the 23 dominant species were obligate wetland species or facultative wetland species.

Twenty-three of the 25 study sites had field indicators of wetland hydrology which included standing water, saturated soils, and evidence of periodic inundation such as water lines or dried algal mats. The only two sites which lacked these field indicators of wetland hydrology were Rainier Spring and Tupapa Seep. The source of water at most of the study sites is groundwater discharge from seeps and springs. Surface runoff from precipitation was found at Yucca Playa Pond and at the four tank sites.

Nineteen of the 25 study sites had field indicators for hydric soils which included saturated or inundated soils, dark-colored soils due to high organic matter content, and soil mottling. Field indicators were scarce at the 19 sites and were often inferred from site hydrology and past observations of surface water or saturated soils. Four of the six sites lacked saturated soils or other field indicators for hydric soils (Pavits Spring, Rainier Spring, Rock Valley Tank, and Tupapa Seep). Two of the six sites lacked soils altogether because they were located in bedrock (Fortymile Canyon Tanks and Tongue Wash Tank).

Eleven of the springs and seeps surveyed have surface flow of water all year long. These sites are Cane Spring, Captain Jack Spring, Cottonwood Spring, John's Spring, Oak Spring, Reitmann Seep, Tippipah Spring, Topopah Spring, Tub Spring, Twin Spring, and Whiterock Spring. The remaining 15 sites are ephemeral; they may dry up at some period of time during the year or during dry years. The sizes of the NTS wetlands are very small. With the exception of Tippipah Spring, Whiterock Spring, and Yucca Playa Pond, most were less than 300 square meters (m^2) (3,228 square feet [ft^2]). They varied in size from less than 1 m^2 (10.8 ft^2) at Reitmann Seep to approximately 3,400 m^2 (37,000 ft^2) along the edges of Yucca Playa Pond, based on the area of hydrophytic vegetation. Water levels were generally shallow at all study sites, ranging from 3 to 200 centimeters (cm) (1.2 to 78.7 inches [in.]). Flow rates of NTS springs measured during 1996 were very low, ranging from 0.0-3.0 liters/minute (ℓ/min) (0.0 to 0.80 gallons [gal]/min).

Eighty-one species of vascular plants have been recorded in or near the NTS wetland sites based on the results of the 1996 and 1997 field surveys and on past NTS studies. Most of the species in NTS wetlands are forbs (33 species, 41 percent) followed by grasses, rushes, and sedges combined (30 species, 37 percent), and trees and shrubs combined (18 species, 22 percent). This is very different from the general flora of the NTS, where forbs make up approximately 74 percent of the total number of species. Grasses, rushes, and sedges

make up only 12 percent while trees and shrubs make up 14 percent (Beatley, 1976). No plant species listed as threatened or endangered under the Endangered Species Act occur at any of the NTS natural water sources.

A total of 138 species of animals have been documented at NTS wetland sites, including various classes of animals such as mammals, birds, reptiles, and terrestrial insects. The largest group of vertebrates using NTS wetlands is birds (100 species). Passerine birds comprise the majority of birds recorded (80 species). Waterfowl use of NTS springs is negligible, probably due to the small surface areas of open water. Cane Spring and Yucca Playa Pond are the only natural NTS wetland sites that are known to attract migratory waterfowl. Many freshwater invertebrates occur in NTS natural water sources. They include nonparasitic nematodes (roundworms), oligochaetes (segmented worms), crustaceans (fairy shrimp, tadpole shrimp, clam shrimp, seed shrimp, copepods, water fleas), hydrobiid gastropods (springsnails), and chironomids (midge larvae). Use of wetland habitats on the NTS by federally listed threatened or endangered animals is negligible. Scat of the threatened desert tortoise have been found at the Rock Valley Tank site.

Executive Order 11990 (Federal Register, 1977) specifies that each federal agency *"shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities."* DOE has taken several actions to ensure compliance with this Order. Data included in this report on NTS wetland locations, boundaries, sizes, animal usage, and presence of field indicators for jurisdictional wetlands classification will be used by DOE to better define the "*natural and beneficial values*" of NTS wetlands and to develop appropriate ecosystem management goals.

DOE has developed several tools to manage biological resources, including wetlands, on the NTS. These tools include a Geographic Information System (GIS) wetlands database which will be linked with other resource databases during development and implementation of land and facility use management goals. This report presents management goals specific for NTS wetlands that incorporate the intent of existing wetlands legislation, the principles of ecosystem management, and the interests of regional land managers and other stakeholders. Specific management goals presented in this report include (1) avoiding wetland impacts whenever possible, (2) minimizing all unavoidable wetland impacts, (3) restoring the biological integrity of wetlands if degradation occurs, and (4) preserving and enhancing the natural and beneficial values of NTS wetlands. Other recommendations pertaining to the management of NTS natural water sources are discussed in the final chapter of this report.

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1.0 INTRODUCTION

1.1 Definition of a Wetland

There are 15 known springs and 5 known seeps on the U.S. Department of Energy's (DOE's) Nevada Test Site (NTS) in southern Nevada. Springs are sites where water flows from soil or rock creating noticeable surface flows. Seeps are sites where water also flows, but at much slower rates than springs resulting in saturated soils without noticeable surface flow. Other wet areas on the NTS include tanks (natural rock basins) and playas (plains of silt or mud, covered with water seasonally). Water flow and saturated soils on these sites may create habitat that supports hydrophytic vegetation or aquatic organisms, characteristic features of wetlands. The reference definition of a wetland is ". . . an ecosystem that depends on constant or recurrent, shallow inundation or saturation at or near the surface of the substrate. The minimum essential characteristics of a wetland are recurrent, sustained inundation or saturation at or near the surface and the presence of physical, chemical, and biological features reflective of recurrent, sustained inundation or saturation. Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation. These features will be present except where specific physicochemical, biotic, or anthropogenic factors have removed them or prevented their development." (Nuclear Regulatory Commission [NRC], 1995).

1.2 Ecological Importance of Wetlands

Identifying and characterizing wetlands is important because of their value to local and regional ecosystems. Wetlands are known to have three major functions: (1) habitat maintenance and food web support; (2) short- and long-term storage of water; and (3) cycling of nutrients, removal of dissolved substances, and accumulation of inorganic sediments. The ecological and societal value of these functions include flood damage control, maintaining water quality, maintaining biodiversity, and providing habitat and forage for nongame and game species such as fish, fur-bearers, and waterfowl.

Wetlands within desert ecosystems are distinctly different from the familiar examples of large marshlands, peatlands, and river floodplains within other physiographic regions of the nation. Desert springs and seeps are often too small in size to affect local or regional surface water flow or nutrient cycling. However, they do provide wildlife habitat, free-standing water, and forage which are regionally rare. They may increase the biodiversity of desert ecosystems, provide habitat and forage to migratory species passing through desert ecosystems, or help to determine the home range of resident wildlife species and the size of resident wildlife populations dependent on drinking water.

1.3 Legal Status of Wetlands

Wetlands are federally regulated throughout the nation on both private and public lands. The Clean Water Act (CWA) of 1977 (42 U.S. Code [USC] 1251, *et seq.* [amendments to the Federal Water Pollution Control Act of 1972]) was enacted to maintain and restore the chemical, physical, and biological integrity of the "waters of the United States." Section 404 of the Act authorizes the U.S. Army Corps of Engineers (USACE) to issue permits

for discharging dredged or fill material into the waters of the United States, including wetlands. Since 1977, the USACE's regulatory authority has been expanded through numerous judicial decisions to include permitting for any disturbance to the size or water quality of wetlands, not just permitting for discharging dredged or fill materials into wetlands. The USACE (Federal Register [FR], 1982) and the U.S. Environmental Protection Agency (EPA) (FR, 1980) have jointly defined wetlands to aid in the delineation of "jurisdictional wetlands," i.e., those regulated under the CWA. Similar to the reference definition above, they define wetlands as "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The National Environmental Policy Act (NEPA) of 1969 (42 USC 4321) requires federal agencies to evaluate the impact of proposed actions on the environment. The broad intent of NEPA includes promoting ". . . efforts which will prevent or eliminate damage to the environment and biosphere and . . . enrich the understanding of the ecological systems and natural resources important to the Nation . . ." Documents produced in compliance with NEPA, including Environmental Assessments (EAs) and Environmental Impact Statements (EISs) routinely identify wetlands as unique components of the ecosystem which are described and discussed as part of the impact analysis.

In furtherance of NEPA, the Carter administration issued Executive Order 11990, *Protection of Wetlands*, in 1977 (42 FR 26961, May 24, 1977) to ". . . avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative." This Order requires governmental agencies to minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities, including managing federal lands and facilities.

1.4 Need and Purpose for Wetlands Survey on the NTS

No field investigations have been conducted in the past to identify all natural water sources on the NTS. Only nine springs have been routinely visited by NTS researchers such as hydrologists, biologists, and archeologists over the past 30 years. However, prior to 1996, 12 other NTS seeps and springs and numerous ephemeral ponds which collect surface runoff on NTS playas remained scarcely studied and largely undocumented in available literature. These lesser-known natural water sources are equally rare and unique NTS habitats important to regional wildlife and localized populations of aquatic organisms and water-dependent vegetation. Their identification is essential for proper management and protection of natural resources on the NTS.

DOE/Nevada Operations Office (NV) has for the past two decades implemented an ecological monitoring program on the NTS to monitor various components of the ecosystem and to provide baseline data needed to identify and protect rare biological resources and federal- and state-protected plants and animals. The monitoring of wildlife

use at selected NTS springs has been a long-term component of this program. This survey, aimed at identifying and describing all the natural water sources on the NTS, was conducted in 1996 and 1997 through DOE/NV's Ecological Monitoring and Compliance (EMAC) program.

The pertinent ecological data gathered on wetlands during this survey will be incorporated into an NTS resource management plan. DOE's *Land- and Facility-Use Management Policy* (O'Leary, 1994) is ". . . to manage all of its land and facilities as valuable national resources . . . based on the principles of ecosystem management and sustainable development. [DOE] will integrate mission, economic, ecologic, social, and cultural factors in a comprehensive plan for each site that will guide land and facility decisions . . . . This policy will result in land and facility uses that support the Department's critical missions, stimulate the economy, and protect the environment." The principles of ecosystem management is an approach to sustain the production of natural resources and the ecosystems on which those resources depend. This resource management plan will identify the rare and unique habitats of the NTS, such as wetlands, and how they will be managed based on ecosystem principles.

This wetlands survey is also helpful for compliance with NEPA. In the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (EIS) (DOE, 1996a), several alternative DOE activities proposed for the NTS over the next ten years were analyzed for their impacts on the existing environment, which included ten known springs and seeps. None of the proposed activities were expected to negatively affect these water sources. Information regarding all the natural water sources, however, even those that are more remote or are ephemeral, may be needed during NEPA impact analyses and siting suitability analyses for new NTS projects developed during, and well beyond, the next ten years.

Due to their federal regulatory status, this survey was designed to provide a preliminary delineation of jurisdictional wetlands that occur on the NTS. If a proposed project would impact a jurisdictional wetland, a permit from the USACE would need to be obtained before construction could begin. This survey also identifies those natural water sources which do not qualify as jurisdictional wetlands, but which may be protected as waters of the United States. Examples of waters of the United States are springs, seeps, tanks, and playas that do not support hydrophytic vegetation, but which have standing water for long periods. The permitting process for projects which may impact these waters is similar to that for jurisdictional wetlands. This survey of natural NTS water sources may expedite project siting, permitting, and construction by identifying up front those sites that may be regulated under Section 404 of the CWA.

1.5 Goals and Objectives of the NTS Wetlands Survey and Report

The goals and objectives of the 1996-1997 NTS wetlands field survey and this summary report are to

- identify and summarize all previous studies of NTS natural water sources;
- describe the physical, chemical, and biological features of these water sources;

- determine if NTS natural water sources have the potential for classification as jurisdictional wetlands or waters of the United States; and
- identify current DOE management practices related to the protection of NTS wetlands

2.0 STUDY AREA

The NTS is located in Nye County in southwestern Nevada. The NTS encompasses 3,496 square kilometers (km^2) (1,350 square miles [mi^2]) and is situated along the transition zone between the Mojave Desert and Great Basin Desert. The topography of the eastern and southern NTS is typical of the Great Basin, with numerous north/south-trending mountain ranges and intervening alluvial basins. In the northwestern portion of the NTS, the physiography is dominated by the volcanic highlands of Pahute and Rainier mesas. There are three primary valleys on the NTS: Yucca Flat, Frenchman Flat, and Jackass Flats. Elevation on the NTS ranges from less than 1,000 meters (m) (3,281 feet [ft]) above sea level in Frenchman Flat and Jackass Flats to about 2,340 m (7,600 ft) on Rainier Mesa.

Both Yucca Flat and Frenchman Flat are closed basins, while Jackass Flats is open with surface water drainage via Fortymile Wash into Amargosa Valley southwest of the NTS. Streams on the NTS are ephemeral. Runoff results from snowmelt and from precipitation during storms that occur most commonly in winter. Localized summer thunderstorms can also produce runoff events. Much of the runoff quickly infiltrates into rock fractures or into the dry soils, some is carried down alluvial fans in arroyos, and some drains onto playas in Yucca and Frenchman flats where it may stand for weeks as lakes.

Elevation is the most obvious factor affecting the distribution of plant and animal communities on the NTS. Mojave Desert plant communities are found at lower elevations, Great Basin Desert plant communities at the higher elevations, and transitional communities are found in the bottom of closed basins.

There are 20 known springs and seeps, 4 tanks, and 1 ephemeral pond on the NTS which occur over a range of elevations and habitats (Figure 2-1, Table 2-1). Eleven of the springs are the only natural sources of perennial surface water on the NTS. These include Cane Spring, Captain Jack Spring, Cottonwood Spring, John's Spring, Oak Spring, Reitmann Seep, Tippipah Spring, Topopah Spring, Tub Spring, Twin Spring, and Whiterock Spring. Most water discharged from NTS springs and seeps travels only a short distance from the source before evaporating or infiltrating into the ground. In contrast, there are at least 23 man-made impoundments on the NTS (Greger and Romney, 1994a) which are sources of perennial surface water. Most of these reservoirs are scattered through the valley bottoms.

The only biological communities on and around the NTS that are not widespread are those associated with the natural wetlands and man-made water sources. Many of the birds on the NTS, including almost all of the waterfowl and shorebirds, use the playas in Frenchman and Yucca flats, artificial ponds at springs, and sewage lagoons during their migration or during winter (Hayward *et al.*, 1963). Bats have been observed feeding and drinking at one natural spring and at five man-made ponds on the NTS and often seek food and water at these water sources (Bechtel Nevada [BN], 1996). The distribution of about 60 wild horses (*Equus caballas*) living on or near Rainier Mesa appear to be directly related to the location of natural and man-made ponds (Greger, 1995).

A more detailed description of the physiography, geology, climate, and vegetation of the NTS has been presented in Beatley (1976) and O'Farrell and Emery (1976).

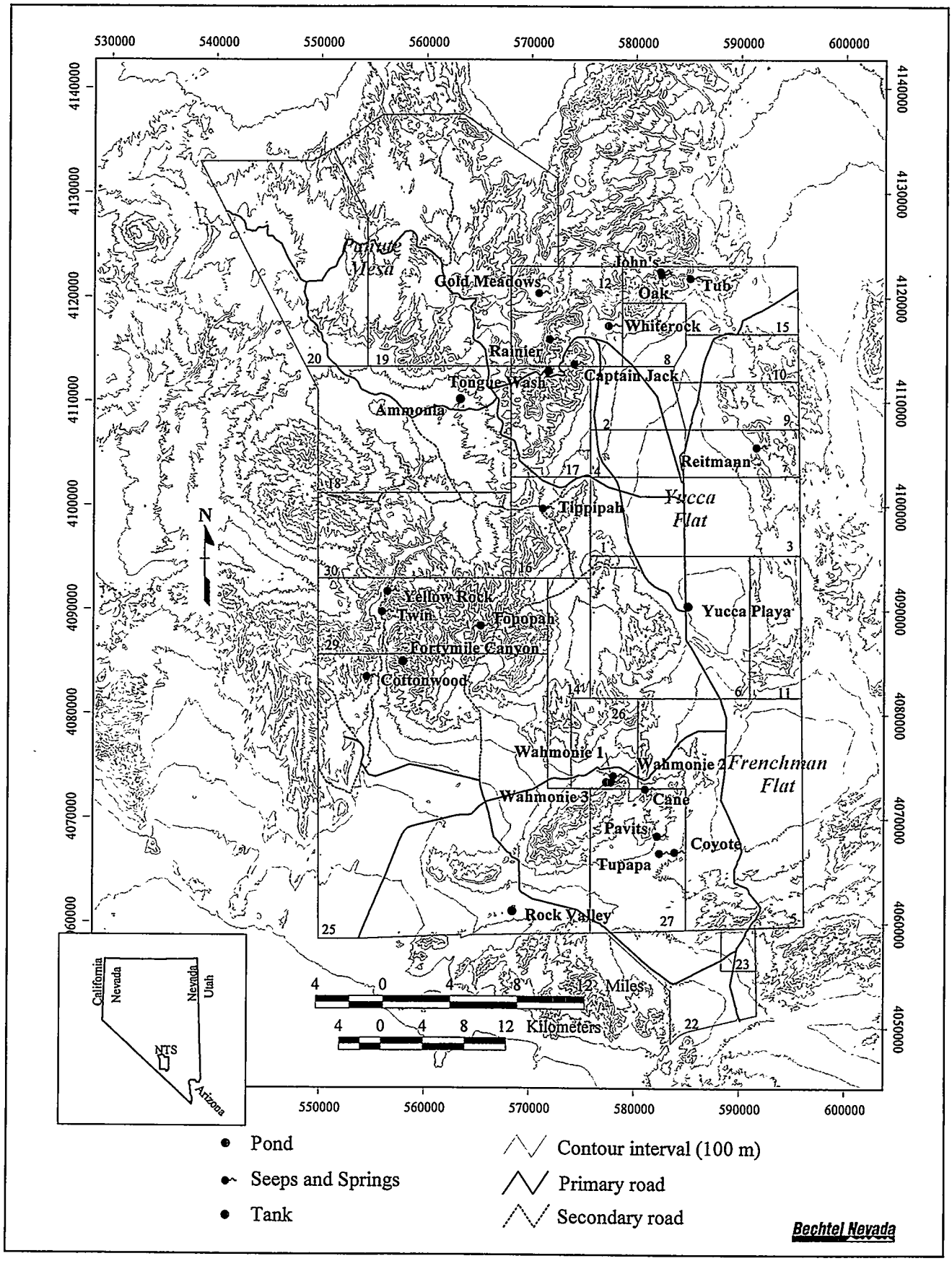

Figure 2-1 **Location of NTS natural water sources monitored in 1996 and 1997**

Table 2-1 Attributes and location coordinates of NTS natural water sources monitored in 1996 and 1997

Water Source	NTS Area	Elevation (m)	Habitat type[a]	Geology/Age[b]	UTM Easting	UTM Northing
Ammonia Tanks	19	1615	Sagebrush	Ash flow tuff/Miocene	562850	4110240
Cane Spring	5	1237	Blackbrush	Lava flows/Miocene	580750	4072641
Captain Jack Spring	12	1792	Pinyon-Juniper	Ash fall tuff/Miocene-Oligocene	573834	4113579
Cottonwood Spring	25	1292	Rabbitbrush	Rhyolitic lava flows-bedded tuff/Miocene	554045	4083726
Coyote Spring	27	1085	Creosote	Lava flows/Miocene	583594	4066568
Fortymile Canyon Tanks	25	1396	Rabbitbrush	Rhyolitic lavas-tuffaceous beds/Miocene	557500	4085000
Gold Meadows Spring	12	2048	Pinyon-Juniper	Ash fall tuff/Miocene-Oligocene	570415	4120398
John's Spring	15	1840	Sagebrush-Oak	Ash fall tuff/Miocene-Oligocene	582100	4122490
Oak Spring	15	1783	Sagebrush-Oak	Ash fall tuff/Miocene-Oligocene	582208	4122209
Pavits Spring	27	1203	Creosote	Lava flows/Miocene	581931	4068118
Rainier Spring	12	1890	Pinyon-Juniper	Ash fall tuff/Miocene-Oligocene	571463	4116050
Reitmann Seep	7	1402	Blackbrush	Ash fall tuff/Miocene	591278	4105578
Rock Valley Tank	25	1048	Creosote	Limestone, dolomites/Upper-Mid Cambrian	568070	4061000
Tippipah Spring	16	1585	Sagebrush	Ash fall tuff/Miocene-Oligocene	570857	4099671
Tongue Wash Tank	12	1950	Pinyon-Juniper	Ash fall tuff/Miocene	571360	4113050
Topopah Spring	29	1774	Blackbrush	Ash flow tuff/Miocene	564973	4088339
Tub Spring	15	1594	Sagebrush	Ash fall tuff/Miocene-Oligocene	584925	4121850
Tupapa Seep	27	1140	Creosote	Lava flows/Miocene	582129	4066459
Twin Spring	29	1310	Rabbitbrush	Rhyolitic lavas/Miocene	555484	4089984
Wahmonie Seep 1	26	1286	Blackbrush	Lava flows/Miocene	577679	4073923
Wahmonie Seep 2	26	1347	Blackbrush	Lava flows/Miocene	577471	4073319
Wahmonie Seep 3	26	1341	Blackbrush	Lava flows/Miocene	577044	4073349

Table 2-1 (continued)

Water Source	NTS Area	Elevation (m)	Habitat type[a]	Geology/Age[b]	UTM Easting	UTM Northing
Whiterock Spring	12	1539	Blackbrush	Ash fall tuff/ Miocene-Oligocene	577099	4117282
Yellow Rock Springs	30	1298	Blackbrush	Rhyolitic lava flow/Miocene	555979	4091944
Yucca Playa Pond	6	1189	Salt cedar	Alluvium/Holocene-Pliocene	584805	4090584

[a] Dominant perennial vegetation surrounding each site.
[b] Taken from Frizzell and Shulters (1990).

3.0 METHODS

3.1 Literature Search to Identify Study Sites and Historical Use

To identify the study sites at which field surveys would be conducted, 30 U.S. Geological Service (USGS) 7.5-Minute Series quadrangle maps were examined for seep and spring sites and a literature search was conducted. Potential wetlands on Frenchman and Yucca flats were identified by examining aerial photographs and looking for vegetated sites on and along the edge of the playas. The literature search identified (1) names of natural water sources which were unnamed on the maps; (2) locations of springs, seeps, and tanks that were not found on the maps; and (3) pertinent studies and historical accounts of wetland sites on the NTS. Many sites that were located on maps or identified in available literature were specifically excluded from this study, including water sources that were created and are sustained by artificial means and would therefore be disqualified as both jurisdictional wetlands and waters of the United States. For example, many wells on the NTS have adjacent ponds that support hydrophytic vegetation and aquatic organisms, but they would dry up if the wells were shut down. Also, treatment ponds or lagoons, although they have standing water for long periods of time, are not waters of the United States as defined by the CWA.

Several internal databases were searched including the BN ecological library database and an annotated ecological bibliography for the NTS (O'Farrell and Emery, 1976). Searches were conducted by the DOE/NV Technical Information Resource Center (TIRC) using their in-house Tech-Lib library database, the Oak Ridge National Laboratory database named ITIS (Integrated Technical Information System), and the University of Nevada System library database. Other agencies and institutions which assisted in literature search efforts by providing bibliographies, references, and documents included Desert Research Institute (DRI), Las Vegas and the EPA, Las Vegas. Internet searches were conducted on DOE and USGS web site databases. The following key words were used in these searches: NTS, springs, wetlands, water quality, water chemistry, hydrology, groundwater, flow rates, and perched water table. Historic information on springs and seeps was collected using additional key words such as historic, prospectors, ranching, mining, prehistoric, artifacts, ethno-history, Native Americans, and cultural resources.

Subject matter experts employed by BN, DOE/NV, and DRI with experience in geology and hydrology were also contacted to find pertinent reports referencing NTS natural water sources. Also, all historical data files and reports created in support of ecological tasks conducted by DOE/NV through the EMAC were referenced to identify past plant or wildlife animal observations at NTS springs and seeps.

The results of the literature searches provided information on spring hydrology, water quality, wildlife use, species inventories, and documented anthropogenic disturbances. These data were summarized and presented in this report, along with the results of the field surveys conducted in 1996-1997.

3.2 Field Surveys

Biologists conducted surveys at 25 natural water sources on the NTS (Figure 2-1, Table 2-1) from June 1996 through February 1997. Three seeps were discovered in the summer of 1996 during field surveys conducted to map desert tortoise (*Gopherus agassizii*) habitat on the NTS. These seeps were not identified on USGS maps or in the available literature. They are located in washes south of Cane Spring Road in Area 26 and are referred to in this report as Wahmonie Seep 1, 2, and 3 (Figure 2-1).

Field surveys were conducted in coordination with other field and office tasks supported by DOE/NV. Therefore, not all springs were surveyed at the same time and many were visited multiple times. In June, biologists visited ten sites: Cane Spring, Captain Jack Spring, Reitmann Seep, Tippipah Spring, Topopah Spring, Tub Spring, Whiterock Spring, and Wahmonie Seep 1, 2, and 3. In July, Gold Meadows Spring and Reitmann Seep were visited. In September, biologists visited 12 sites: Cane Spring, Captain Jack Spring, Coyote Spring, Pavits Spring, Reitmann Seep, Tippipah Spring, Topopah Spring, Tongue Wash Tank, Tub Spring, Tupapa Seep, Whiterock Spring, and Wahmonie Seep 1. In November, biologists visited five sites: Cane Spring, Oak Spring, Reitmann Seep, Tippipah Spring, and Tupapa Seep, and in December six sites were visited: Cottonwood Spring, Fortymile Canyon Tanks, John's Spring, Rainier Spring, Twin Spring, and Yellow Rock Springs. In January 1997, Ammonia Tanks, Rock Valley Tank, Yellow Rock Springs, and Yucca Playa Pond were visited, and in February 1997, Fortymile Canyon Tanks, John's Spring, and Rainier Spring were visited.

Data were collected at each site to (1) identify the location and size of each wetland (i.e., delineate wetland boundaries); (2) describe the vegetation, hydrology, and soils to delineate jurisdictional wetland boundaries; (3) collect cursory physical and chemical water quality data; (4) document wildlife usage; and (5) document wetland habitat with photographs.

3.2.1 Determining Wetland Site Coordinates

The coordinates identifying the field location of each study site (Table 2-1) were recorded using hand-held Global Positioning System (GPS) units (Magellan™ ProMark V). Coordinates were recorded as Universal Transverse Mercator (UTM) system values (Zone 11, North American datum) based on an average of 20 GPS readings and an average PDOP for all 20 readings of 10 or less. PDOP is defined as the precision dilution of perception and refers to the three-dimensional spacing of satellites. If satellites are properly spaced (indicated by a low PDOP, where PDOPs of six or less are recommended), the resulting coordinate readings are more accurate. The GPS coordinates for each site were not corrected for degradation by the U.S. Department of Defense and are believed to be accurate to within 100 m (328 ft) of the true location. The UTM coordinates of each NTS wetland site were then cross-checked with coordinates from the appropriate USGS 7.5-Minute Series quadrangle maps.

3.2.2 Selecting Wetland Delineation Methods

The method used to delineate wetland boundaries at each site on the NTS was the Routine Wetland Determination method (Table 3-1) published in the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (1987 Manual) (Environmental Laboratory, 1987). There are two other wetland delineation methods, the use of National Wetland Inventory (NWI) maps prepared by the U.S. Fish and Wildlife Service (FWS) and the Comprehensive Wetland Determination method. The three methods vary in intensity of field effort and their applicability to the NTS.

Table 3-1 Steps for conducting an on-site routine wetland delineation survey

- Locate the project area
- Determine whether an atypical situation exists
- Identify the plant community types
- Determine whether normal environmental conditions are present
- Select representative observation points
- Characterize each plant community type
- Record indicator status of dominant species
- Determine whether hydrophytic vegetation occurs
- Apply wetland hydrologic indicators
- Determine whether wetland hydrology is present
- Determine whether soils must be characterized
- Dig a soil pit
- Apply hydric soil indicators *
- Determine whether hydric soils are present
- Make wetlands determination
- Determine wetland-nonwetland boundary
- Sample other transects and synthesize data

* Munsell color chart classifications were not applied in describing soils; only the presence or absence of mottling was recorded. Table is cited from the methods described in *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987).

NWI wetland maps provide classification and identification of general categories or types of wetlands (e.g., lake-based wetlands, riverine wetlands, palustrine wetlands, estuary wetlands, coastal wetlands, and marine or saltwater wetland types) (Cowardin *et al.*, 1979). The only wetland type applicable to the NTS wetlands is the palustrine (inland) wetland type. Because of the scale size of the maps (1:24,000 or 1:100,000), many or most areas less than 2 hectares [ha] (5 acres [ac]) in size, such as those on the NTS, are not identified or distinguishable. Furthermore, these maps do not distinguish between jurisdictional and nonjurisdictional wetlands. Apparently, because of the small size and infrequent occurrence of wet areas on the NTS, no NWI maps have been produced, and hence, identification of wetlands or approximate wetland boundaries using these maps was not done.

The Comprehensive Wetland Determination method is used to delineate jurisdictional wetlands based on the presence of field indicators for three parameters: (1) wetland hydrology (flooded or saturated), (2) hydric soils (formed in a low-oxygen environment), and (3) hydrophytic (water tolerant) vegetation. The same three parameters are also used in the Routine Wetland Determination method; however, the Comprehensive Wetland Determination method uses more precise and quantitative methods of determining canopy cover such as line-point transects for estimating the canopy cover of dominant plants and for identifying hydrophytic vegetation.

Comprehensive determinations are only to be used when the project area is very complex (especially large wetlands) or when the determination requires rigorous documentation (e.g., if litigation is anticipated, or when the presence of one parameter such as hydrology, hydric soils, or hydrophytic vegetation is disputed). This method was not deemed appropriate because the NTS EIS did not identify any proposed actions that would impact NTS wetlands (DOE, 1996a), nor were there any disputes or controversies identified associated with the NTS wetlands.

The Routine Wetland Determination method delineates jurisdictional wetlands based on the presence of the same field indicators as does the comprehensive method. However, the vegetation sampling methods are not as stringent. Ocular estimates of canopy cover of dominant species of plants can be taken to characterize and identify hydrophytic vegetation. The Routine Wetland Determination method was selected for use because it is a rapid, yet effective and accepted method to identify jurisdictional wetlands. The data collected at each site to identify the presence of hydrophytic vegetation, wetland hydrology, and hydric soils were recorded on a data form (Figure 3-1) similar to the USACE Form 1 (Environmental Laboratory, 1987).

3.2.3 Delineating Wetland Boundaries

The aerial extent of each wetland was determined by identifying the boundary between wetland and upland vegetation. This boundary was determined by comparing plant species composition of the plant community in or immediately surrounding the seep or spring with plant species composition of the upland plant community more distant from the seep or spring. Changes in vegetation, in both species presence and abundance, were generally obvious (e.g., green vegetation versus brown vegetation), and transitions between the two

Routine Jurisdictional Wetland Determination

Name:_____ Wetland Unit:_____
Location:_____ UTM Coordinates Easting: _____ Northing:_____
Date: _____

Hydrology

Type: Seep ____ Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained_____
Source: Natural ____ Man-enhanced ____ Man-made____ Ephemeral ____ Permanent____ Temporary_____
Date of construction/Period of flow: _____
Disturbance type (if any) and date: _____
Inundated: Yes_____ No_____ Depth of standing water_____ Saturated: Yes____ No____ Depth to saturation_____
Other field indicators: _____
Atypical situation: Yes _____ No _____ **Wetland hydrology: Yes ____ No___**
Basis: _____

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*	*% Cover*
Trees			
1.			
2.			
3.			
4.			
5.			
Shrubs			
1.			
2.			
3.			
4.			
5.			
Herbs			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: _____
Percentage of species that are OBL, FACW, and/or FAC: _____%; **Hydrophytic vegetation: Yes ____ No___**
Basis: _____

Hydric Soils
Field indicators: _____
Hydric Soils: Yes_____ No_____

Jurisdictional Wetland Determination : Wetland _____ Nonwetland _____

NOTES:

Figure 3-1 Form used to document field indicators for wetlands on the NTS

community types were rather abrupt (e.g., less than 1 m [3.3 ft] wide). Wetland areas were identified by the presence of plant species such as hydrophytic grasses, sedges, rushes, and shrubs that are characteristically restricted to moist habitats. Upland areas were identified by the presence of plant species characteristic of dry, arid soils. The boundaries of the wetland areas were then paced off to estimate the approximate dimensions of the wetland area.

To identify the boundaries of jurisdictional wetlands, in accordance with the Routine Wetland Delineation method, a further field analysis of plant communities within the wetland (non-upland) areas was required. The wetland area at each site was subdivided into zones. Areas with standing water, or evidence of historic standing water (e.g., presence of dried algae or waterlines), were distinguished as one zone. Transitional areas between the very wet zone and the dry uplands were divided into one or more zones based on changes in species composition. The NTS wetlands were very small, often less than 0.4 ha (1 ac), and many only a few square meters in size. Therefore, usually only one wetland vegetation zone was identified per site. Within each major zone, a sample plot (also referred to as an "observation point") of approximately 1.5 m (5 ft) radius was selected. Plot size was smaller for small wetlands having less area. Tippipah Spring and Whiterock Spring were large wetlands where a mosaic of mesic habitats occurred or where a long linear wetland habitat occurred which had different vegetation characteristics downslope from the springhead. Within such larger wetland mosaics, boundaries of wetland zones that were patchy, discontinuous, or represented a changing linear corridor were sketched on a site map showing the relative position of site features. Approximate dimensions of each distinct wetland zone were recorded. The exact location of boundaries was difficult to document in the field because of a lack of aerial photos or maps with sufficient resolution or detail to permit determining their precise spacial locations.

3.2.4 Characterizing Wetland Vegetation

At each NTS site, one representative observation point per wetland zone was selected to examine field indicators for hydrophytic vegetation. The presence of hydrophytic vegetation is one of three parameters used to define a jurisdictional wetland. Vascular plants were identified and, using an ocular estimate (a visual projection of the plant canopy to the ground surface), were assigned an absolute percent cover estimate in each vegetation layer present (i.e., tree, shrub, herb). Plants in each vegetation layer with a 10 percent or greater cover value were defined as dominant species. All plants were classified as to their wetland status. To classify them, the *National List of Plant Species That Occur in Wetlands Intermountain (Region 8)* (Reed, 1996) was used. The plant names used are according to the National Plant Database (NRCS, 1996a). This list has assigned species to one of the following classes. A suffix of "-" or "+" is often used with the following codes to indicate that the plant is found on either the lower or higher ends of the range of probabilities that define each class. An asterisk (*) following a regional indicator identifies tentative assignments based on limited information from which to determine the indicator status.

- UPL – Upland plants, occur almost exclusively in upland environments
- FACU – Facultative upland plants, occur in wetlands less than 33 percent of the time

- FAC – Facultative wetland species, occur in wetlands between 33 to 67 percent of the time
- FACW – Facultative wetland plants, occur in wetlands between 67 to 99 percent of the time
- OBL – Obligatory wetland species, occur in wetlands greater than 99 percent of the time
- NI – No indicator, or not sufficient information to classify this species at this time
- NL – Not listed in the *National List of Plant Species That Occur In Wetlands: Intermountain (Region 8)* because they occur in wetlands less than 1 percent of the time

One additional classification was assigned to some plants found at NTS study sites:

- UNKN – Unknown status because plants lacked taxonomic characteristics needed to determine the genus and species.

Those wetland zones in which greater than 50 percent of the dominant plants are classified as FAC, FACW, or OBL were considered to possess hydrophytic vegetation per the USACE guidelines (Environmental Laboratory, 1987). In situations where there were equal numbers of dominant hydrophytic and upland species (e.g., four dominant hydrophytic and four dominant upland species), an alternative method for establishing dominance, recommended in a USACE memorandum (Williams, 1992), was used. This method was presented in a 1989 interagency manual produced by the USACE, FWS, and the U.S. Department of Agriculture (USDA) and uses a comparison of the proportion of canopy cover due to hydrophytic versus upland species. If the canopy cover at a site due to hydrophytic plants is greater than 50 percent, then the site would be considered as having field indicators for hydrophytic vegetation. The presence of filamentous algae and moss, although they are not vascular plants used to define wetlands, also were recorded when observed at study sites.

To conform to USACE convention, the Latin scientific names of plants are used throughout the text of this report. The common name of each plant species is presented once in the text the first time it is discussed, and thereafter the genus and species name of each plant is used. To assist the reader, Appendix A presents a table of both the scientific and common names of all plants presented in the text or tables of this report.

3.2.5 Characterizing Wetland Hydrology

Wetland hydrology encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface for some duration during the growing season, usually about 12.5 percent of the growing season (Environmental Laboratory, 1987). At the NTS, this is about 14 to 21 days depending on elevation. The presence of natural surface water or saturated soils (i.e., not derived from human intervention or construction of such things as wells or sumps) in the late summer or fall was considered sufficient evidence of wetland hydrology at each NTS study site. Because 1996 was a rather dry year with little precipitation, most of the water at the springs and seeps was assumed to be from subsurface flows rather than from runoff. Data from past visits to these sites were also used as evidence of perennial supplies of spring water.

At each wetland site, the maximum depth of standing water was measured with a meter stick. The areal extent of standing water was estimated by pacing off the area using a known stride. Depth to saturation was recorded as zero at all sites with pools or where the surface soils were saturated. The presence of saturated soils was determined by squeezing free water from a soil sample by hand or by observing water seeping into a 46-cm- (18-in-)-deep soil pit upon excavation. Soil pits were dug at very few study sites to avoid disturbing the sites. Therefore, depth to saturation was commonly not measured in wetland zones where surface soils were dry. One exception was in a wetland zone downslope of the springhead at Whiterock Spring. Here, a meter stick was inserted into a previously installed vertical pipe and the distance to water was recorded. At those NTS sites where standing water was absent, field indicators for wetland hydrology, including water marks on rocks and the presence of dried algae and other field indicators were recorded, as described in the 1987 Manual (Environmental Laboratory, 1987) (Figure 3-1).

Spring flow rate (ℓ/min) was measured at sites where water flowed through previously installed pipes (Reitmann Seep, Topopah Spring, Tub Spring, and Whiterock Spring) or where stream flow could be directed through a hand-held pipe (Cane, Captain Jack, Cottonwood, John's Oak, and Tippipah springs, and Fortymile Canyon Tanks) and measured in a graduated beaker per unit time. Flow rate measurements were replicated three or more times, and the average rate was recorded (Figure 3-2).

At 11 NTS sites, water quality parameters that may be important to aquatic animals and wildlife were measured by a simplified, rapid technique. These parameters included water temperature, dissolved oxygen, pH, conductivity, and total dissolved solids (TDS). Hand-held probes (Corning Checkmate System, Corning Scientific Products, Inc.) were used to take measurements at a depth of 5 cm (2 in). Readings were taken from one or more microhabitats (e.g., open pools, cave pools, man-made containers) where water was at least 5 cm (2 in) deep. Water quality probes were calibrated with known standard solutions prior to use and frequently checked against these standard solutions while in the field. Automatic endpoint readings from the meter were used to determine when a particular value had stabilized. The stabilized values were recorded (Figure 3-2).

3.2.6 Characterizing Hydric Soils

A hydric soil is "A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of the hydrophytic vegetation." (Environmental Laboratory, 1987). Biologists dug one or more soil pits 46 cm (18 in) deep at 7 of the 25 NTS study sites to identify indicators of hydric soils. The presence of organic matter was noted and the general thickness and texture of soils (e.g., rocky, gravelly) was recorded (Figure 3-1). Soil mottling was visually determined to be present or absent from the soil pits and also was recorded.

A complete soil analysis as prescribed by the Routine Wetland Determination method was not completed at the majority of the NTS wetland sites. For example, soil pits were not dug at 18 of the sites with smaller wetland zones, and a Munsell Color Chart (Munsell, 1992) was not used to classify mottling of mineral deposits in the soil horizons or in any dark chroma observed. A determination was made that digging a soil pit would create too much disturbance at small sites and that complete soil analyses would be unnecessary to

NTS Wetlands Water Quality and Wildlife Monitoring Form

Location: _____ Date: _____ Time: Start _____ Finish _____

Observer(s) _____ Air Temp °C: _____ Wind: _____ Weather: _____ Cloud Cover: _____

Location notes: _____

Water Temp (°C)	Dissolved Oxygen (ppm)	pH	TDS (ppm)	Cond/(μS)
1) _____	1) _____	1) _____	1) _____	1) _____
2) _____	2) _____	2) _____	2) _____	2) _____
3) _____	3) _____	3) _____	3) _____	3) _____

Max Depth of surface water: _____ Surface area of spring: _____ Spring flow rate: _____ ℓ/min

Rel. Depth to water table: _____ Location notes: _____

Water Temp (°C)	Dissolved Oxygen (ppm)	pH	TDS (ppm)	Cond/(μS)
1) _____	1) _____	1) _____	1) _____	1) _____
2) _____	2) _____	2) _____	2) _____	2) _____
3) _____	3) _____	3) _____	3) _____	3) _____

Max depth of cave water _____ Surface area of cave pool: _____ Vegetation _____ Invertebrates _____

Filamentous algae/moss: _____

Genus species	Common Name	Total	Number Observed				Animal Sign		Condition/behavior/animal
			M	F	J	A	Track	Scat	
1									
2									
3									
4									
5									
6									

Searched riparian zone for presence of animal sign: _____. Abbreviations: M = male, F = female, J = juvenile, A = adult. Animal Sign: 1 = low abundance, 2 = moderate abundance, 3 = high abundance. Cloud cover = % visual estimates; 0-25% = low, 25=75% = moderate, 75-100% = high. Filamentous Algae: absent, minimal, abundant, or heavy growth.

Notes, UTMs, Slope, Drawings:

Figure 3-2 Form used to collect data on water quality and wildlife observations

delineate sites as jurisdictional wetlands. It is known that the USACE regards desert springs and seeps to be sites where "atypical situations" often occur in regards to the presence of hydric soil indicators (personal communication with Nancy Kang, USACE, Reno, Nevada Office, November 21, 1996). An atypical situation, as defined by the USACE, is an occasion where one or more field indicators for wetlands (i.e., hydrophytic vegetation, hydrology, hydric soils) have been sufficiently altered by natural events or by recent human activities to preclude their presence (*Section F., Atypical Situations*, in Environmental Laboratory, 1987). NTS wetlands that support hydrophytic vegetation and have surface hydrology are considered by the USACE to possess hydric soils, even though the field indicators for hydric soils are absent. Such sites would be classified by the USACE as atypical situations and would still be classified as jurisdictional wetlands.

Soils in sites that are ponded or saturated for a long duration (seven days to one month) or a very long duration (>one month) during the growing season (NRCS, 1996b) are also defined as hydric soils according to the 1987 Manual. The growing season is defined in the 1987 Manual as the portion of the year when soil temperatures at 50 cm (19.7 in) below the soil surface are higher than biologic zero (5 degrees Celsius [°C] [41° Fahrenheit [F]) (for ease of determination, this period is usually approximated by the number of frost-free days). Because there had been only trace amounts of precipitation at the NTS prior to and during the fall of 1996, the presence of saturated soils or the presence of surface water, together with the presence of filamentous algae (which requires several weeks to grow), was interpreted as evidence to support the conclusion that the water must have persisted at least seven days and perhaps for several weeks or months. This water would have been present during a frost-free period (i.e., the growing season) and would therefore meet the criteria used to verify the presence of hydric soils.

3.2.7 Delineating Jurisdictional Wetlands

After field data about field indicators were collected, a determination was made as to which area(s) within each site would be considered jurisdictional wetlands regulated by the USACE. Wetland plant community zones that were dominated by hydrophytic vegetation, hydric soils, and that had wetland hydrology were considered jurisdictional wetlands. Because of the small size of the jurisdictional wetlands on the NTS, it was not always possible to accurately depict boundaries on site sketches or aerial photographs (i.e., identifying 1 m [3.3 ft] boundaries on photos or maps that are only accurate to 10 m [32.8 ft]) or through narrative descriptions. The original intent of the wetland surveys was merely to identify NTS wetlands that had jurisdictional wetland areas that would require future field work to precisely identify boundaries. It is anticipated that if future development plans require disturbance of wetlands with areas considered jurisdictional, then the exact boundaries of the jurisdictional and nonjurisdictional areas would be surveyed and appropriate scale maps produced.

All boundaries of jurisdictional wetlands within this report should be considered approximate and managers directing future development activities within or near these areas should recognize that additional field work will be required to accurately identify jurisdictional boundaries. The size of these areas, and associated boundaries, probably

fluctuate over time along with the amount of groundwater surfacing at each site. Because detailed aerial photos or surveys were not available, the relative location of areas (plant communities) that are considered jurisdictional wetlands is communicated through site sketches or narrative descriptions. The USACE usually conducts a site visit to verify field boundaries and site conditions, and locating jurisdictional boundaries may be adjusted by the USACE at the time of the site visit.

3.2.8 Describing Historical Use

Sites with prior historical use or natural events that obscure positive wetland field indicators require additional field techniques for delineating wetland boundaries. These altered sites are referred to as "atypical situations." Unique delineation procedures for these atypical situations are described in the 1987 Manual. These procedures attempt to determine site conditions prior to alteration by observing field evidence remaining at the site. Historical use at each potential wetland site was reviewed in the field and in the literature to determine if human alteration of a site occurred. Such alterations might include the removal of soils while attempting to improve water sources or while constructing stream channels. Each site was also evaluated to determine if natural events such as floods, fires, or landslides may have altered site conditions. Evidence of atypical situations, when found, is presented in the appropriate subsections of Section 4.2, "Site Description and Historical Use."

3.2.9 Characterizing Wildlife Use

Biologists recorded all sightings of animals, presence of tracks, and scat observed at each wetland site. On approach to a site, biologists first observed and counted any fleeing animals. Biologists then walked the complete perimeter of the vegetated wetland zones to locate any tracks and scat. Tracks and scat were identified with the aid of Murie (1974). The spring pools were also inspected for the presence of selected aquatic invertebrate groups (e.g., snails, ostracods, copepods). After vegetation, hydrology, soils, wildlife signs, and aquatic animal data were collected, a stationary observation point was chosen where birds, attracted to the wetland site, were observed and counted for a period of 30 minutes. All animal use data from these 1996 and 1997 surveys were recorded (Figure 3-2), compiled, and added to an existing historical database of similar data collected at NTS springs and seeps from 1988 to 1994.

The common names of animals are used throughout this report. The Latin genus and species name for each animal is presented only once in the text the first time the animal is mentioned. Appendix D presents a table which includes both the common and scientific names of all animals mentioned in this report.

3.2.10 Photographing Wetlands

An historical database of over 550 photographs taken on and near the NTS wetland sites between 1960 and 1996 was searched. Recent photographs which best showed the boundary of the wetlands and the characteristic vegetation and hydrology of each site were retrieved and compared with historical photographs dating to 1960. These comparisons were made to identify any trends in wetland attributes over time. Where needed,

biologists took 35-mm photographs during these 1996 surveys to show the current conditions and specific microhabitats of NTS wetlands.

3.2.11 Creating a Wetlands Geospatial Database

ArcView GIS™ 3.0 software was used to organize information about NTS wetlands into a geospatial database. This database is part of a larger geospatial database developed by BN called the Ecosystem Geographic Information System (EGIS). EGIS operates on a Pentium®-based (166 MHZ, 32 Mb RAM) IBM PC-compatible computer. EGIS was structured to access and display spatial information about NTS ecosystem resources and features such as UTM coordinates of site locations, topographic data, roads, NTS site boundaries, tabular site data, text files, digital photographs, other images (e.g., aerial digital photographs and satellite images), and biological data. Topographic data for the wetlands geospatial database were created from USGS Digital Elevation Model data sets. Road and site boundary data were created from NTS site facilities datasets. Wetland photographs (10 × 15 cm [4 × 6 in]) were scanned at a file size ranging from 300 bytes to 3 megabytes and stored as digital image files in a tagged image file format (TIFF) format. Several GIS project files were created for the wetlands geospatial database and stored in computer files at BN's North Las Vegas Facility. Layouts (figures) were developed for each wetland site and printed on an Epson Stylus Pro XL™ printer.

4.0 RESULTS

4.1 Previous Studies

The hydrologic conditions of the NTS have been studied extensively and have probably received more scientific scrutiny than any other area in Nevada. DOE/NV has funded studies of surface water and groundwater in order to best predict the impact of their missions on these resources and to develop project siting and operating criteria which will protect these resources. Some of these investigations have examined springs on and near the NTS and have provided some information on the physical hydrology, recharge and discharge rates, hydrochemistry, water quality, historical use, plant communities, and wildlife usage of NTS springs.

4.1.1 Hydrology

NTS springs are generally located in volcanic lavas and tuff formations of Miocene age (Table 2-1). Water flow derives from perched water tables in these formations (Moore, 1961; Ingraham *et al.*, 1990). NTS springs are not believed to be restricted to any single lithologic unit (Clebsch, 1960), suggesting that they are fed by several different perched zones of saturation throughout the NTS. The area of any one perched aquifer may be only as large as a few square miles (Clebsch, 1960). Springs from perched water are characterized by highly variable discharge and by variable temperature, usually less than 21 °C (70 °F) (Winograd and Thordarson, 1975). No springs on the NTS emerge from the valley-fill or the lower-carbonate aquifers found on the floor of valleys in the region, such as Big Spring in Ash Meadows. That type of spring, in contrast to perched groundwater springs, represents discharge points of a regional zone of saturation and are characterized by high and uniform discharge and uniform temperatures, generally from 24 °C to 35 °C (75 °F to 95 °F) (Winograd and Thordarson, 1975).

Discharges from springs, seeps, and aquifers in the region range from less than one to several thousands of gallons per minute (DOE, 1996a). Recorded flow rates from springs and seeps at NTS are all very low, generally less than 10 ℓ/min (2.6 gal/min) (Ball, 1907; Moore, 1961; Thordarson and Robinson, 1971; DOE, 1988; Lyles *et al.*, 1990; Ingraham *et al.*, 1991). Moore (1961) reported estimates of discharge rates for eight springs on the NTS taken from 1958 to 1960. The highest discharge rates were observed at Cane Spring (7.6-11.4 ℓ/min [2-3 gal/min]) and Whiterock Spring (3.8-7.6 ℓ/min [1-2 gal/min]). The other six NTS springs (Captain Jack, Oak, Rainier, Tippipah, Topopah, and Tub) have recorded maximum discharge rates less than 1.7 ℓ/min (0.4 gal/min) (Moore, 1961; Lyles *et al.*, 1990).

Cane and Whiterock springs are two of the most studied springs, and the variation in their flow rates over time has been examined. Between 1981 and 1988, discharges varied from 1.1 to 6.0 ℓ/min (0.3 to 1.5 gal/min) at Cane Spring and from 0.5 to 4.4 ℓ/min (0.1 to 1.2 gal/min) at Whiterock Spring (Ingraham *et al.*, 1991; Lyles *et al.*, 1990). Such changes in discharge rates are most likely affected by changes in the volume of local precipitation. Recharge of the perched water tables that feed NTS springs occurs by infiltration of rain or snowmelt through unsaturated, fractured rock. Two mechanisms of infiltration are

thought to affect spring discharges: slow infiltration to the perched water table through unsaturated rock, and rapid infiltration through the rock fractures. During periods of moderate precipitation, water infiltrates slowly through the pores of the rock resulting in longer residence time of the recharging water and in reduced fluctuations in spring discharge rates. During large precipitation events, water infiltrates rapidly, primarily by fracture flow, allowing the water a short-circuit path to the springs. This mechanism of recharge and discharge is thought to explain observed increases in discharge at Cane Spring and Whiterock Spring within two to three months after heavy rains (Ingraham *et al.*, 1991). Thordarson (1965) has also documented increased infiltration and discharge at Whiterock Spring after heavy rains. Through oxygen isotopic analyses of rainwater and discharge water from Cane and Whiterock springs, Ingraham *et al.* (1991) concluded that both summer and winter precipitation are responsible for recharging the perched groundwater. Ingraham *et al.* (1991) determined the residence time of groundwater at Cane Spring to be approximately 600 years. Lyles *et al.* (1990) suggested a mean residence time of about 30 years for groundwater at Whiterock Spring. Long-term trends (over several decades) in discharge rates of NTS springs and seeps have not been studied.

4.1.2 Water Quality

To understand the regional movement of groundwater, numerous chemical analyses have been conducted at selected springs on or near the NTS by Schoff and Moore (1964), Taylor and Giles (1979), Winograd and Thordarson (1975), and Lyles *et al.* (1990). Various kinds of water quality data also have been collected at selected springs on the NTS. Moore (1961) recorded water temperature, pH, selected cations and anions, conductivity, alkalinity, and dissolved solids at eight springs. As part of a study of algae, Taylor and Giles (1979) measured various water quality data including pH, water temperature, total alkalinity, total phosphorus, ammonia, and nitrate nitrogen at eight NTS springs. Lyles *et al.* (1990) recorded water temperature, electrical conductivity, pH, selected cations, and anions at Cane Spring and Whiterock Spring to examine how precipitation events influence temporal water chemistry of springs. Romney and Greger (1992) measured selected cations and 20 mineral elements in spring water from ten sites on the NTS. Stetzenbach (1995) also measured selected anions, cations, and 73 trace metals at three NTS springs.

Moore (1961) measured radioactivity at eight springs on the NTS. Beginning in 1965, DOE began long-term monitoring of radioactivity in four to eight springs on the NTS (Lewis *et al.*, 1965). This monitoring still occurs annually (Davis *et al.*, 1996). Taylor and Giles (1979) measured the uptake of tritium and gamma-emitting radionuclides by algae in eight NTS springs. All of these investigations have reported negligible levels of radioactivity, commensurate with natural background levels or indicative of regional and global fallout as a result of historic aboveground nuclear testing.

4.1.3 Vegetation

No systematic inventory of vascular or aquatic plants has been conducted at springs on the NTS. Past botanical surveys have been conducted at only a few of the known springs. They provide lists of species present at or near springs, but the location of hydrophytic

versus upland plants, relative to the spring source or standing water, has not been clearly documented. The most thorough listing of plants can be found for Cane Spring. Drouet (1960) and Shields and Drouet (1962) recorded 16 aquatic species of algae at Cane Spring. Taylor and Giles (1979) also conducted an algae survey at Cane Spring and at seven other NTS springs. Fifty-two individual species were documented, of which 29 were found at only a single spring. Allred *et al.* (1963) surveyed four NTS springs (Cane, Tippipah, Topopah, and Whiterock) and listed 33 species of vascular plants located at or near these springs. Beatley (1976) lists 35 species of plants occurring at or near six springs on the NTS.

4.1.4 Wildlife Use

The most thorough surveys of selected NTS springs to record the presence of both invertebrates and vertebrates were conducted in the 1960s by researchers from Brigham Young University (Allred *et al.*, 1963; Jorgensen and Hayward, 1965). Of the four springs surveyed, Cane Spring was studied most extensively. Allred *et al.* (1963) recorded 5 species of lizards, 5 species of mammals, 18 species of insects, and 70 species of birds at Cane Spring. Hayward *et al.* (1963) reported 35 species of birds from Cane Spring and only 7, 2, and 3 species of birds from Tippipah, Topopah, and Whiterock springs, respectively. Castetter and Hill (1979 and unpublished field notes) reported 45 species of birds observed at Cane Spring from 1975 to 1977.

Giles (1976) examined eight NTS springs to assess the potential costs of improving the availability of water for wildlife at the springs and provided some anecdotal comments on wildlife use at springs. Most wildlife species which were noted as using the sites included mule deer (*Odocoileus hemionus*), mourning doves (*Zenaida macroura*), black-tailed jackrabbits (*Lepus californicus*), coyotes (*Canis latrans*), and mountain lions (*Felix concolor*). In 1987, researchers from the University of California at Los Angeles were funded by DOE and began to collect wildlife use data from nine springs on the NTS. A total of 46 vertebrate species, including reptiles, birds, and mammals were observed across all nine springs (Romney and Greger, 1992; Greger and Romney, 1994a,b). An undescribed species of aquatic snail was observed at Cane Spring during these wildlife use surveys (Greger and Romney, 1994a).

4.1.5 Historical Use

Worman (1969) has provided the most extensive historical account of human activities around the NTS springs. Seven springs that occur east and north of the Yucca Mountain area have been identified as important Native American sites (Stoffle *et al.*, 1990a,b; Henton and Pippin, 1988). Also, ethnobotanical studies have been conducted on the NTS which document how Native Americans in the region used numerous wetland plant species (Stoffle *et al.*, 1989). From the available literature, it is known that over 15 NTS springs, seeps, and tanks were used by either miners, homesteaders, or Native Americans. Of these, over 11 springs have been modified in an attempt to increase or contain water flow. The site-specific information on the historical usage of each NTS natural water source, obtained from these citations, is presented in the following descriptions of each study site.

4.2 Description of Study Sites

This section includes a description of all 25 NTS study sites, including all known springs, seeps, tanks, and natural ponds. The sites are presented in alphabetical order. The data collected at each site are presented so as to clearly describe the presence or absence of field indicators which determine the jurisdictional status of wetlands to facilitate USACE's use of this document as reference material if needed in the future for permitting purposes.

4.2.1 Ammonia Tanks

4.2.1.1 *Site Description and Historical Use*

The Ammonia Tanks are located in a side canyon at the lower end of Stockade Wash, approximately 1 km (0.6 mi) north of Airport Road (Figure 4-1) and 3 km (1.9 mi) west of Pahute Mesa Road in Area 18. The site consists of two large natural rock basins (tanks) located below bedrock areas that collect surface runoff and several smaller tanks along a wash channel that drains from these basins. These tanks retain water for a limited time during the year. The Ammonia Tanks site was used by Native Americans from before the 1820s until about 1950. A fall festival (possibly to harvest wild grains, pinyon nuts, and conduct rabbit drives) was held at the Ammonia Tanks and drew people from Oasis Valley and other areas (Stoffle *et al.*, 1990a). Euroamericans used the tanks around 1900. Man-made rock walls have been added to a large fire-blackened rock shelter near the tanks. The rock walls narrow the entrance of the shelter and form a door opening. Numerous inscriptions occur on the rock wall near the upper tank (Photo 4-1). Some inscriptions of names date to 1904. Old tin cans litter the area around the rock shelter. There appears to be little evidence, however, of human manipulation of the water source.

4.2.1.2 *Hydrophytic Vegetation*

A routine wetlands survey was conducted at this site on January 7, 1997. Baltic rush (*Juncus balticus*) was the only wetland species observed at the observation point at the pool of the upper tank and comprised about 8 percent of the cover (Table 4-1). Louisiana sagewort (*Artemisia ludoviciana*) was the dominant plant species growing at the water source and comprised about 30 percent of the absolute cover. Basin wildrye (*Leymus cinereus*) and brittlebush (*Encelia* sp.) also occurred in lesser amounts near the water tank, 5 percent and 2 percent, respectively. The total vegetated area near the two largest tanks was estimated to be about 12 m^2 (108 ft^2). Other plants in the surrounding upland area included big sagebrush (*Artemisia tridentata*), redstem stork's bill (*Erodium cicutarium*), mormon tea (*Ephedra viridis*), cheatgrass (*Bromus tectorum*), green rabbitbrush (*Chrysothamnus viscidifloris*), flax (*Linum* sp.), and antelope bitterbrush (*Purshia tridentata*). The lower tank had very little vegetation with no hydrophytic species of plants.

4.2.1.3 *Hydrology*

The site consists of two large tanks and several smaller tanks that vary in size. Two of the largest tanks were each approximately 3 m by 5 m (9.8 ft by 16.4 ft) ft) and had estimated depths of 100 cm (39 in) (Photo 4-2). The tanks fill with water primarily from

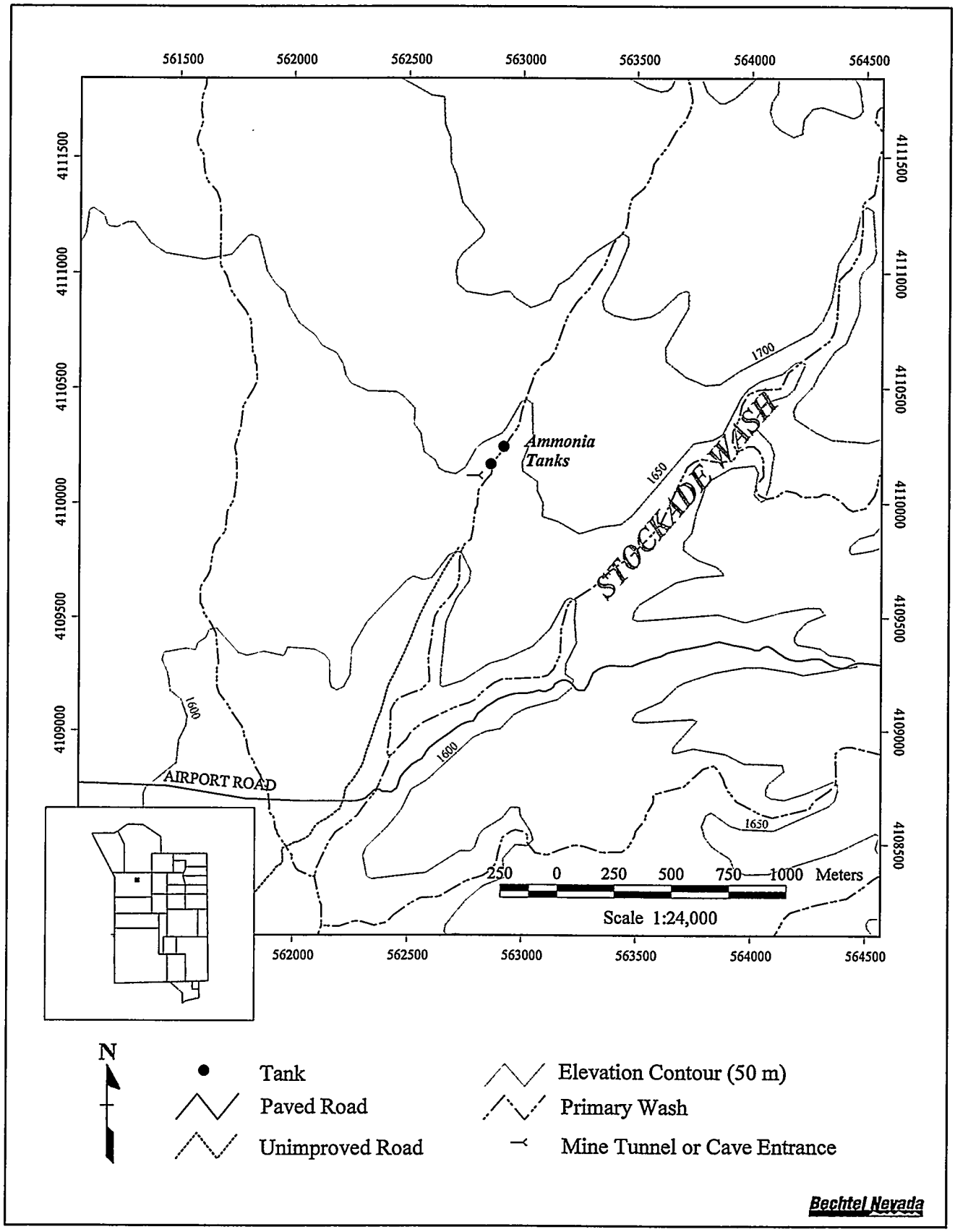

Figure 4-1 **Location of Ammonia Tanks**

Photo 4-1. Upland vegetation around the upper tank at Ammonia Tanks on January 7, 1997.
(WS346-16.TIF)

Photo 4-2. Lower tank at Ammonia Tanks looking northeast on January 7, 1997.
(WS346-18.TIF)

Table 4-1 Ammonia Tanks wetland vegetation as surveyed on January 7, 1997

Habitat: Wash Pool

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Artemisia ludoviciana	Louisiana sagewort	FACU	30
Encelia sp.	unidentified brittlebush	UNKN	2
Juncus balticus	Baltic rush	FACW	8
Leymus cinereus	basin wildrye	FACU	5

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 0 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

surface flow. They are located in a narrow, rocky wash with moderate amounts of exposed bedrock upstream. No surface flow from the tanks was observed. No water quality measurements were taken.

4.2.1.4 *Hydric Soils*

Field indicators of hydric soils were restricted to small accumulations of soil fines located downslope of the tank above bedrock where soil appeared to be saturated for at least seven days during the growing season, indicating the presence of hydric soils.

4.2.1.5 *Determination of Jurisdictional Status*

Because of a lack of hydrophytic vegetation at Ammonia Tanks, this site would probably not be considered a jurisdictional wetland.

4.2.1.6 *Wildlife Use*

Little is known of wildlife use of the area; however, deer and coyote scat and tracks were observed near the water source, suggesting use by these species.

4.2.2 Cane Spring

4.2.2.1 *Site Description and Historical Use*

Cane Spring is located at the northeast end of Skull Mountain near the junction of Cane Spring Road and Area 27 Road, south of Cane Spring Wash (Figure 4-2). The Cane Spring site (Photo 4-3) has a moderate slope (30 percent) with a north-facing aspect. Native Americans occupied the site and cultivated corn and squash (Stoffle *et al.*, 1990a). Present historical structures on site include an old rock and wood house with a corral built to hold relay horses for a freight line that ran from Utah to southern Nevada prior to 1900 (Worman, 1969). A tunnel was excavated into the spring, apparently by ranchers or miners, to improve the flow of water, forming a horizontal shaft (an adit) and cave pool (Photo 4-4). The adit is about 3 m (9.8 ft) wide, more than 1 m (3.3 ft) in diameter, and of undetermined length into the hillside. Water from this site was hauled to the mining camp (tent town) of Wahmonie in 1928. A local gravesite near the spring dates to 1922. Livestock and some feral horses occupied the area until at least 1976 (Giles, 1976) and probably grazed heavily on wetland vegetation.

Water from the cave pool flows through a drainage channel about 30 m (98 ft) north to a man-made reservoir (Figure 4-2). This reservoir is known to fill with water during wet years (Photo 4-5), but was dry during site visits in 1996 (Photo 4-6). The reservoir was apparently created by early ranchers who constructed an earthen berm across the drainage channel. The berm also functions as a road. Spring water also flows intermittently from a seep adjacent to a large Goodding's willow (*Salix gooddingii*) tree inside a fenced area to the east of the cave pool (Figure 4-2). This area was fenced by DOE in the early 1970s to protect largeflower suncup (Cane Spring evening primrose) (*Camissonia megalantha*) from grazing by feral horses (this plant was believed to be locally rare and threatened on the NTS [Rhoads and Williams, 1977]). Water flows from this seep through another drainage channel into the reservoir (Figure 4-2). A wooden flow gauge box has been installed about 20 m (66 ft) downslope from the cave pool (Figure 4-2) and is fed water through a PVC (polyvinyl chloride) pipe. An existing bladed road into the Cane Spring site was barricaded by DOE some time in the 1970s to protect this historical site from future human disturbance.

4.2.2.2 *Hydrophytic Vegetation*

A mosaic of small wetland habitats comprise the Cane Spring site as shown in Figure 4-2. Wetland plant species observed at the site include Baltic rush, rabbitsfoot grass (*Polypogon monspeliensis*), Goodding's willow, and saltcedar (*Tamarix ramosissma*). On a hill slope above the pool (Photo 4-3), a small 70-m^2 (753-ft^2) delta, with an accumulation of over 2 m (6.6 ft) of fines, supports a mixture of Baltic rush and basin wildrye. A small stand (25 m^2 [269 ft^2]) of southern cattail (*Typha domingensis*) stalks occurs below the flow gauge box. Four to five large (5 to 15 m [16.4 to 49.2 ft] tall) Goodding's willow trees on the site offer significant cover to wildlife. Southern cattails were recorded growing in the seep under these willows in September of 1996. Common upland plant species growing in the area include fourwing saltbush (*Atriplex canescens*), foxtail brome (*Bromus rubens*), cheatgrass, rubber rabbitbrush (*Ericameria [Chrysothamnus] nauseosa*), and blackbrush (*Coleogyne ramosissima.* Largeflower suncup (Cane Spring evening primrose) was first described from Cane Spring (Beatley, 1976). Two additional wetland

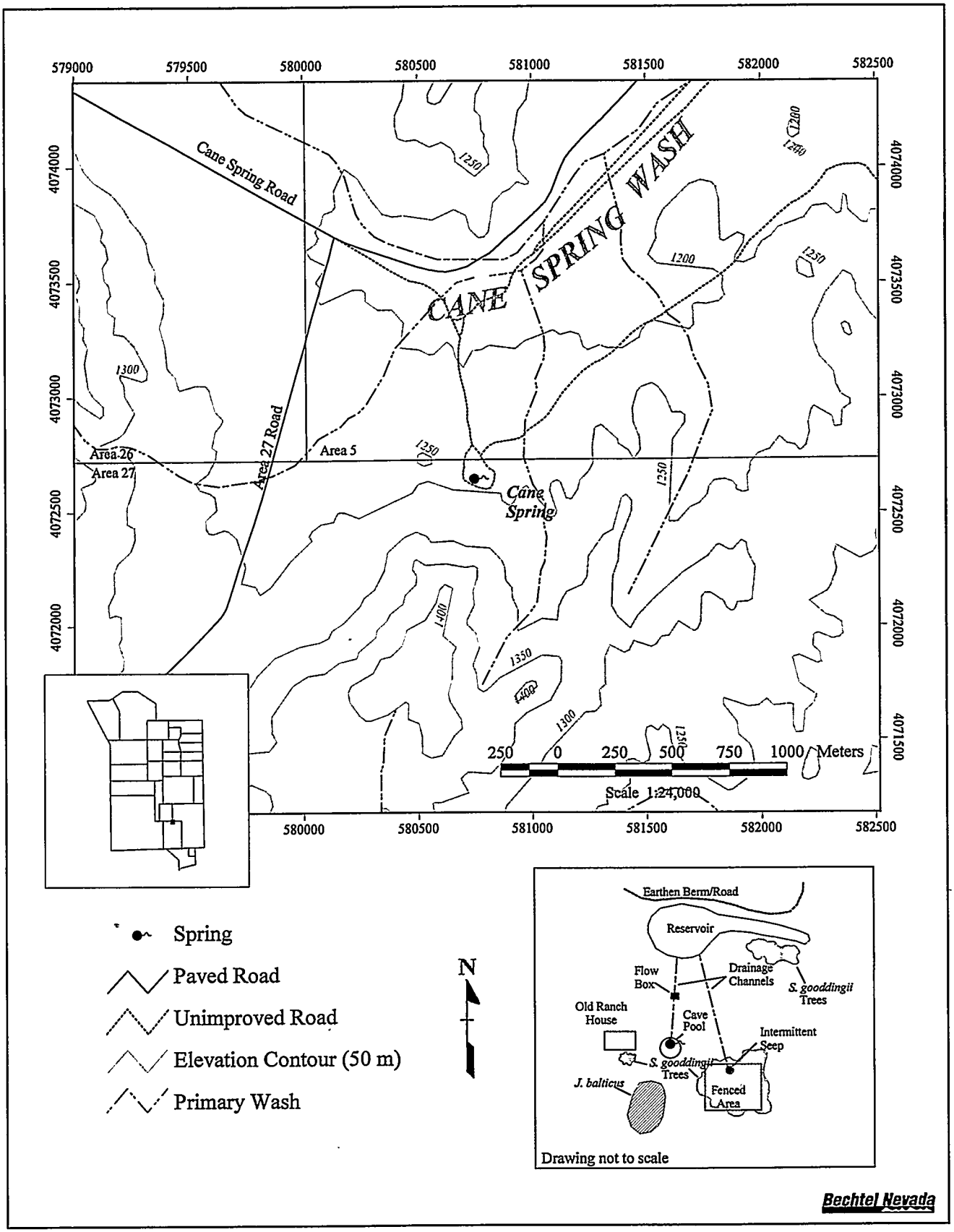

Figure 4-2 **Location and sketch of Cane Spring**

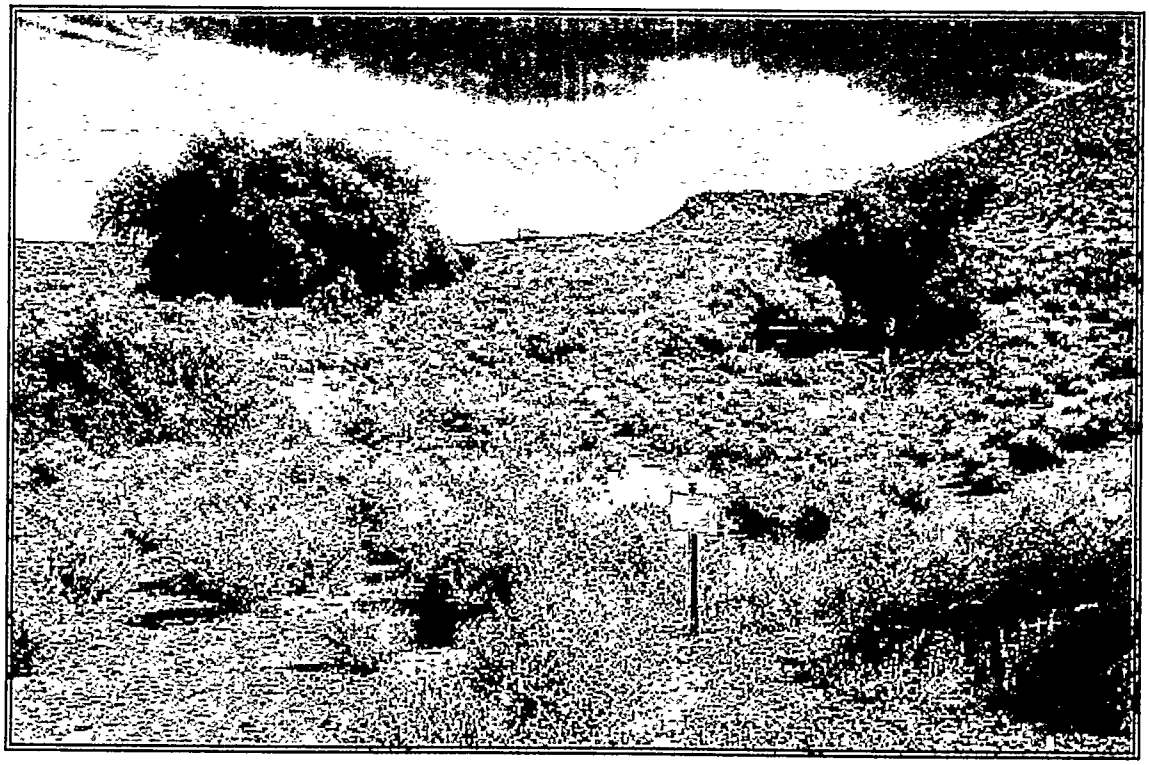

Photo 4-3. Cane Spring area, looking southeast on June 19, 1996. (WS339-08.TIF)

Photo 4-4. Cave pool and outflow at Cane Spring on June 19, 1996. (WS344-19.TIF)

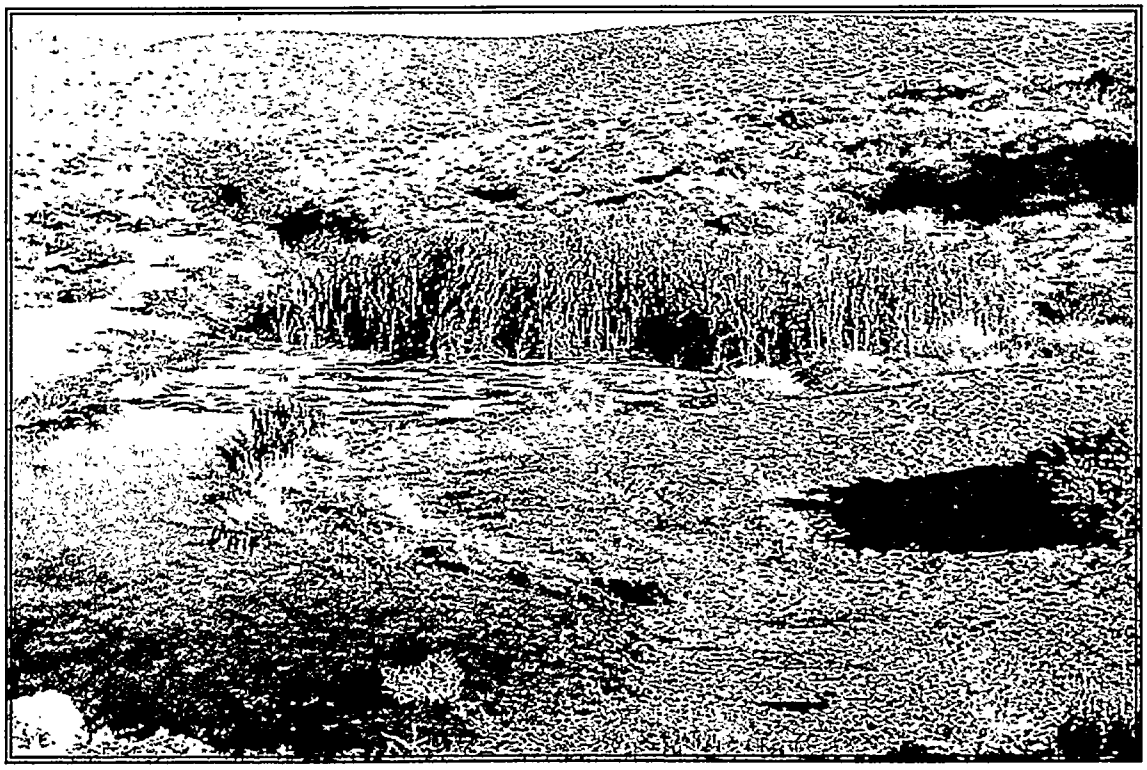

Photo 4-5. Reservoir at Cane Spring, looking east in 1963 (Allred et al., 1963). (WS500-01.TIF)

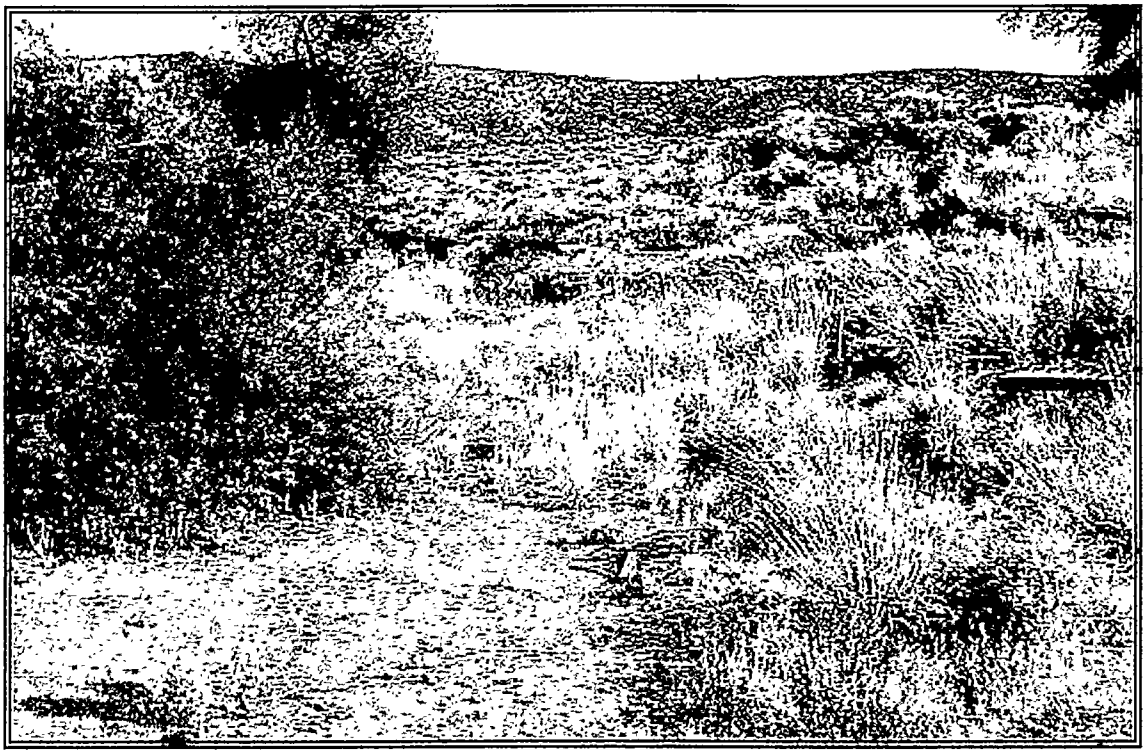

Photo 4-6. Dry reservoir at Cane Spring, looking east on November 14, 1996. (WS501-01.TIF)

species were reported to occur at Cane Spring in 1988 that were not observed during the 1996 field survey: common reed (*Phragmites australis*) and western honey mesquite (*Prosopis glandulosa*) (Stoffle *et al.*, 1989). Beatley (1976) stated that three small western honey mesquite trees were apparently planted at Cane Spring and that they were not known to flower.

A wetland plant survey was conducted in the drainage channel 5 m (16.4 ft) directly down slope from the cave pool on June 19, 1996. In this area, approximately 33 percent of the dominant plants observed were hydrophytic, a value too low for the area downslope from the cave pool to be considered a jurisdictional wetland (Table 4-2). The seep site, however, had a dominance of hydrophytic plants (>51 percent) when surveyed in September 1996 (Table 4-3). These hydrophytic plants included Baltic rush, southern cattail, and Goodding's willow which were growing in saturated soils. This area of about 230 m^2 (2,475 ft^2) (Table 5-1, Section 5.0) has field indicators positive for hydrophytic vegetation.

Table 4-2 Cane Spring wetland vegetation as surveyed on June 19, 1996

Habitat: Drainage Channel Below Cave Pool

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Atriplex canescens	fourwing saltbush	UPL	**15**
Herb Layer:			
Leymus cinereus	basin wildrye	FACU	**40**
Rumex salicifolius	willow dock	FACW*	**15**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 33 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

Table 4-3 Cane Spring wetland vegetation as surveyed on September 9, 1996

Habitat: Seep Under Willow Trees

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
Salix gooddingii	Goodding's willow	FACW	**90**
Shrub Layer:			
no species			

Habitat: Seep Under Willow Trees

Species	Common Name	Indicator Status[a]	Absolute % Cover
Herb Layer:			
Juncus balticus	Baltic rush	FACW	**30**
Leymus cinereus	basin wildrye	FACU	**40**
Typha domingensis	southern cattail	OBL	**15**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 75 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

4.2.2.3 *Wetland Hydrology and Water Quality*

Areas observed to have field indicators of wetland hydrology included the cave pool and the seep area inside the fence to the east of the cave pool. The amount of surface water increased visibly from June to November 1996 due to precipitation. On June 19, 1996, surface water was observed only in the cave pool and in the flow gauge box. On September 9, 1996, surface water was seeping through the earthen dam forming saturated soils below the cave pool and was also flowing from the seep within the fenced area under the Goodding's willow tree, forming a 4-m^2 (43-ft^2) inundated area. On November 14, 1996, water was flowing over the cave dam and had inundated a small area 1 to 2 m^2 (11 to 21 ft^2) and 10 to 15 cm (4 to 6 in) deep just below the cave dam in the main drainage channel.

The flow rates of surface water at Cane Spring also increased from June to November. During June, no flow was observed into the flow gauge box from the cave pool via an existing PVC pipe. In September, the flow rate into the box was 0.015 ℓ/min (0.004 gal/min). In November, water was flowing over the cave dam at a measured rate of 3 ℓ/min (0.8 gal/min). The flow rate of water into the flow gauge box was not noticeably greater, however, than in September, but it was not measured.

The depth of water in the cave pool also increased from June to November. The cave pool is about 2 m (6.6 ft) inside the cave opening. On June 6, 1996, water depth of the pool was about 60 cm (24 in). In September, the water level rose about 10 cm (4 in), but had not overflowed the cave dam. In November, the water depth measured was greater than 1 m (3 ft), and its maximum depth was visually estimated to be 2 m (6 ft). Water quality data were taken at the cave pool and the flow box in June, September, and November 1996. These water quality data are presented in Table 5-2 (Section 5.0).

4.2.2.4 *Hydric Soils*

Several field indicators of hydric soils were found at the cave pool and the seep area inside the fence and included dark (low-chroma) organic profiles, mottling, and evidence

of saturated soils. Soil, eroding by sheet erosion from slopes adjacent to the site, appears to have collected or been trapped by the dense vegetation of sedges and grasses growing at the seep. This has resulted in the accumulation of soil fines to a moderate depth of 2 to 3 m (6.6 to 9.8 ft) (based on comparisons with adjacent topographic contours) which has apparently accumulated over hundreds or perhaps thousands of years. The strongest evidence of hydric soils is the occurrence of soils that appear to have been saturated or inundated for greater than seven days during the plant growing season (see Section 3.2.6).

4.2.2.5 *Determination of Jurisdictional Status*

Portions of the Cane Spring site may qualify as jurisdictional wetlands because they have field indicators for all three required parameters: hydrophytic vegetation, wetland hydrology, and hydric soils. The seep area within the fenced area which supports Goodding's willow, Baltic rush, and southern cattail qualifies as a jurisdictional wetland. While the area directly downslope from the cave pool did not have a dominance of hydrophytic vegetation during the surveys, it is likely that during wetter periods of time, this area would also have more hydrophytic species and would probably be considered a jurisdictional wetland. The size of these two areas fluctuates with seepage and will vary over time. The cave pool was unvegetated and therefore did not meet the criteria of a jurisdictional wetland. However, the pool may be considered by the USACE to be waters of the United States protected under the CWA.

4.2.2.6 *Wildlife Use*

The area is used heavily for drinking and resting sites by numerous migrating birds including passerines (perching song birds), mourning doves, and resident species such as chukar (*Alectoris chukar*) and Gambel's quail (*Callipepla gambelii*) (Table 5-4, Section 5.0). The large Goodding's willow trees provide nesting sites for common ravens (*Corvus corax*) and long-eared owls (*Asio otus*). Bobcats (*Lynx rufus*), coyotes, mountain lions, and mule deer are some common mammals that use the area. Mule deer tracks at the cave pool entrance indicate the opening is large enough for this species to access the pool.

An undescribed species of hydrobiid snail (*Pyrgulopsis* sp.) occurs at Cane Spring. From June through November 1996, the snail was found on several algal mats in the cave pool nearest the tunnel entrance. Previous field records show that the snail occurred in the east channel (Paul Greger, unpublished data, 1988) and was collected from the wooden flow gauge box in 1992. The east channel was dry and had no snails in June 1996. Other invertebrates including both ostracods and copepods occur at this spring.

4.2.3 Captain Jack Spring

4.2.3.1 *Site Description and Historical Use*

Captain Jack Spring (Figure 4-3) occurs in a rocky, remote area at the northeastern end of the Eleana Range on steep slopes with a southeast-facing aspect. Native American cultural sites, including two rock shelters and various other artifacts, are located at short distances from the spring (Worman, 1969). The area was occupied and named after an early Native American explorer who carried mail from Utah to the Groom Mine (Worman, 1969). Livestock was kept in the area as evidenced by the presence of an old corral. Remnants of old livestock watering tanks and old pipes occur about 30 m (98 ft)

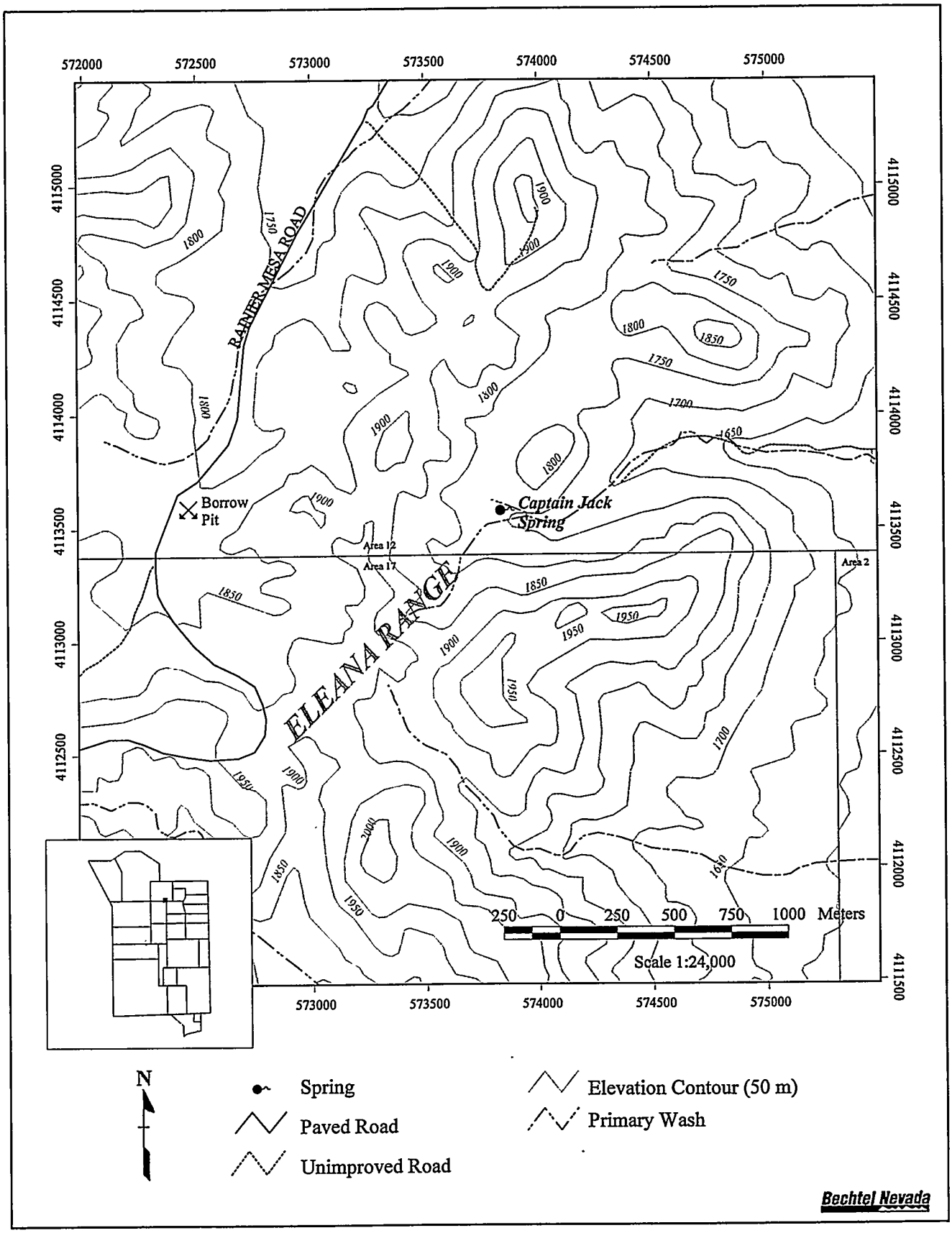

Figure 4-3 Location of Captain Jack Spring

below the spring pool. The old pipes (not functional) apparently fed water to the tanks for livestock. After flood damage, new pipes were installed and a new watering tank was bolted to the bedrock (Smith *et al.*, 1979).

Water flows from the base of a narrow rocky box canyon which is about 5 m (16.4 ft) wide by 15 m (49.2 ft) long. The water forms a pool 61 × 76 cm (24 × 30 in) which is about 20 cm (8 in) deep (Photo 4-7). This pool drains downslope through a channel. This small stream of water was about 30 m (131 ft) long and 20 cm (8 in) wide. The drainage channel is at times thickly vegetated with aquatic plants (Photo 4-8). A small herd of about 20 feral horses occupies the area (Photo 4-9) (Greger and Romney, 1994b). Use of the spring by horses varies with the season, and heavy grazing and trampling by horses results in seasonal reductions in the absolute cover of wetland vegetation at the site (Photo 4-10).

4.2.3.2 *Hydrophytic Vegetation*

Captain Jack Spring occurs in typical pinyon-juniper habitat where localized patches of Gambel's oak (*Quercus gambelii*) are common around the base of rocky ledges. Upland species include Louisiana sagewort, big sagebrush, foxtail brome, cheatgrass, mormon tea, eastern Mojave buckwheat (*Eriogonum fasciculatum*), Utah juniper (*Juniperus osteosperma*), basin wildrye, singleleaf pinyon (*Pinus monophyla*), and bluegrasses (*Poa* spp.). Wetland plant species in the area around the spring and within the drainage channel include seep monkeyflower (*Mimulus guttatus*), biennial cinquefoil (*Potentilla biennis*), willow dock (*Rumex salicifolius*), water speedwell (*Veronica anagallis-aquatica*), and bridge penstemon (*Penstemon rostriflorus*).

On June 19, 1996, the spring drainage channel was nearly denuded of aquatic vegetation for most of its length coincident with heavy horse usage. On September 19, 1996, vegetation had regrown and there was extensive growth of aquatic vegetation throughout the total length of the drainage channel and the pool. This vegetated area was approximately 30 m^2 (323 ft^2) (Photo 4-8). A wetland vegetation survey was conducted in the drainage channel of Captain Jack Spring about 25 m (82 ft) downslope of the spring pool. Results showed that 100 percent of the dominant species observed were hydrophytic plants indicating that field indicators for hydrophytic vegetation are present at Captain Jack Spring (Table 4-4).

4.2.3.3 *Wetland Hydrology and Water Quality*

Areas observed to have field indicators of wetland hydrology included the spring pool and the drainage channel below the pool. Water flow rate was approximately 0.9 ℓ/min (0.2 gal/min) on September 10, 1996 (Table 5-1, Section 5.0). The total inundated area at Captain Jack Spring was about 7 m^2 (75 ft^2) during September 1996. The spring pool is less than 0.5 m^2 (4.9 ft^2) in surface area and contains an estimated volume of about 70 L (18.5 gal). Surface water and saturated soils were present at Captain Jack Spring on both visits during June and September 1996. Water quality data were taken during both visits and are presented in Table 5-2 (Section 5.0).

Photo 4-7. Pool at Captain Jack Spring on September 10, 1996. (WS340-19.TIF)

Photo 4-8. Vegetation along spring outflow at Captain Jack Spring on September 10, 1996. (WS340-18.TIF)

Photo 4-9. Horses at Captain Jack Spring on June 1989. (WS112-16.TIF)

Photo 4-10. Horse damage at Captain Jack Spring on November 21, 1988. (WS104-04.TIF)

Table 4-4 Captain Jack Spring wetland vegetation as surveyed on June 19, 1996

Habitat: Drainage Channel Below Pool

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Mimulus guttatus	seep monkeyflower	OBL	**10**
Potentilla biennis	biennial cinquefoil	FAC	5
Rumex salicifolius	willow dock	FACW*	**50**
Veronica anagallis-aquatica	water speedwell	OBL	**10**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

4.2.3.4 *Hydric Soils*

Field indicators of hydric soils were limited at this site. Soils were poorly developed, shallow, and sandy in this region with low amounts of organic matter. Areas identified as having hydric soils were confined to the spring pool and the narrow drainage channel where the soils appeared to be saturated for seven or more days during the growing season, indicating the presence of hydric soils.

4.2.3.5 *Determination of Jurisdictional Status*

Two areas at Captain Jack Spring (the spring pool and the narrow drainage channel below the pool) would probably qualify as jurisdictional wetlands because they had field indicators for all three required parameters: hydrophytic vegetation, wetland hydrology, and hydric soils.

4.2.3.6 *Wildlife Use*

This spring is commonly used by coyotes, feral horses, mountain lions, mule deer, and large numbers of upland game birds such as chukar, Gambel's quail, and mourning doves. Sixteen or more species of passerine birds have been recorded using the spring habitat (Table 5-4, Section 5.0). Raptors are also common in this area, including the Cooper's hawk (*Accipiter cooperii*) and the sharp-shinned hawk (*Accipiter striatus*). Tiny fresh-water crustaceans such as ostracods and copepods are common in the spring pool.

4.2.4 Cottonwood Spring

4.2.4.1 *Site Description and Historical Use*

Cottonwood Spring is located northwest of Calico Hills about 1 km (0.6 mi) west of Fortymile Canyon (Figure 4-4). This spring occurs in an east-facing wash at the top of a steep (40 percent) slope. It flows from fractures in rock ledges at approximately a 1,292-m (4,240-ft) elevation and is visible from a distance because three cottonwood trees (*Populus fremontii*) occur at the spring (Photo 4-11). The spring is marked on the Topopah Spring NW USGS 7.5-Minute Series quadrangle map (1961), but is not named. This spring is the only site on the NTS where a cottonwood tree exists; therefore, the spring was named "Cottonwood Spring." The spring was used by Native Americans, as evidenced by a temporary camp site which is located just above the spring on the ridge face at 1,310 m (4,300 ft). This site has three rock shelters and one rock alignment (Henton and Pippin, 1988). Prospecting and mining occurred in Fortymile Canyon near this spring. A surviving Forty-Niner emigrant claimed to have found some ore in Fortymile Canyon near a spring with a cottonwood tree close to the junction of several Native American trails (Stoffle *et al.*, 1990a). A prospector set out to find the spring in 1880 and was attacked by Native Americans and driven away (Stoffle *et al.*, 1990a).

There appears to be little evidence of human disturbance at this spring. A few pieces of iron pipe were located in the wash about 100 m (328 ft) below the spring, suggesting that water was piped down the wash. A few pieces of metal rebar were also found near the cottonwood trees.

4.2.4.2 *Hydrophytic Vegetation*

A wetland vegetation survey was conducted on December 12, 1996. Within the sampling area (observation point), 66 percent of the dominant plants were hydrophytic species indicating that hydrophytic vegetation was present at Cottonwood Spring (Table 4-5). Seep monkeyflower was the dominant species growing throughout the entire habitat; however, most of these individuals were very young plants of 1 cm (0.5 in) in height or less (Photo 4-12). Old flowering stalks of last year's plants remained. Mosses and western goldfern (*Pentagrama triangularis*) were also widely distributed throughout the habitat. Plant species along the border of the delineated wetland area included wormwood (*Artemisia dracunculus*), Louisiana sagewort, and New Mexico thistle (*Cirsium neomexicanum*). Plants observed in the upland areas surrounding the drainage channels included green rabbitbrush, needle-leaf rabbitbrush (*Ericameria teretifolia*), eastern Mojave buckwheat, mormon tea, Cooper's heathgoldenrod (*Ericameria cooperi*), and Mexican bladdersage (*Salazaria mexicana*). An approximate 40-m^2 (430-ft^2) area near the cottonwood trees had accumulated deep soils, but the soils were not saturated. Roots from the trees appeared to extend into the adjacent spring pool area where saturated soils were present. A small pile of runoff debris in the dry wash near the cottonwoods suggested previous surface water flow through this area. The surface area delineated by hydrophytic plants was estimated to be approximately 130 m^2 (1,399 ft^2) (Table 5-1, Section 5.0).

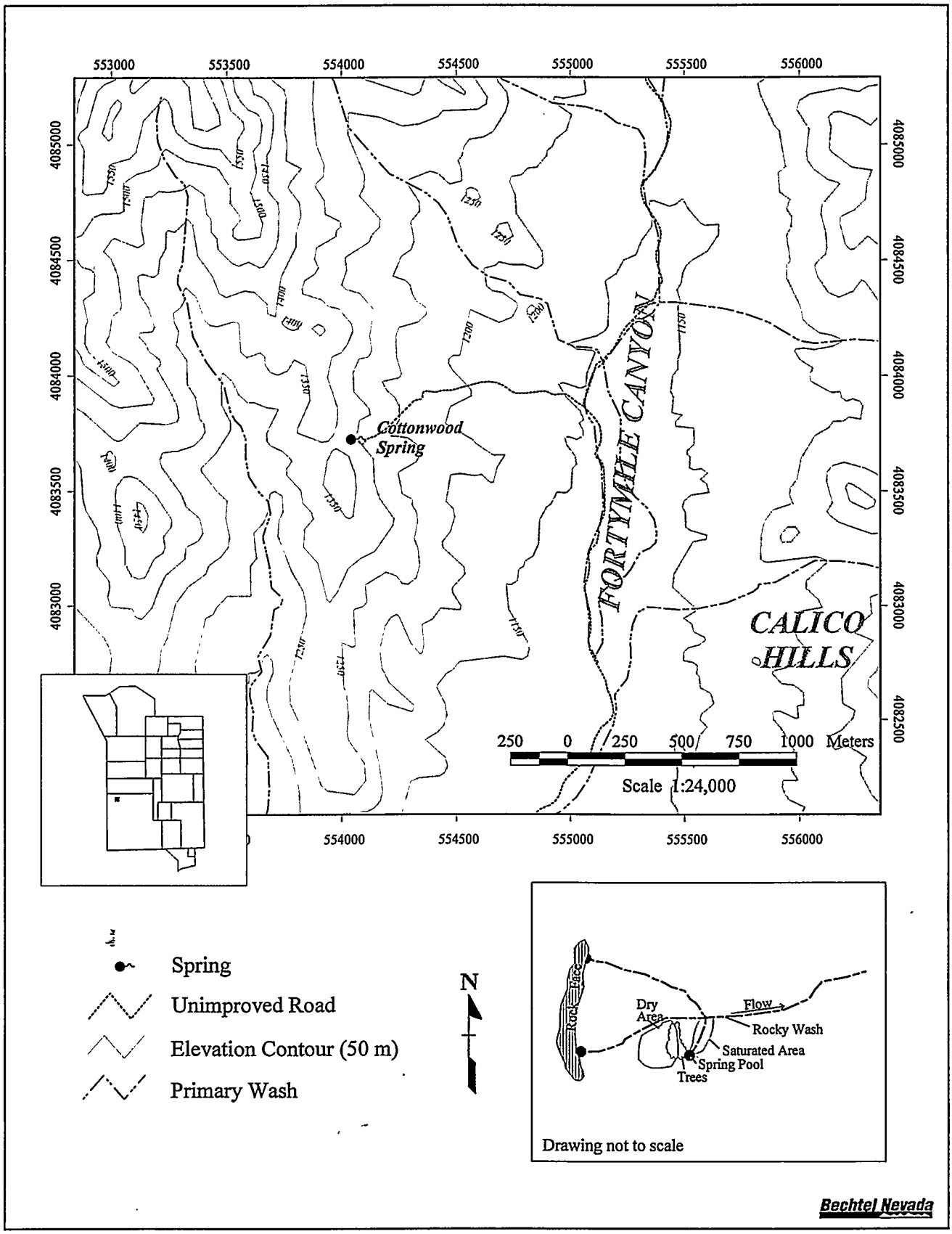

Figure 4-4 **Location and sketch of Cottonwood Spring**

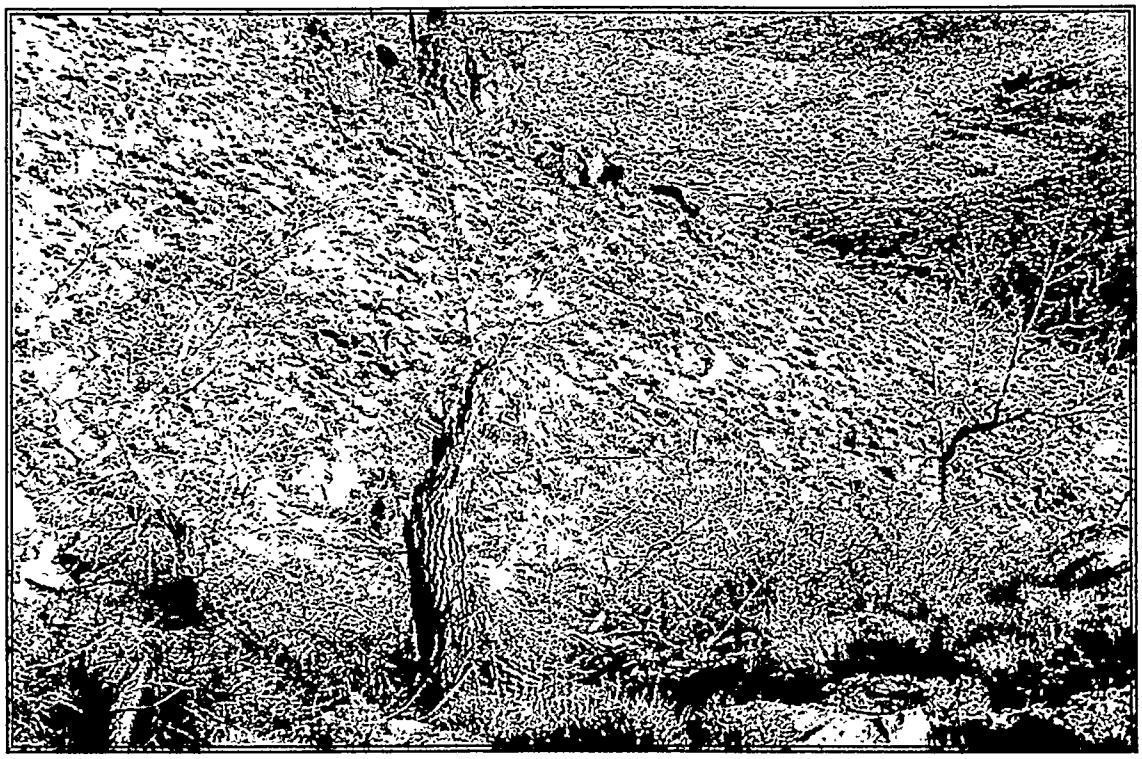

Photo 4-11. Cottonwood Spring looking northeast on January 8, 1997. (WS347-11.TIF)

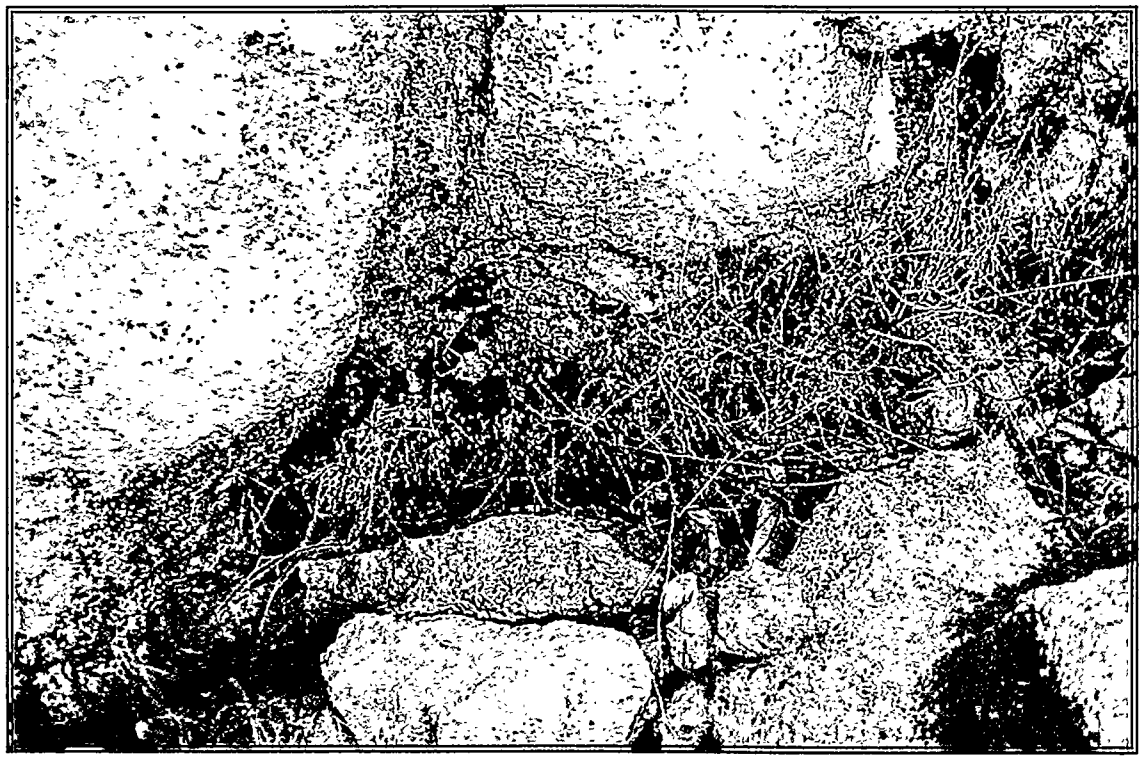

Photo 4-12. Vegetation on rock face at Cottonwood Spring on January 8, 1997. (WS347-09.TIF)

Table 4-5 Cottonwood Spring wetland vegetation as surveyed on December 12, 1996

Habitat: Drainage Channel

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
Populus fremontii	Fremont's cottonwood	FACW*	**20**
Shrub Layer:			
Rhus trilobata	smooth sumac	NI	**10**
Herb Layer:			
Bromus rubens	foxtail brome	UPL	2
Mimulus guttatus	seep monkeyflower	OBL	**20**
Ferns:			
Pentagrama triangularis	western goldfern	NL	2

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 66 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

4.2.4.3 *Wetland Hydrology and Water Quality*

Areas observed to have field indicators of wetland hydrology included the spring pool, a seep area below the spring pool, and intermittently wet areas within two drainage channels below the spring pool. The spring pool, about 1 m^2 (10.8 ft^2) in area and about 25 cm (10 in) deep, was located just below the three cottonwood trees (Photo 4-13). Growths of filamentous algae were abundant in the spring pool. Below the spring pool is a seep area. Water also flows from two other locations (Figure 4-4) along a rock face (Photo 4-12) covered with mosses, ferns, and other hydrophytic plants. Most inundated areas in the habitat were shallow, about 3 cm (1 in) deep. The seep area and two channels near the spring had surface flow in December 1996 and formed a confluence about 70 m (230 ft) below the cliff face (Figure 4-4). These channels cut through rock and formed pools of various size and depth. They vary from about 15 cm (6 in) to 2 m (6 ft) in width and 3 cm (1 in) to about 25 cm (10 in) in depth (Photo 4-14). The flow rate measured in December 1996 in the wash below the confluence of the two channels was approximately 1 ℓ/min (0.3 gal/min) (Table 5-1, Section 5.0). The area of surface inundation was about 90 m^2 (969 ft^2). Water quality data were taken in January 1997 and are presented in Table 5-2 (Section 5.0).

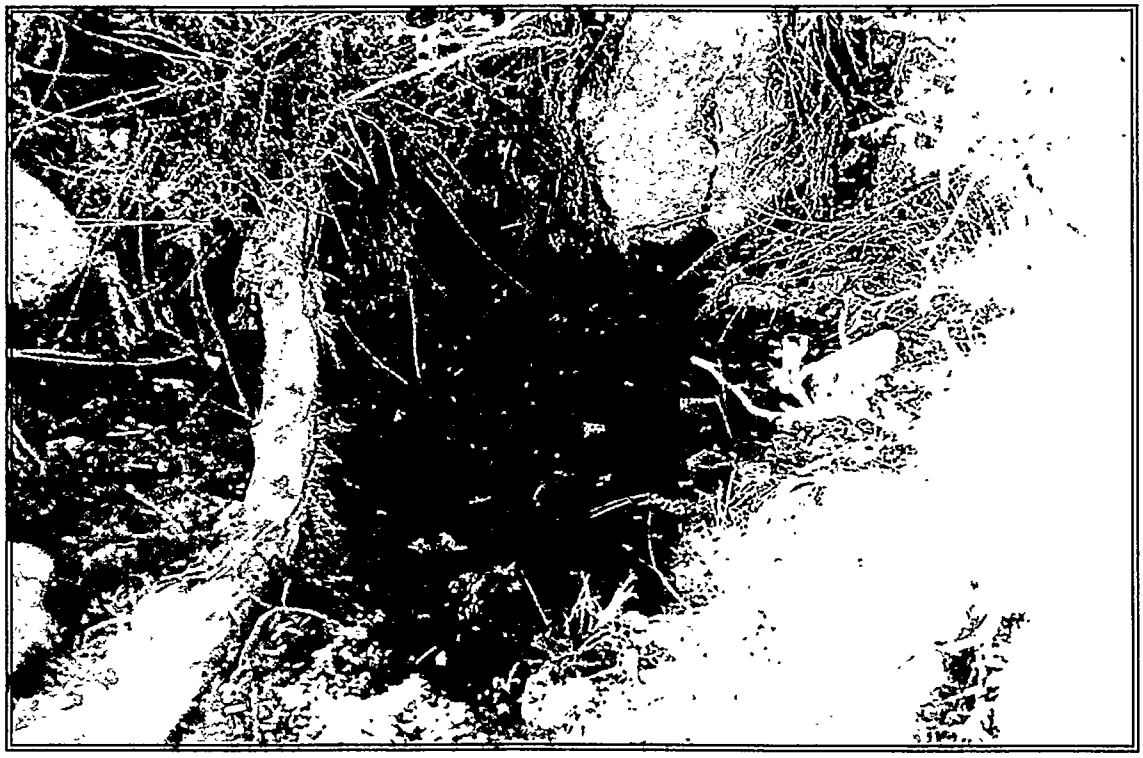

Photo 4-13. Spring pool at Cottonwood Spring on January 8, 1997. (WS347-08.TIF)

Photo 4-14. Pool in rocky wash at Cottonwood Spring on January 8, 1997. (WS347-05.TIF)

4.2.4.4 *Hydric Soils*

Hydric soils appear to be present at Cottonwood Spring and were confined to the seep below the spring pool, and in pools and saturated soils within the two drainage channels. These soils appeared to be saturated for at least seven days during the growing season, indicating the presence of hydric soils.

An area with deeper soils directly under the three cottonwood trees did not appear to have hydric soils. Soils did not appear to be saturated within 61 cm (2 ft) of the surface; however, no soil pits were dug at this site.

4.2.4.5 *Determination of Jurisdictional Status*

Several areas around Cottonwood Spring would probably be considered jurisdictional wetlands because they have field indicators of all three required wetland parameters: hydrophytic vegetation, wetland hydrology, and hydric soils. These areas include the spring pool, the seep or saturated area below the spring pool, and intermittent pools or wet areas within the two drainage channels located about 70 m (230 ft) upslope and about 150 m (492 ft) downslope from the confluence of the drainage channels.

4.2.4.6 *Wildlife Use*

No previous monitoring of wildlife use has been conducted at this spring. Little is known about wildlife use of the spring. Mule deer scat was observed in the vicinity of the spring at the time of the wetland survey. Aquatic invertebrates observed in the spring pool in December 1996 included crustaceans (ostracods and copepods).

4.2.5 Coyote Spring

4.2.5.1 *Site Description and Historical Use*

Coyote Spring (Figure 4-5) is located about 3 km (2 mi) southeast of Hampel Hill and approximately 3 to 5 km (2 to 3 mi) southwest of Frenchman Flat. The site (Photo 4-15) is within a wash in an area that is distant from any roads and shows no evidence of disturbance by man.

4.2.5.2 *Hydrophytic Vegetation*

A wetland vegetation survey of Coyote Spring was conducted on September 4, 1996. Coyote Spring consists of three seep areas (*Figure 4-5*) that either currently or previously supported wetland vegetation. In September, only one of these three areas was dominated by hydrophytic vegetation (Table 4-6, Photo 4-16). This area was the furthest downslope and was dominated by inland saltgrass (*Distichlis spicata*), a wetland plant species which covered a surface area of about 160 m^2 (1,722 ft^2). A second seep area is about 40 m^2 (430 ft^2) in size and is located on the adjacent hill side. It was dominated by common kochia (*Kochia scoparia*) and soils there were moist and dark-colored. No vegetation occurred on the third area which had dark-colored and moist soils and was located west of the other seep areas.

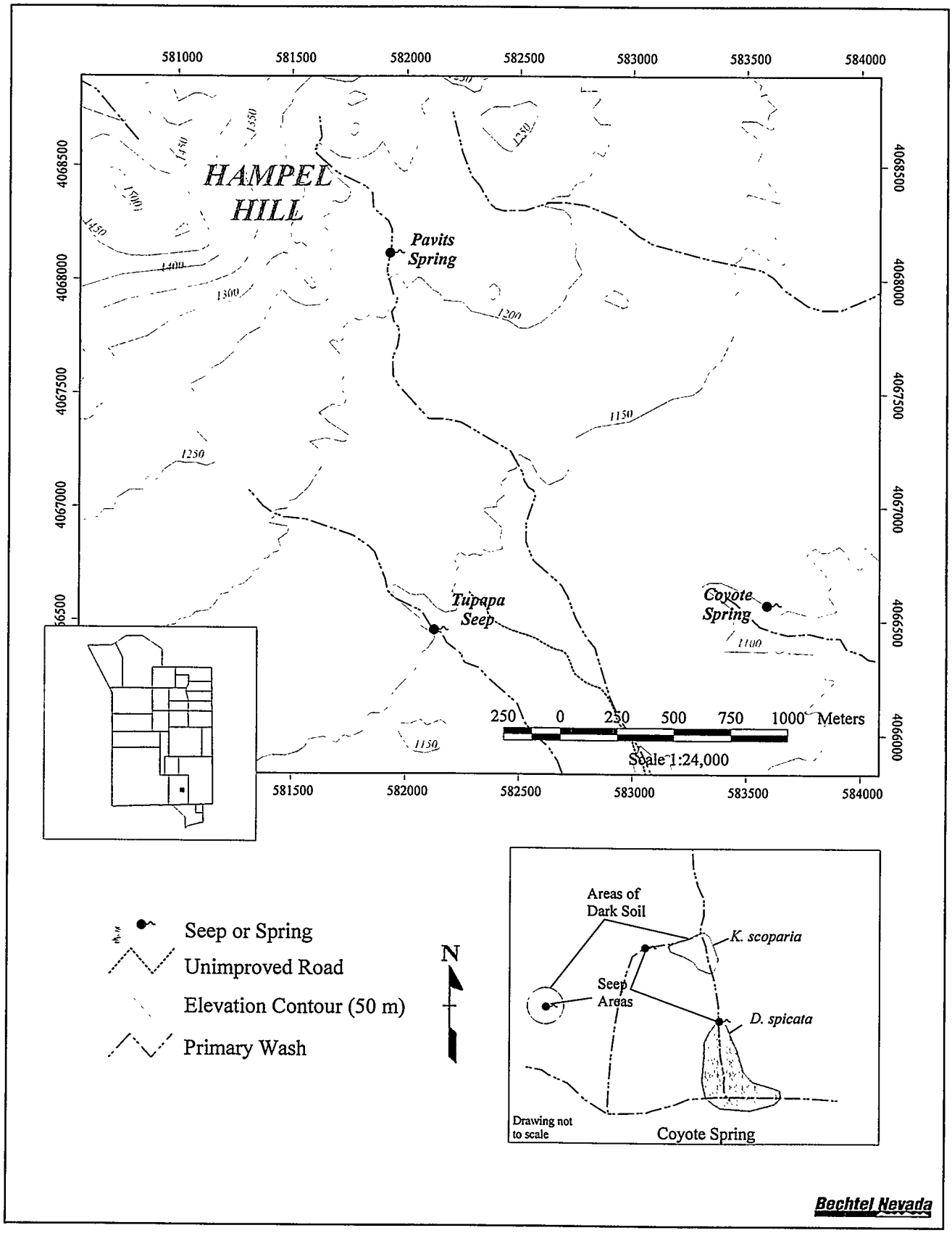

Figure 4-5 **Location and sketch of Coyote Spring, Pavits Spring, and Tupapa Seep and sketch of Coyote Spring**

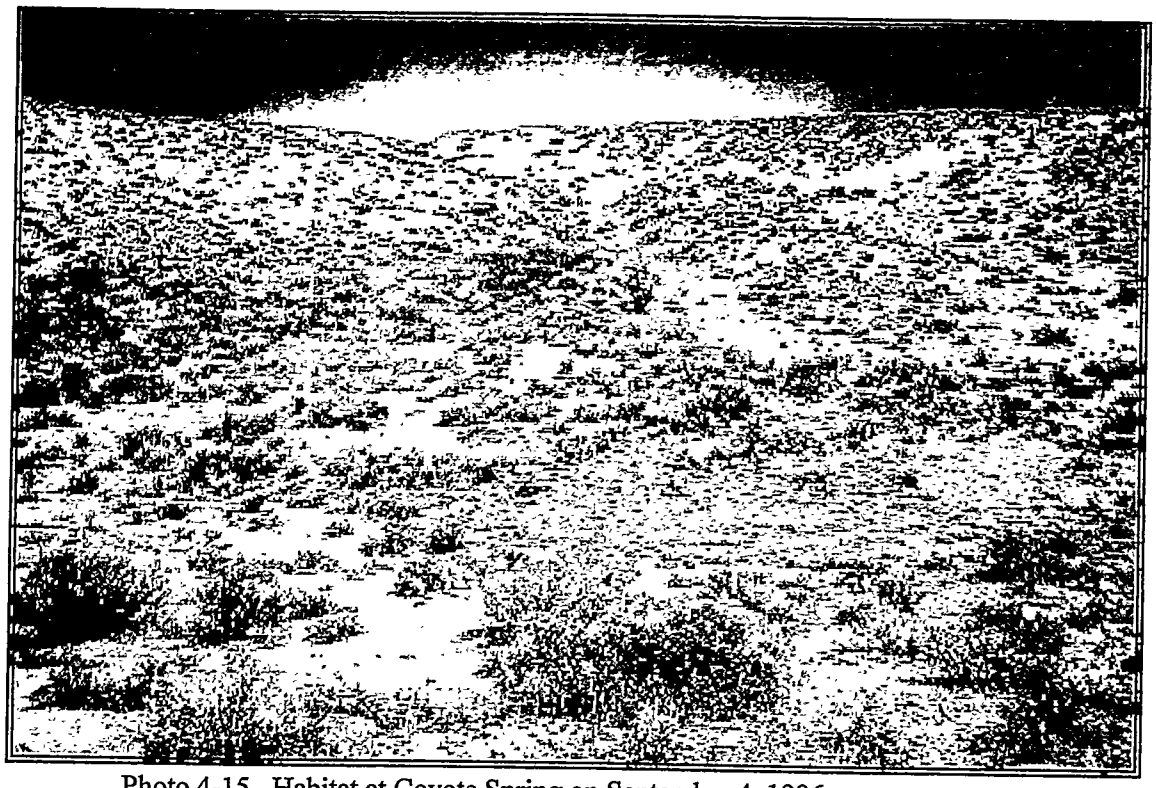

Photo 4-15. Habitat at Coyote Spring on September 4, 1996. (WS503-02.TIF)

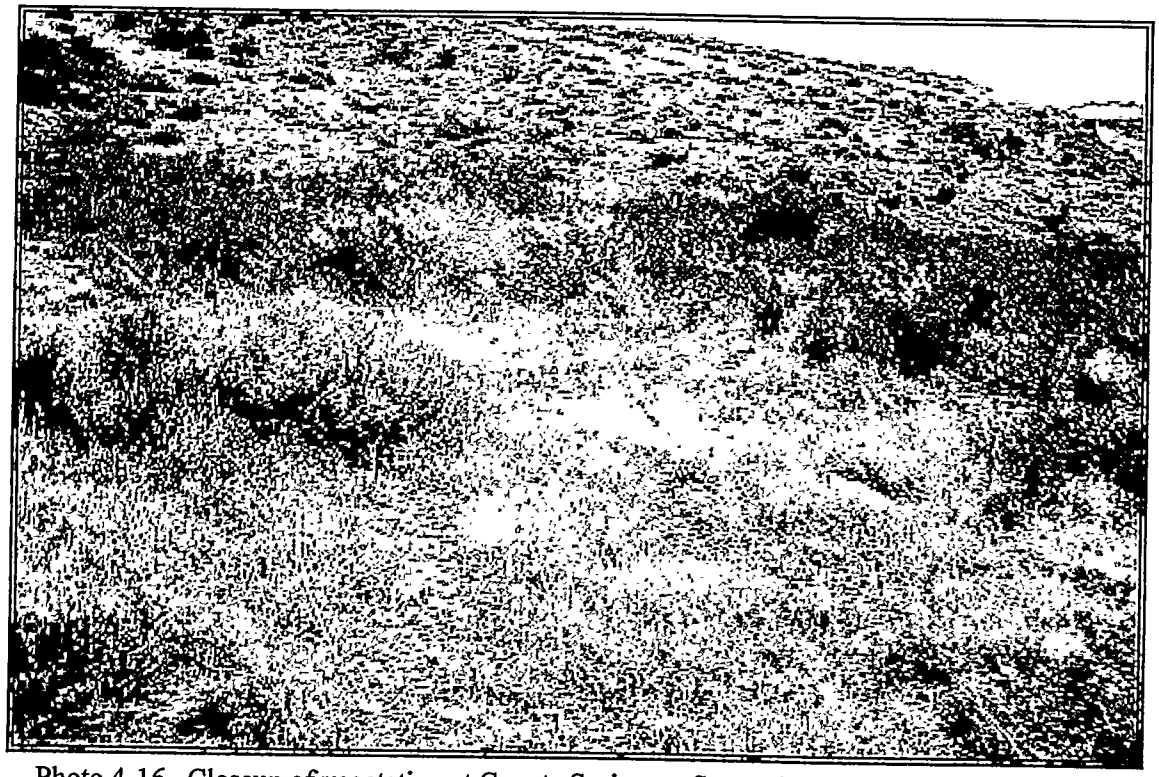

Photo 4-16. Closeup of vegetation at Coyote Spring on September 4, 1996. (WS504-01.TIF)

Table 4-6 Coyote Spring wetland vegetation as surveyed on September 4, 1996

Habitat: Wash Slope

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Distichlis spicata	inland saltgrass	FAC+*	**60**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

Other upland plants in the area included shadscale saltbush (*Atriplex confertifolia*), largeflower suncup (Cane Spring evening primrose), bottlebrush squirreltail (*Elymus elymoides*), and basin wildrye.

4.2.5.3 *Wetland Hydrology and Water Quality*

The only area observed to have field indicators of wetland hydrology was the seep area farthest downslope, although no standing water was observed at this site. Seasonal water availability at Coyote Spring is poorly understood; however, the presence of facultative wetland vegetation (inland saltgrass) and dark-colored soils are evidence of prior wetland hydrology. The unvegetated area of 6 m^2 (65 ft^2) located in the wash also had dark-colored and wet surface soils. Observations made in September 1996 may not be representative of conditions during wetter years. No water quality data were collected at the time of the field survey.

4.2.5.4 *Hydric Soils*

Field indicators for hydric soils appeared to be present in the area dominated by inland saltgrass (i.e., the seep area furthest down slope). These indicators included dark-colored soils which appeared to have been saturated for periods of at least seven days during the growing season. No soil pits were dug. The other two seep areas also had dark-colored moist soils, but did not have evidence of saturated soils.

4.2.5.5 *Determination of Jurisdictional Status*

Coyote Spring has one area that would probably qualify as a jurisdictional wetland (the area dominated by inland saltgrass) because it had all three required parameters:

hydrophytic vegetation, wetland hydrology, and hydric soils. Field indicators from the other two areas suggest that these areas could also support hydrophytic vegetation after a period of normal precipitation when seep flows would be higher. However, at the time of the survey, these other two seep areas did not have field indicators that would meet criteria to be considered jurisdictional wetlands.

4.2.5.6 *Wildlife Use*

Coyotes, mule deer, and game birds such as Gambel's quail are common vertebrates in the area and likely use the seep areas during winter and spring when flow rates are expected to be highest. No previous monitoring of wildlife use has been conducted at these seeps. No birds or other wildlife signs were observed at the seeps during limited observations conducted as part of the wetland survey.

4.2.6 Fortymile Canyon Tanks

4.2.6.1 *Site Description and Historical Use*

Several unnamed tanks and a small seep, identified as "Seep" on the Topopah Spring USGS 7.5 Minute Series quadrangle map (1961), are located in a side wash about 2 km (1.2 mi) east of Fortymile Canyon (Figure 4-6). The tanks and seep are located in a narrow section of the canyon with steep barren slopes on either side (Photo 4-17). There is no reported evidence of human occupation or use of this site.

4.2.6.2 *Hydrophytic Vegetation*

A wetland vegetation survey of Fortymile Canyon Tanks was conducted on February 12, 1997. Most of the tanks at this site have no vegetation associated with them. One area did have some limited soil and vegetation (Photo 4-18). Cover on this area was low at approximately 11 percent (Table 4-7). Louisiana sagewort and foxtail brome dominated the site. One other species, seep monkeyflower, occurred at the site, but averaged only 1 percent cover. No other species were found at this site. Because only 33 percent of the species identified from the observation point were classified as obligate or facultative wetland species, the site would be classified as not having hydrophytic vegetation. Plant species observed in the upland area were Stansbury cliffrose (*Purshia stansburiana*), skunkbush sumac (*Rhus trilobata*), green rabbitbrush, roundleaf rabbitbrush (*Ericameria teretifolia*), mormon tea, Nevada jointfir (*Ephedra nevadensis*), and big sagebrush.

4.2.6.3 *Hydrology*

This site consists of seven water tanks located in bedrock and a small seep at the head of the tanks. The tanks are located in a narrow rocky wash and they vary in size. The two largest ones were approximately 1 m by 3 m (3 ft by 9 ft), and the water in this tank was about 20 cm (8 in) deep. All tanks were filled with water at the time of the survey in February 1997. The estimated total area of surface water was 8 m^2 (86 ft^2) (Table 5-1, Section 5.0). Bedrock is exposed about 30 m (98 ft) up both sides of the canyon, which

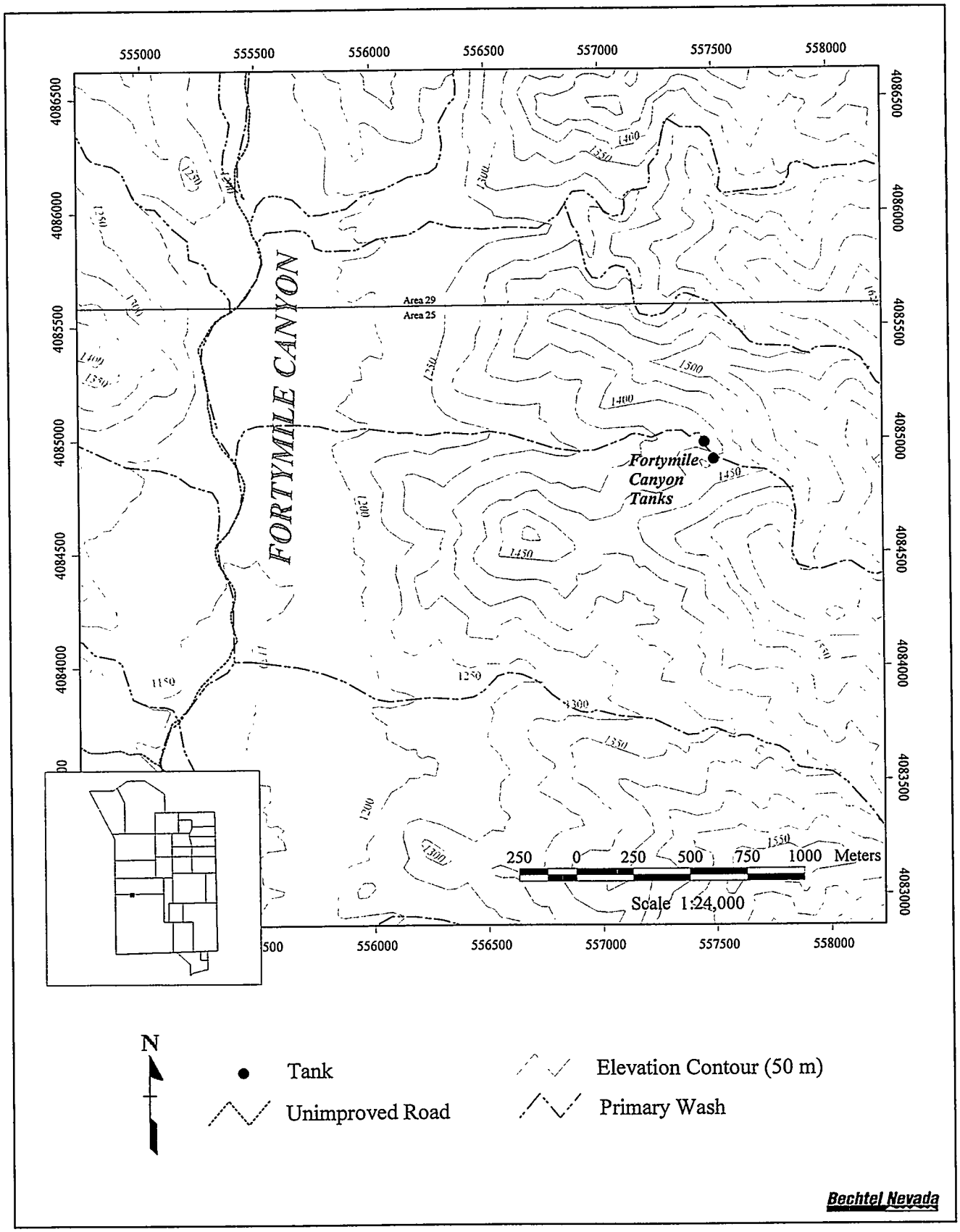

Figure 4-6 **Location of Fortymile Canyon Tanks**

Photo 4-17. Habitat at Fortymile Canyon Tanks looking east on February 12, 1997.
(40MILE1.TIF)

Photo 4-18. Vegetation at Fortymile Canyon Tanks on February 12, 1997.
(40MILE2.TIF)

Table 4-7 Fortymile Canyon Tanks wetland vegetation as surveyed on February 12, 1997

Habitat: Third Tank Downslope from Seep

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Artemisia ludoviciana	Louisiana sagewort	FACU	5
Bromus rubens	foxtail brome	UPL	5
Mimulus guttatus	seep monkeyflower	OBL	1

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 33 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

hastens runoff and aids in the collection of water in the tanks on the canyon bottom. The tanks appear to collect surface runoff from precipitation and from water flow from the seep. At the time of the survey, water was seeping from under a large boulder at the head of the tanks at a measured rate of 0.2 ℓ/min (0.05 gal/min). No water quality measurements were taken.

4.2.6.4 *Hydric Soils*

This site occurs primarily on bedrock which has no soil development. However, one small (4 m^2 [43 ft^2]) area had shallow soils which appeared to be saturated for at least seven days during the growing season, indicating the presence of hydric soils.

4.2.6.5 *Jurisdictional Wetland Determination*

This site would not be considered a jurisdictional wetland because it lacks hydrophytic vegetation.

4.2.6.6 *Wildlife Use*

Little is known of wildlife use of this water source, although mule deer and coyotes are common in the area and their scat were observed in the adjacent wash area. During the survey, three golden eagles were observed soaring in the canyon above the tanks.

4.2.7 Gold Meadows Spring

4.2.7.1 *Site Description and Historical Use*

Gold Meadows Spring is located near the base of a wash in Gold Meadows (Figure 4-7) about 3 km (2 mi) north of Rainier Mesa. It is about 100 m (328 ft) from Kawich Valley Road. Native American artifacts have been recovered from the Gold Meadows area, indicating there were Native American camps in the area (Worman, 1969). Gold Meadows Spring has an ephemeral pond during the spring which dries up in late summer of most years. Gold Meadows Spring appears to have been used by ranchers to water livestock in recent times. An earthen berm was constructed on the southwest side of the pond apparently to improve water storage. During years of abundant rainfall (e.g., 1992), the pond measures about 10 × 40 m (33 × 131 ft) (Photo 4-19).

4.2.7.2 *Hydrophytic Vegetation*

From the survey observation point located within the pond area, 100 percent of the dominant plants were wetland species (Baltic rush; Table 4-8) indicating that hydrophytic vegetation was present at this site. Baltic rush, a facultative wetland species, was the only plant species recorded at the Gold Meadows Spring observation point during July of 1996. This species covered an area about 45 m^2 (484 ft^2). Plant species bordering the perimeter of the pond (then dry) were primarily big sagebrush and basin wildrye. The upland habitat was dominated by the trees Utah juniper and singleleaf pinyon.

4.2.7.3 *Wetland Hydrology and Water Quality*

The only area observed to have field indicators of wetland hydrology was the ephemeral pond. During the winter and spring of most years, water in the pond is present (based on observations in 1989 to 1996). By summer, the pond usually dries up (Photo 4-20); however, in 1992 the pond remained all year. Although surface water was not present at the time of the field survey on July 22, 1996, previous field observations of ponded water and water lines on rocks in the pond area indicated that the site had wetland hydrology. No water quality data were able to be taken at the time of the 1996 survey.

4.2.7.4 *Hydric Soils*

Soils at this site were shallow, about 20 cm (8 in) deep and had a dark-colored surface layer (probably because of high levels of organic matter). No evidence of soil mottling was observed. This site may have been periodically dug out by man to deepen the pond, and excavated soils were probably used to build up the existing berm. Therefore, an atypical situation occurred where hydric soils have been removed or disturbed. At the time of the survey, no saturated soils were observed (Table 5-1, Section 5.0); however, because the pond soils appeared to have been flooded or saturated for at least seven days during the growing season of each year, it seems that the site had hydric soils. This estimated area of saturated soils coincides with the area where Baltic rush was found (45 m^2 [484 ft^2]).

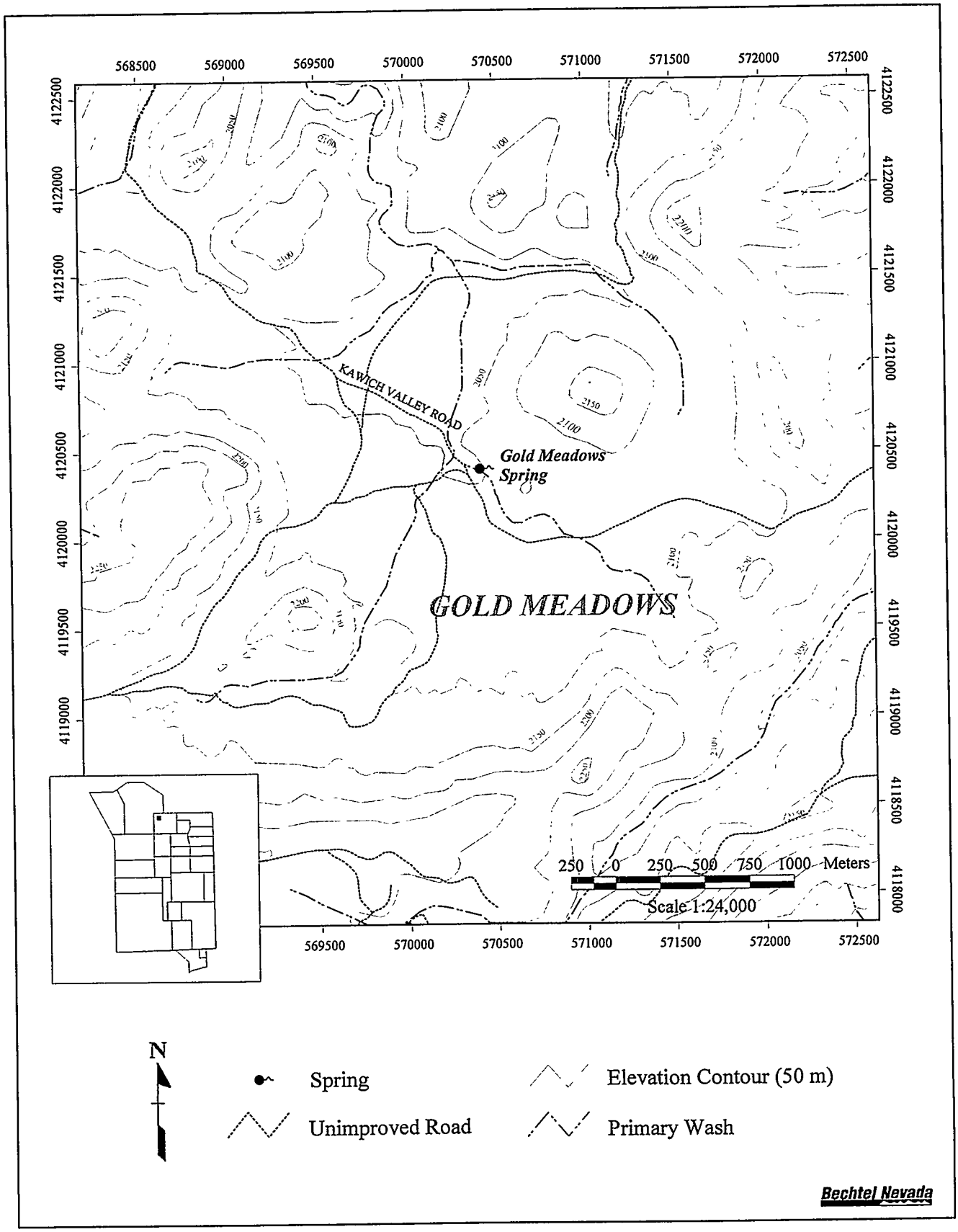

Figure 4-7 **Location of Gold Meadows Spring**

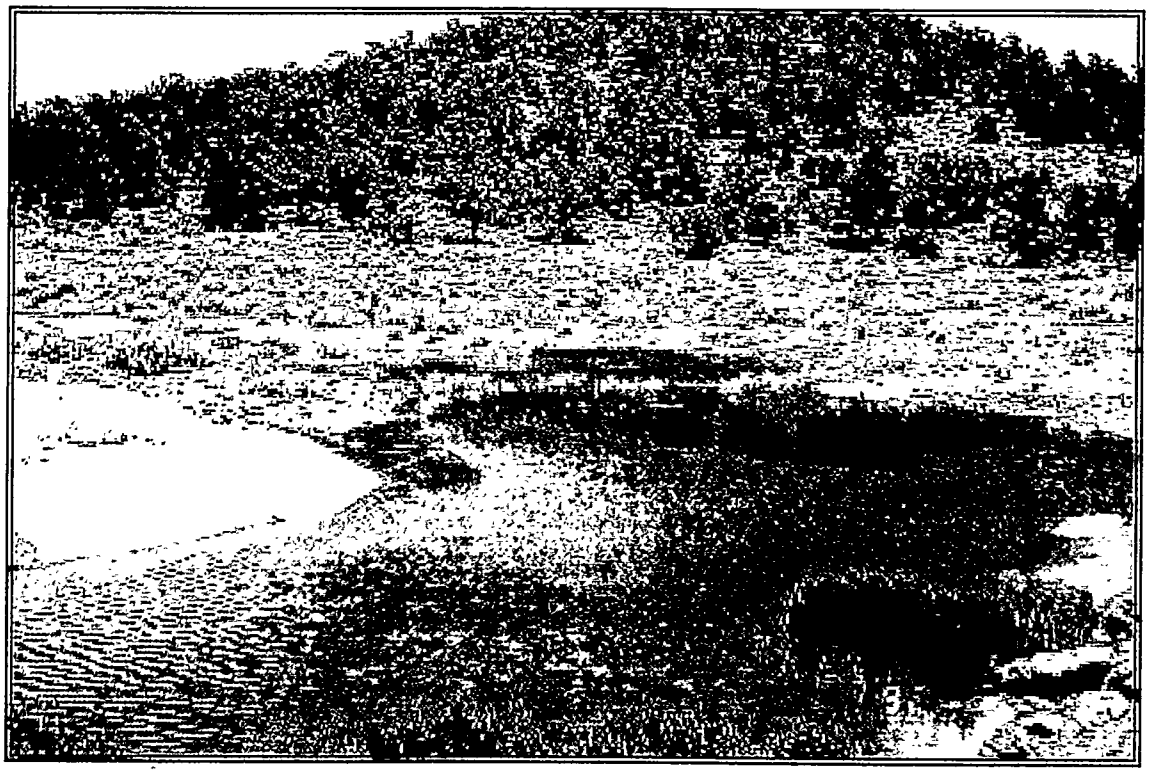

Photo 4-19 Emergent vegetation in Gold Meadows Spring on June 10, 1992 (WS310-12.TIF)

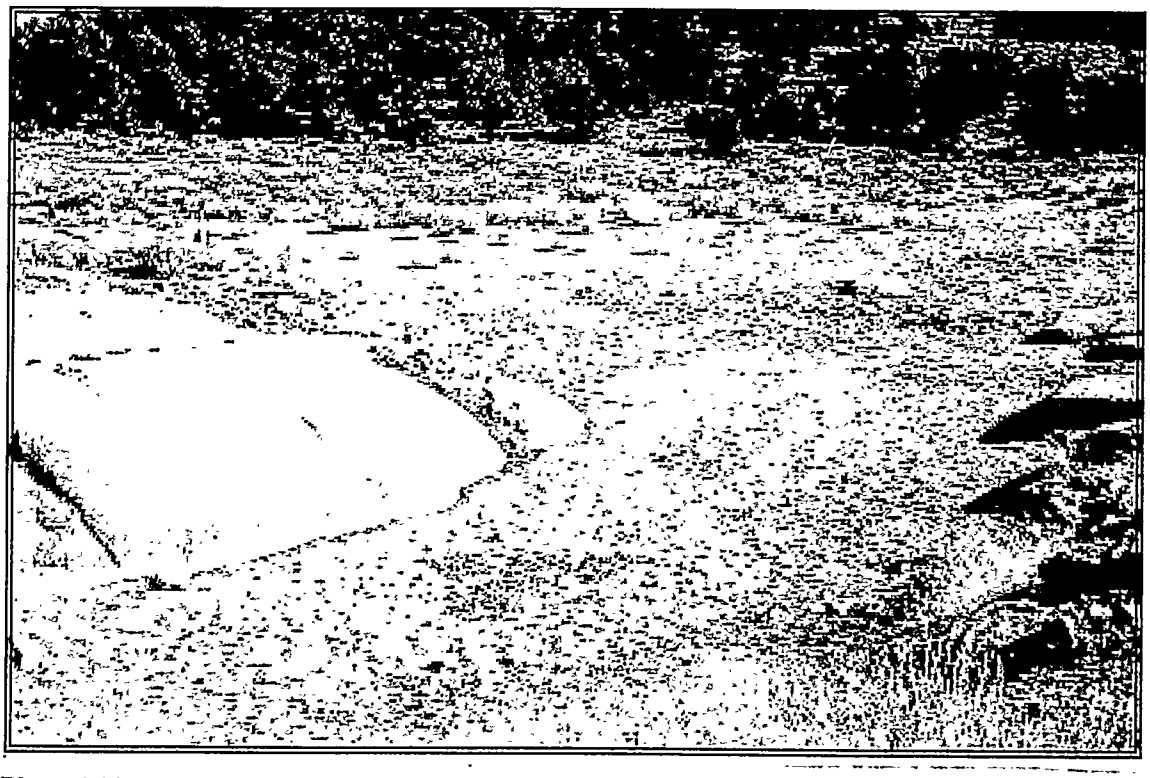

Photo 4-20 Dry pond at Gold Meadows Spring on December 10, 1990 (WS213-23.TIF)

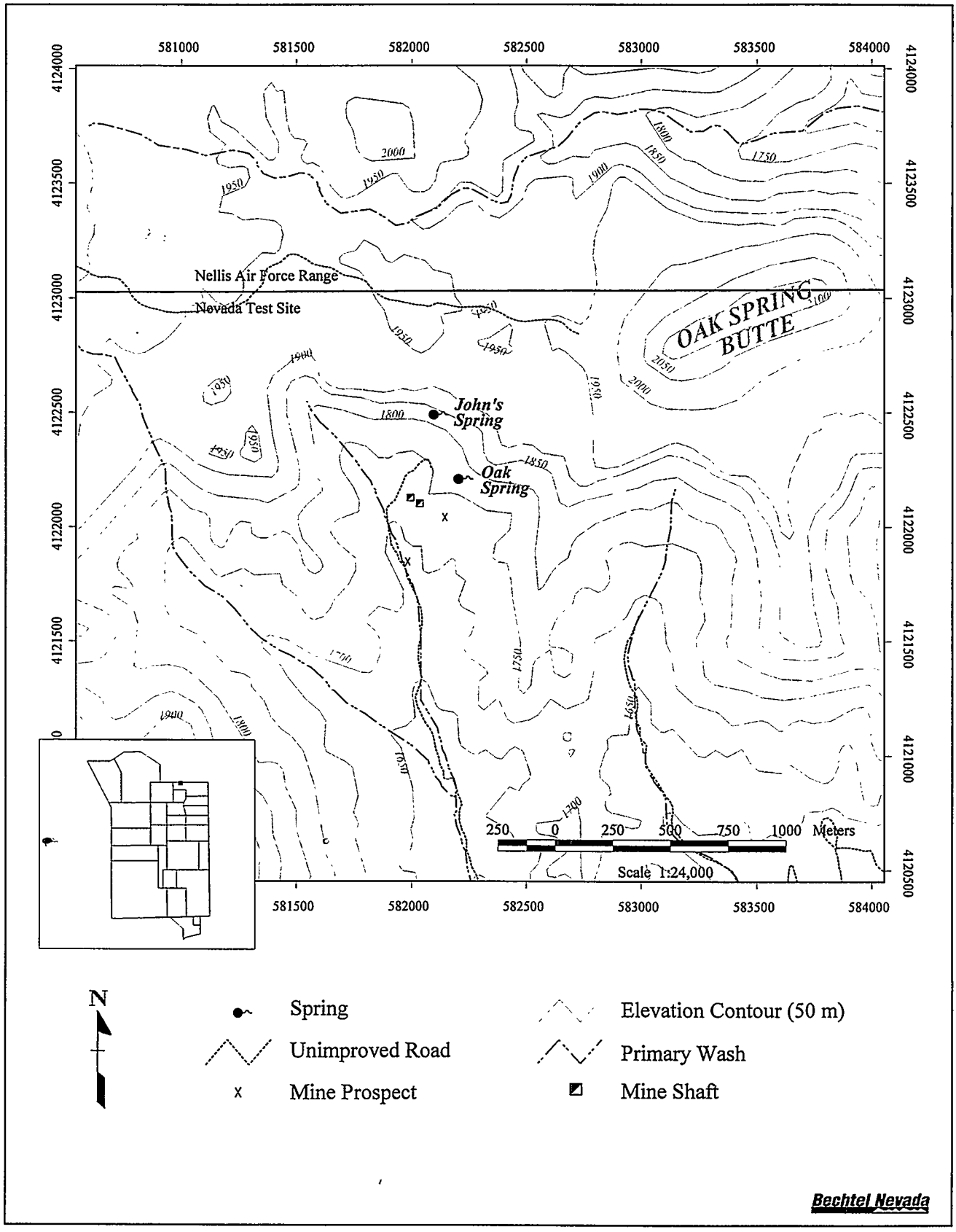

Figure 4-9 Location of Oak Spring

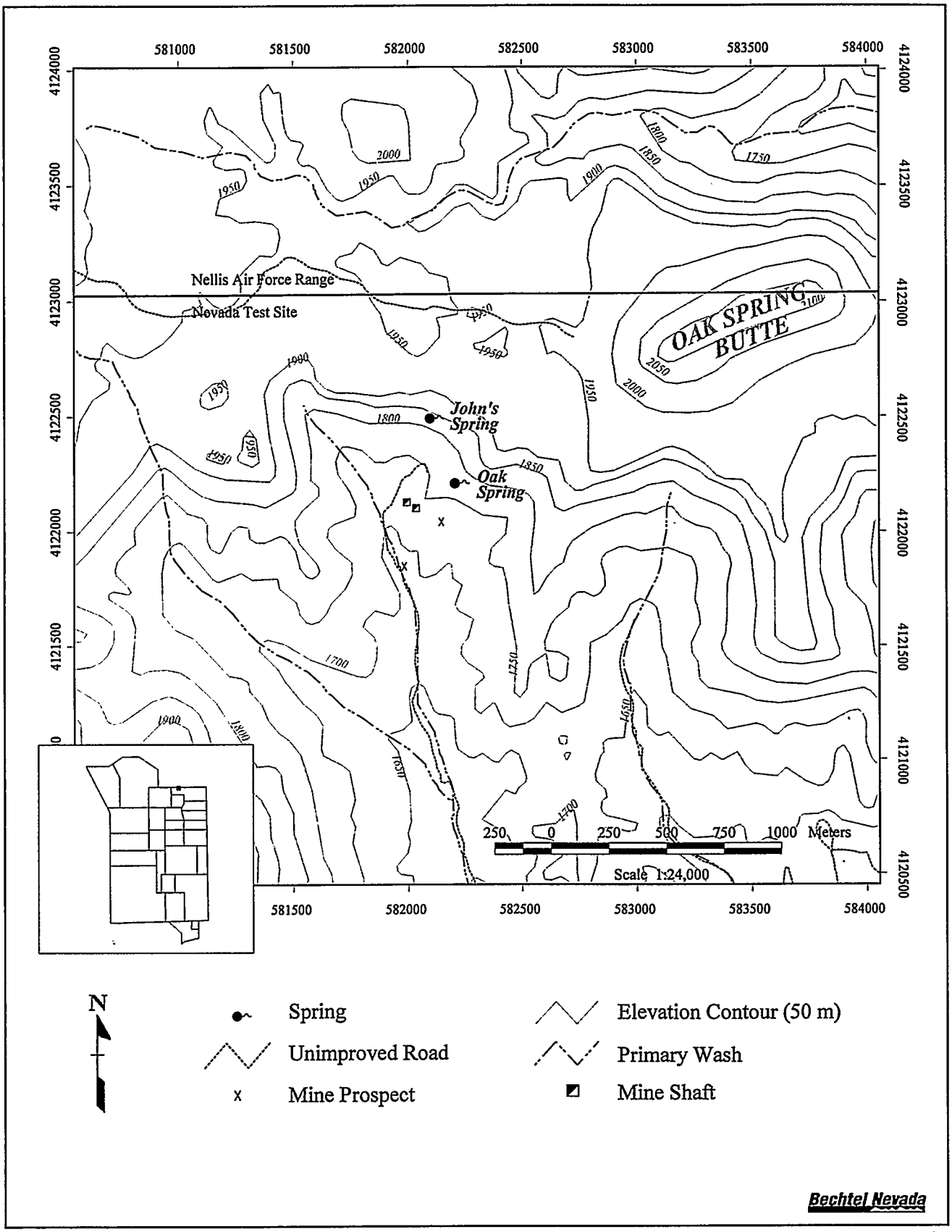

Figure 4-8 **Location of John's Spring**

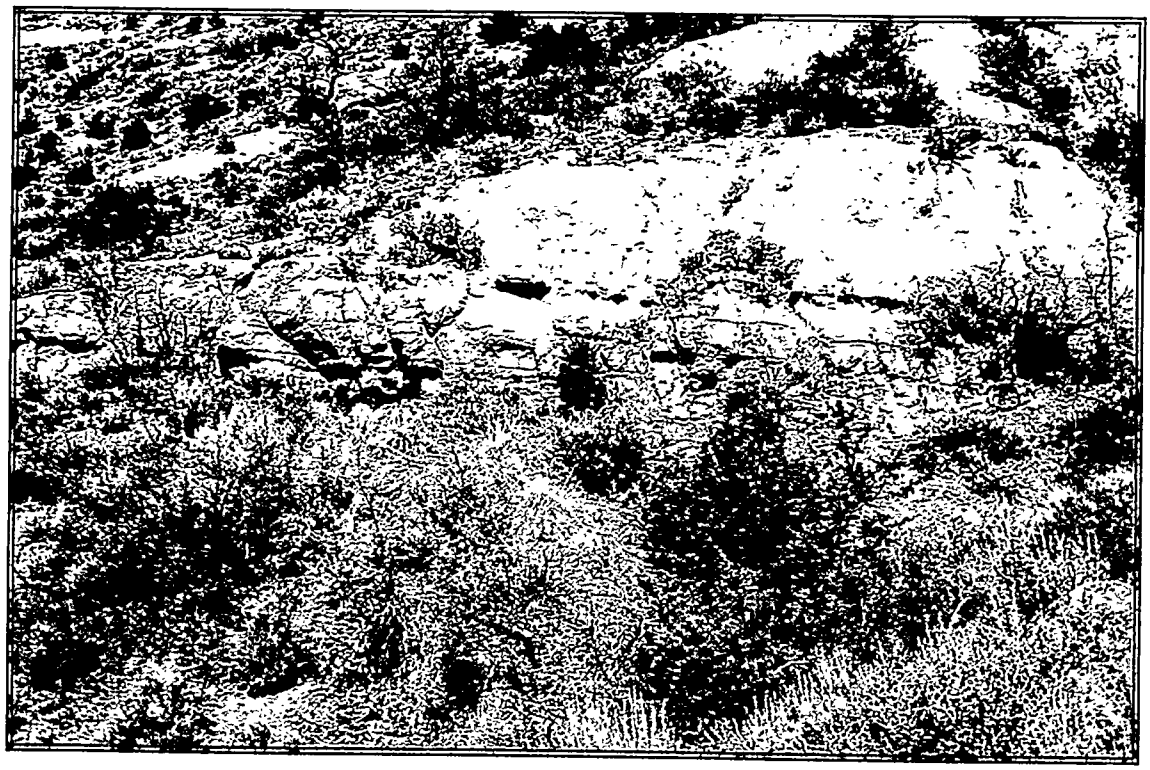

Photo 4-21 John's Spring below the rocky outcrop looking north on February 24, 1997 (JOHNS1.TIF)

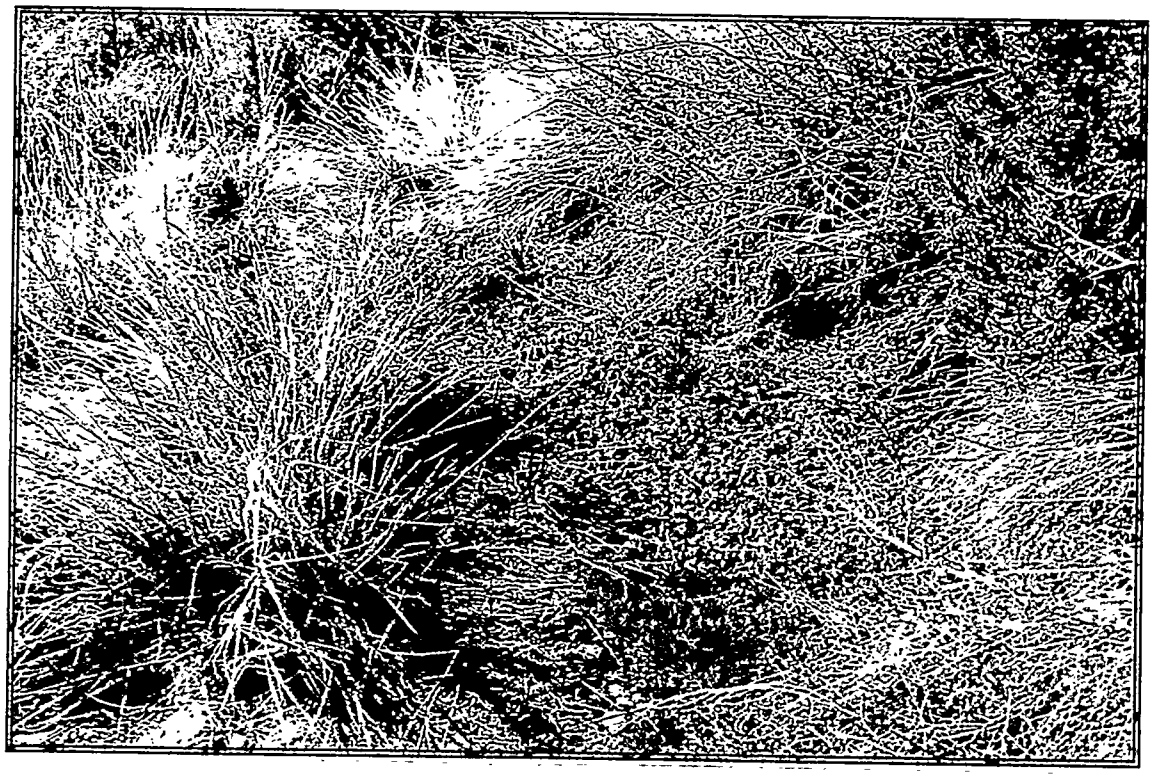

Photo 4-22 Wetland vegetation at John's Spring on February 24, 1997 (JOHNS2.TIF)

wood embedded in the ground near the spring. It is likely that this spring was used by Native Americans because of its proximity to Oak Spring, where Native Americans had winter camps (Stoffle *et al.*, 1990a). This spring appears to have been minimally impacted from mining activities in comparison to Oak Spring (see Section 4.2.9).

4.2.8.2 *Hydrophytic Vegetation*

A wetland vegetation survey was conducted at John's Spring in December 1996. From the observation point located at the ledge pool just below the rock face, 100 percent of the dominant plants were hydrophytic species, indicating that hydrophytic vegetation was present at this site (Table 4-9). Mosses and filamentous algae were common along the wet cliff face. Tufted evening primrose (*Oenothera cespitosa* var. *marginata*), although categorized as an "NL" species (see Methods, Section 3.2.4), was found primarily in seep areas of the rock face. Dominant hydrophytic species included clustered field sedge (*Carex praegracilis*) and seep monkeyflower which comprised about 80 percent of the cover of the ledge pool area. Other species such as stickywilly (*Galium aparine*) and an unidentified penstemon constituted plant species with less than 1 percent cover. An adjacent transitional area between the jurisdictional wetland and the upland was comprised of basin wildrye and smooth sumac. Within this transitional area, basin wildrye constituted about 60 percent cover and smooth sumac constituted about 20 percent cover. Species in the adjacent upland area included big sagebrush, fourwing saltbush, cheatgrass, mormon tea, singleleaf pinyon, desert bitterbrush (*Purshia glandulosa*), and Gambel's oak. The total area of the wetland habitat dominated by hydrophytic species was estimated to be about 50 m^2 (538 ft^2) (Table 5-1, Section 5.0) and was restricted to seep areas along the rock face and the ledge pool below the rock face.

4.2.8.3 *Wetland Hydrology and Water Quality*

Areas observed to have field indicators of wetland hydrology included seeps located in the rock face and a surface pool at the base of the rock face. Water seeps out of the rock face in numerous locations across a distance of about 25 m (82 ft) and flows down a steep slope for about 5 m (16 ft). Flow rate was measured at 0.4 ℓ/min (0.01 gal/min) in December 1996 (Table 5-1, Section 5.0). A 2-cm- (1-in)-deep surface pool exists on a relatively flat area at the base of the rock face. The surface area of this pool is about 5 m^2 (54 ft^2) and is covered with a dense growth of seep monkeyflower (Photo 4-22). Water quality measurements were not taken at this site.

4.2.8.4 *Hydric Soils*

Hydric soils at John's Spring were confined to the seep areas at the base of the rocky cliff and the ledge pool, and comprised about 50 m^2 (538 ft^2). Soils in these areas appeared to be saturated for at least seven days during the growing season, indicating the presence of hydric soil.

Table 4-9 John's Spring wetland vegetation as surveyed on December 12, 1996

Habitat: Ledge Pool

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Carex praegracilis	clustered field sedge	FACW-	**20**
Gallium aparine	catchweed bedstraw	FACU	Tr
Mimulus guttatus	seep monkeyflower	OBL	**80**
Oenothera cespitosa ssp. *marginata*	tufted evening primrose	NL	Tr
Penstemon sp.	unidentified penstemon	UNKN	Tr

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values. Tr = trace, <1% absolute cover.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

4.2.8.5 *Determination of Jurisdictional Status*

Several areas at John's Spring would probably be considered jurisdictional wetlands because they had field indicators of all three wetland parameters: hydrophytic vegetation, wetland hydrology, and hydric soils. These areas include the seep areas along the rock face and the ledge pool at the base of the rock face which covered an area about 50 m^2 (538 ft^2).

4.2.8.6 *Wildlife Use*

Little is known about wildlife use of the spring because of limited study. Mule deer use the area as indicated by the presence of scat near the spring. Migratory passerine birds such as dark-eyed juncos (*Junco hyemalis*) were observed drinking from the spring on December 18, 1996. Many species of passerine birds probably benefit from drinking at this site during summer months.

4.2.9 Oak Spring

4.2.9.1 *Site Description and Historical Use*

Oak Spring is located southwest of Oak Spring Butte (Figure 4-9) in an oak grove on a hillside (Photo 4-23) near the northern NTS boundary. Native Americans were reported to

have had winter camps at Oak Spring during the late 1800s or early 1900s (Stoffle *et al.*, 1990a). Gold and silver mining activities occurred around 1905 in the Oak Spring area (Stoffle *et al.*, 1990a). Historic disturbances at the site include depressions and excavation of soil from around the spring on the hillside, flattening of the slope just below the spring to provide space for small water drums, and old 5-cm- (2-in)-diameter metal pipes laid from the spring down the hillside. These disturbances suggest that Oak Spring was developed to provide water for these local mining activities. The metal pipe apparently provided water to living quarters and an old corral located about 1.6 km (1 mi) south of the spring (Giles, 1976). In the 1970s, DOE modified the site to enhance water availability to wildlife (Smith *et al.*, 1978). An existing pipe, inserted in the ground below the spring, apparently directed water to two small converted 55-gallon (208-ℓ) drum guzzlers (one with an animal-escape ladder). At the time of the survey on November 4, 1996, the mouth of the spring was a small opening or depression in the soil less than 0.5 m (2 ft) wide with observable flow, and both guzzlers were dry.

4.2.9.2 *Hydrophytic Vegetation*

Wetland vegetation around the saturated soils of the spring was primarily a thick growth of small sandbar willow (*Salix exigua*) (Photo 4-24). Basin wildrye and smooth sumac also occurred in the adjacent moist soils. The willows comprised about a 40-m^2 (430-ft^2) area around the spring outflow. Upland vegetation nearby was big sagebrush, fourwing saltbush, cheatgrass, green rabbitbrush, mormon tea, singleleaf pinyon, desert bitterbrush, and Gambel's Oak.

From the survey observation point, located at the spring pool, nearly 100 percent of the dominant plant species were wetland species (sandbar willow) indicating that hydrophytic vegetation was present (Table 4-10). Beatley (1976) reported five additional wetland plant species from Oak Spring (Table 5-3, Section 5.0) that were not detected during the survey: sturdy sedge (*Carex alma*), beardless wildrye (*Leymus [Elymus] triticoides*), seep monkeyflower, and beardless rabbitsfoot grass (*Polypogon viridis*). All of these species are obligate or facultative wetland species. It is probable that some of these species reestablish during periods of greater spring flow and moist soil conditions. Seeds of some of these plants might readily disperse to the site from plants growing at John's Spring about 250 m (820 ft) away.

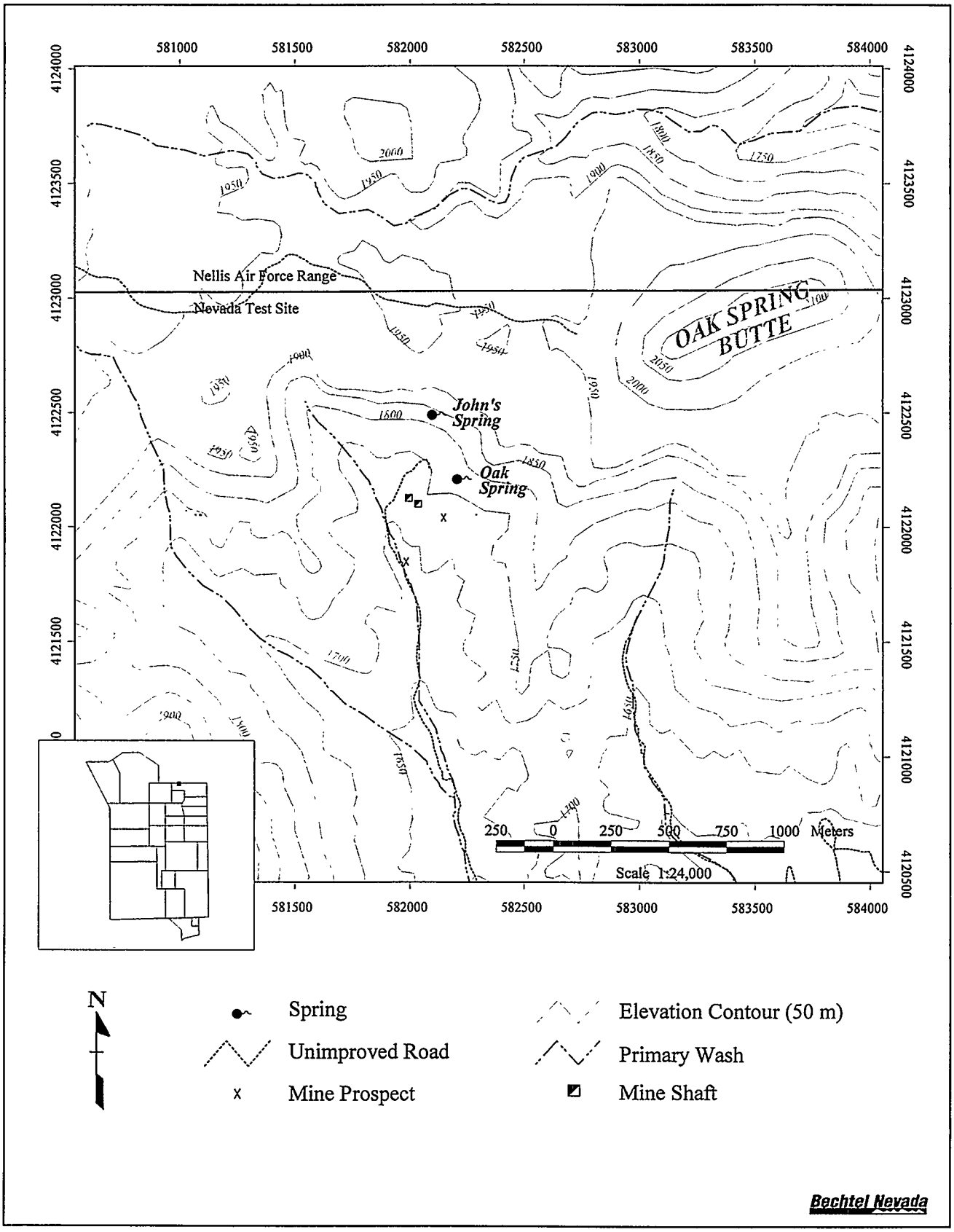

Figure 4-9 **Location of Oak Spring**

Photo 4-23 Vegetation at Oak Spring looking south on November 4, 1996 (WS343-13.TIF)

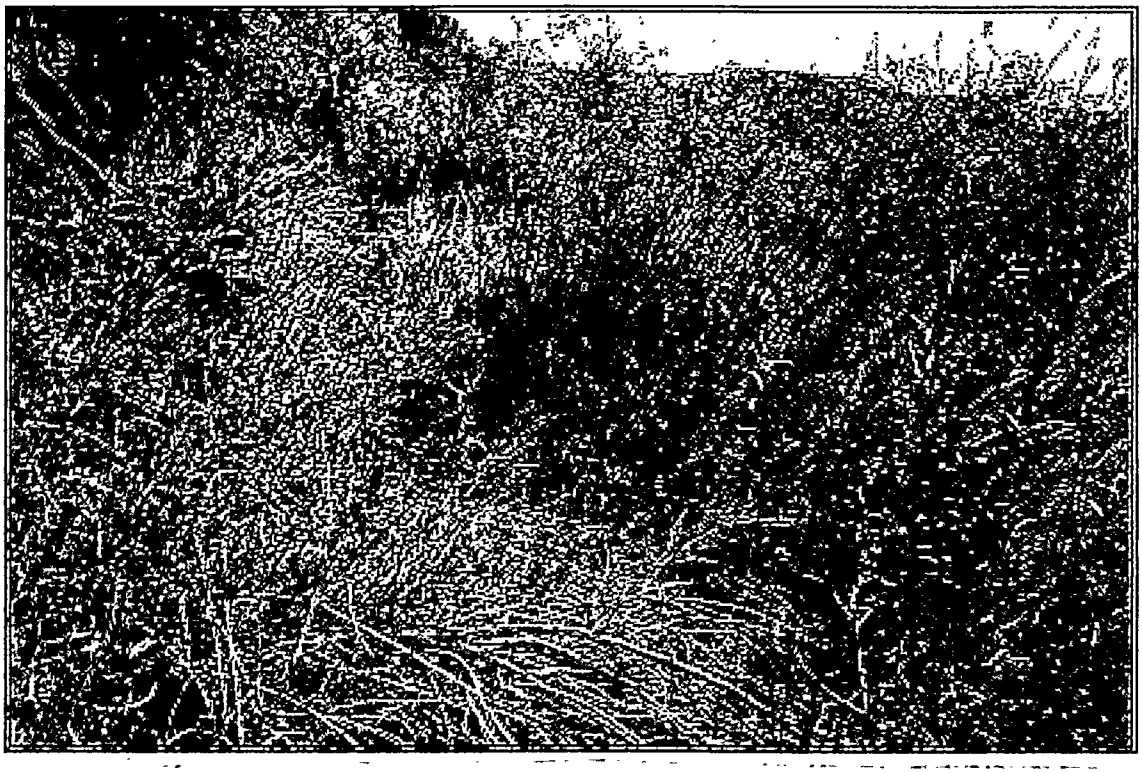

Photo 4-24 Closeup of wetland vegetation at Oak Spring on November 4, 1996 (WS343-16.TIF)

Table 4-10 Oak Spring wetland vegetation as surveyed on November 4, 1996

Habitat: Spring Outflow

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Salix exigua	sandbar willow	FACW	**100**
Herb Layer:			
no species			

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

An adjacent transitional area between the jurisdictional wetland and upland areas was comprised of basin wildrye and smooth sumac. Within this transitional area, basin wildrye constituted about 30 percent cover and smooth sumac about 5 percent.

4.2.9.3 *Wetland Hydrology and Water Quality*

Field indicators of wetland hydrology were restricted to one area during the wetland survey in November 1996. This area was a small pool of surface water less than 1 m^2 (11 ft^2) in area and about 2.5 cm (1 in) deep. Flow out of this pool was measured at 0.4 ℓ/min (0.1 gal/min) in December 1996 (Table 5-1, Section 5.0). No water quality measurements were taken at the site.

4.2.9.4 *Hydric Soils*

Field indicators for hydric soils were restricted to saturated soils at the surface pool at Oak Spring. Soils were fairly shallow and limited in areal extent. Soil mottling was not observed in the soil pit that was dug; however, soils had a moderate amount of dark organic matter and were saturated for what appeared to have been greater than seven days during the growing season, indicating the presence of hydric soils. The spring had apparently been excavated and soils may have represented an atypical situation.

4.2.9.5 *Determination of Jurisdictional Status*

Only the small area at Oak Spring occupied by sandbar willow met the criteria to be considered as a jurisdictional wetland because it had field indicators for all three required

parameters: hydrophytic vegetation, wetland hydrology, and hydric soils. Other areas lacked field indicators for hydrophytic vegetation.

4.2.9.6 *Wildlife Use*

Few observations of wildlife have been made at this site due to its remote location. Mule deer are common in the area as evidenced by the presence of scat near the spring. Other species which have been observed in the past include black-tailed jackrabbits, mourning doves, common ravens, and scrub jays (*Aphelocoma coerulescens*). The grove of Gambel's oak probably offers significant cover for many species of wildlife.

4.2.10 Pavits Spring

4.2.10.1 *Site Description and Historical Use*

Pavits Spring is located in a remote area east of Hampel Hill in a wash bottom about 3.2 km (2 mi) southwest of Frenchman Flat (Figure 4-10; Photos 4-25 and Photo 4-26). There is no evidence that indicates this spring has been modified by man. Surface water was observed in a small pool about 20 cm (8 in) deep at Pavits Spring during previous visits to this spring on February 2, March 23, and September 9, 1988 (Photo 4-27). However, during the September 1996 visit, the spring pool was dry (Photo 4-28).

4.2.10.2 *Hydrophytic Vegetation*

The only wetland plant species recorded at Pavits Spring during September 1996 was alkali sacaton (*Sporobolus airoides*). This species was confined to an area less than 1 m^2 (11 ft^2). Upland species in the area include creosotebush (*Larrea tridentata*), white burrowbush (*Ambrosia dumosa*), rubber rabbitbrush, orchardgrass (*Dactylus glomerata*), blugrasses, and largeflower suncup (Cane Spring evening primrose).

From the survey observation point located at the dry wash pool, only 33 percent of the dominant plant species were wetland species (Table 4-11), indicating that field indicators for hydrophytic vegetation were not present at Pavits Spring.

4.2.10.3 *Wetland Hydrology And Water Quality*

Field indicators for wetland hydrology consisted of water marks on the sides of the dry spring pool. Surface water did not exist at Pavits Spring during the wetland survey in September 1996 (Photo 4-28). The spring pool (dry during the September 1996 survey) is located at the bottom of a hill and adjacent to a drainage channel. No water quality measurements were taken at this site.

4.2.10.4 *Hydric Soils*

Field indicators for hydric soils were not observed at this site. Soil pits were not dug because of the potential to disturb the small pool site. Soils at this site are poorly developed, with little organic matter.

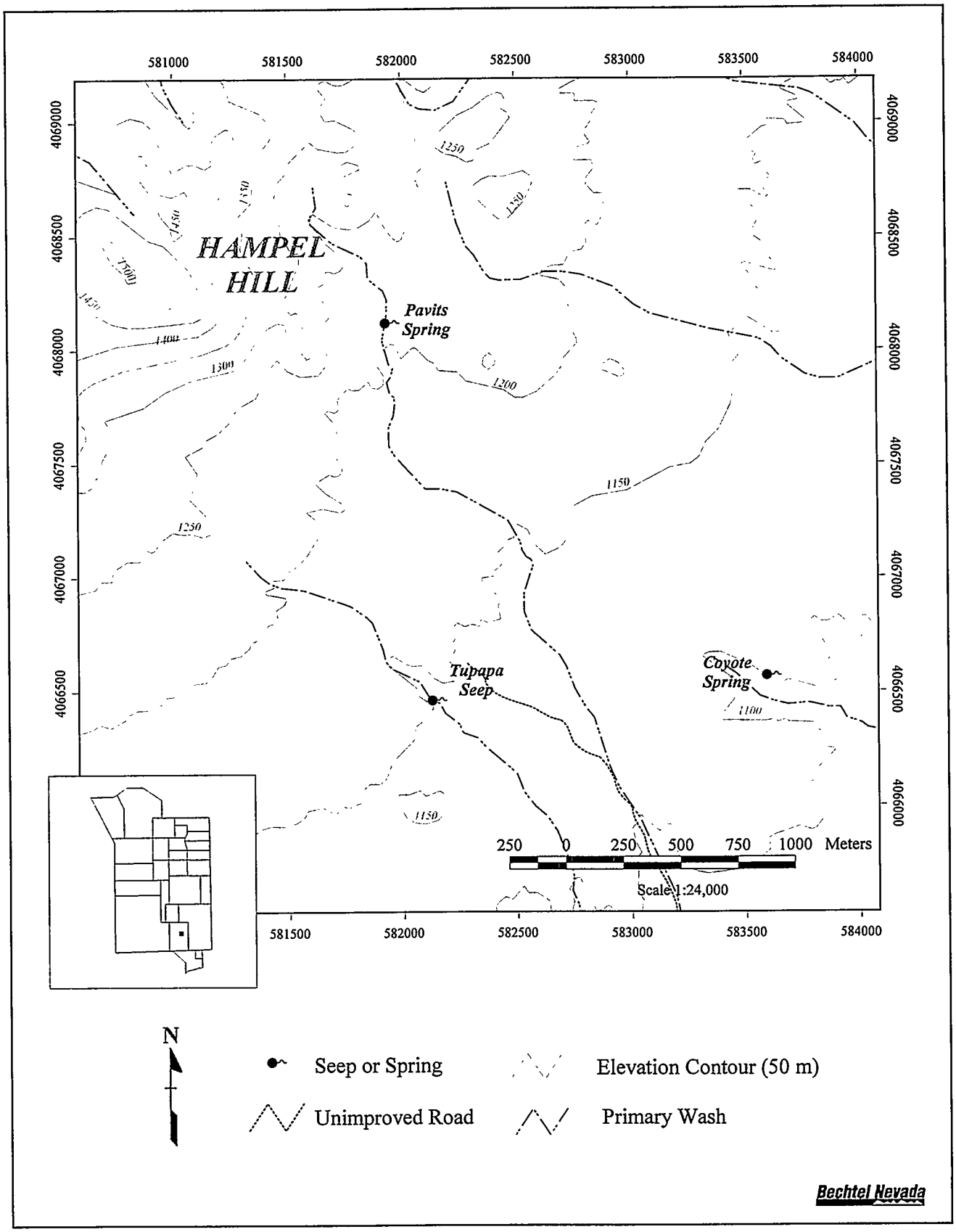

Figure 4-10 Location of Pavits Spring

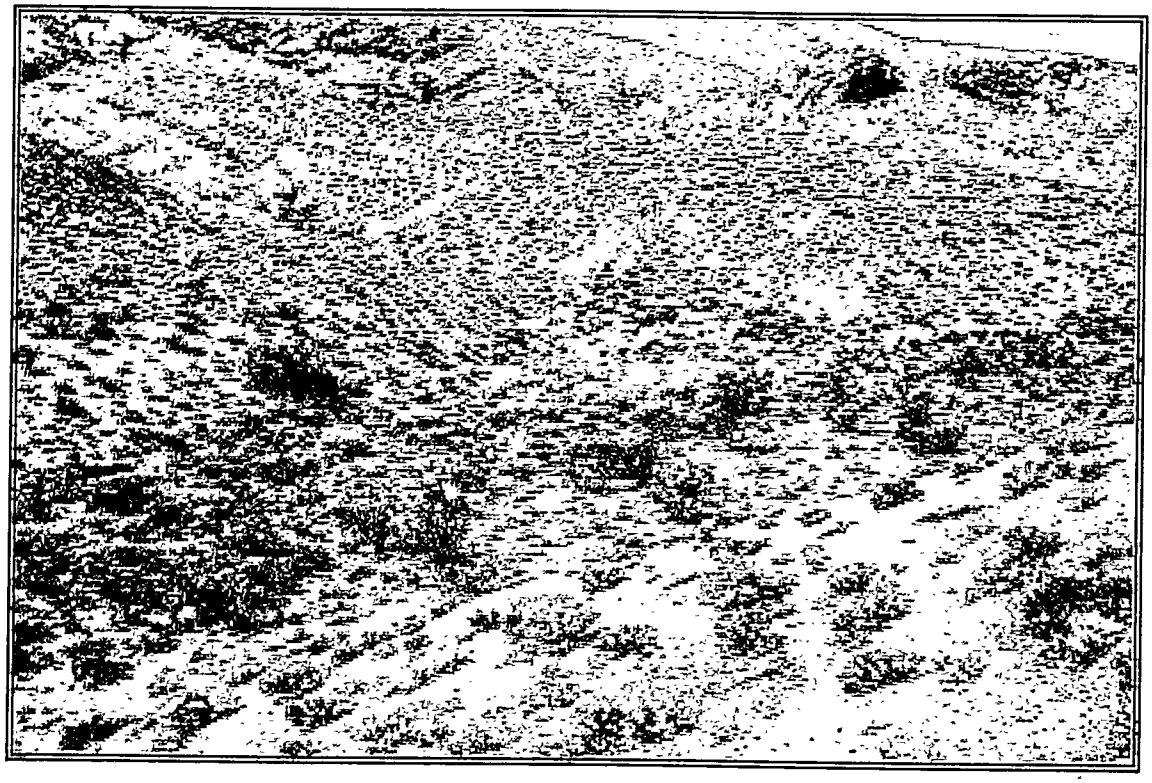

Photo 4-25 Habitat of Pavits Spring looking north on September 9, 1988 (WS036-17.TIF)

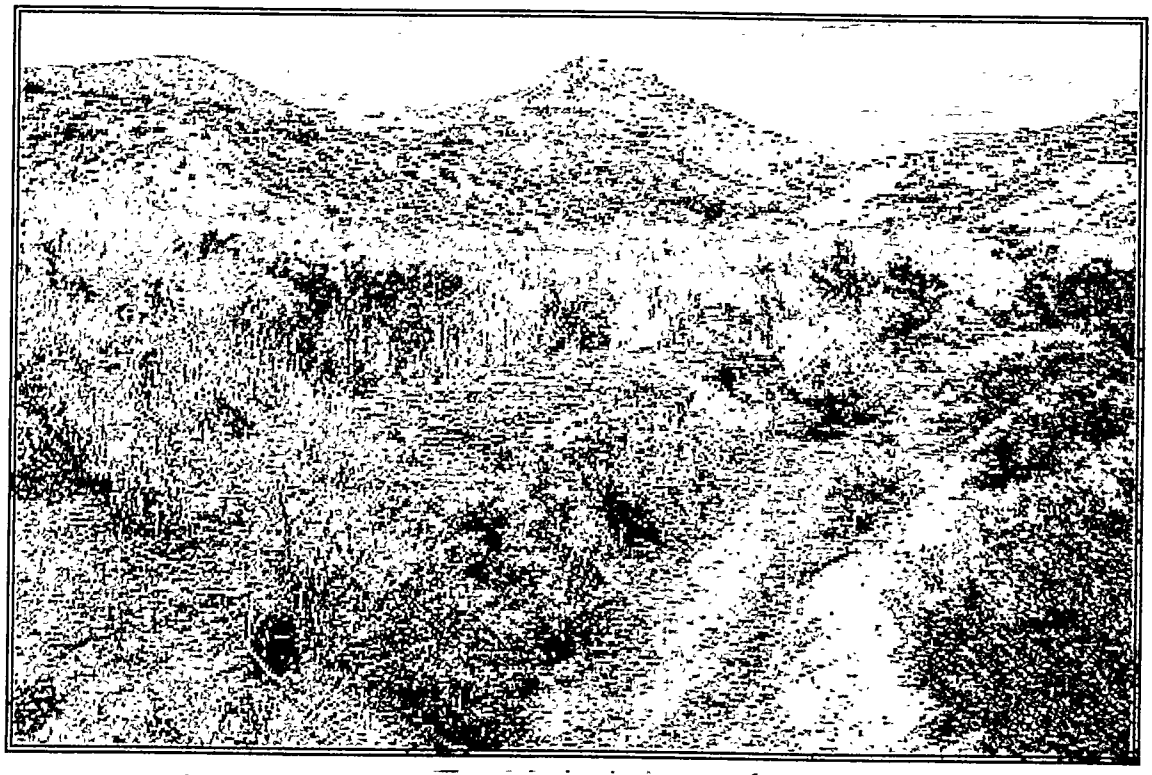

Photo 4-26 Wash vegetation around Pavits Spring looking northeast on September 9, 1988 (WS036-14.TIF)

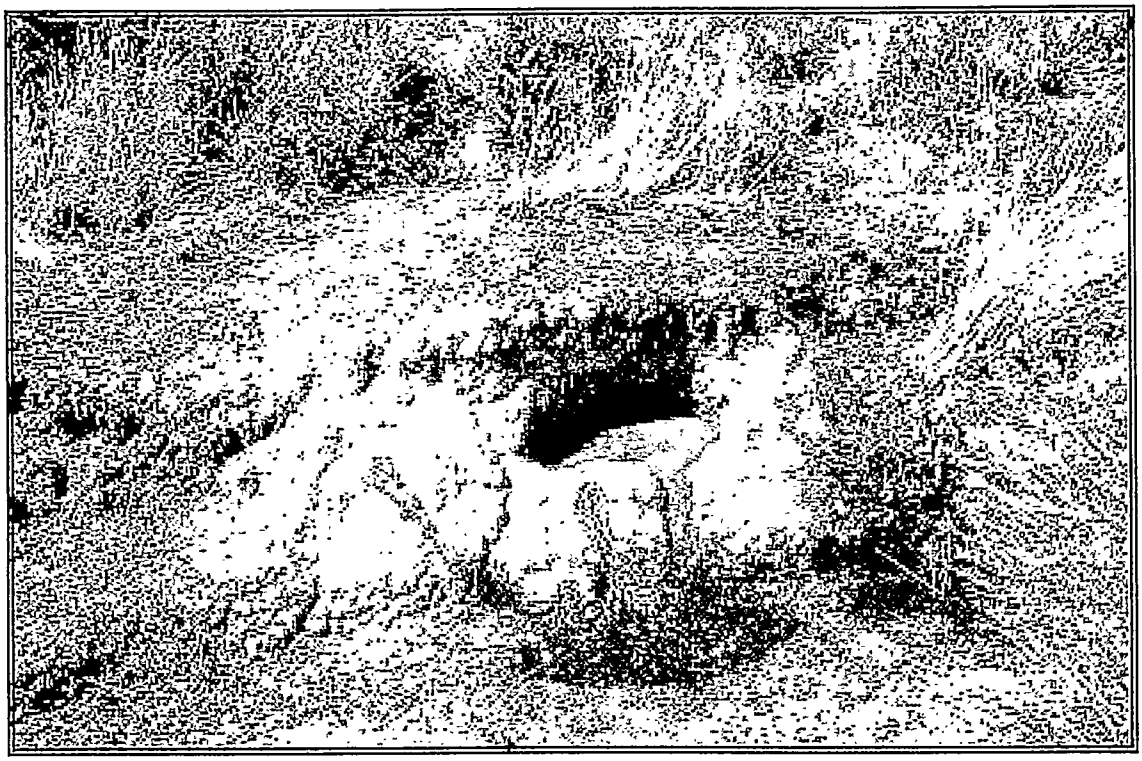

Photo 4-27 Pavits Spring pool with water on September 9, 1988 (WS036-10.TIF)

Photo 4-28 Dry pool at Pavits Spring on September 4, 1996 (WS502-01.TIF)

Table 4-11 Pavits Spring wetland vegetation as surveyed on September 4, 1996

Habitat: Dry Wash Pool

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Ericameria (Chrysothamnus) nauseosa	rubber rabbitbrush	NL	**40**
Herb Layer:			
Dactylus glomerata	orchardgrass	FACU	**10**
Sporobolus airoides	alkali sacaton	FAC-	**10**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 33 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

4.2.10.5 *Determination of Jurisdictional Status*

Because of the lack of hydrophytic vegetation and hydric soils, it is probable that Pavits Spring would not be considered a jurisdictional wetland.

4.2.10.6 *Wildlife Use*

Wildlife which use Pavits Spring include desert cottontails (*Sylvilagus audobonii*), coyotes, Gambel's quail, hummingbirds, and mule deer. Invertebrate groups recorded from water samples from Pavits Spring in 1988 (Greger, unpublished notes) include chironomids (aquatic midges), cladocerans (water fleas), oligochaetes (aquatic earthworms), and nematodes (round worms).

4.2.11 Rainier Spring

4.2.11.1 *Site Description and Historical Use*

Rainier Spring is located in a wash adjacent to a dirt road approximately 300 m (984 ft) north of E Tunnel Portal (Figure 4-11, Photo 4-29). This site was apparently used in the

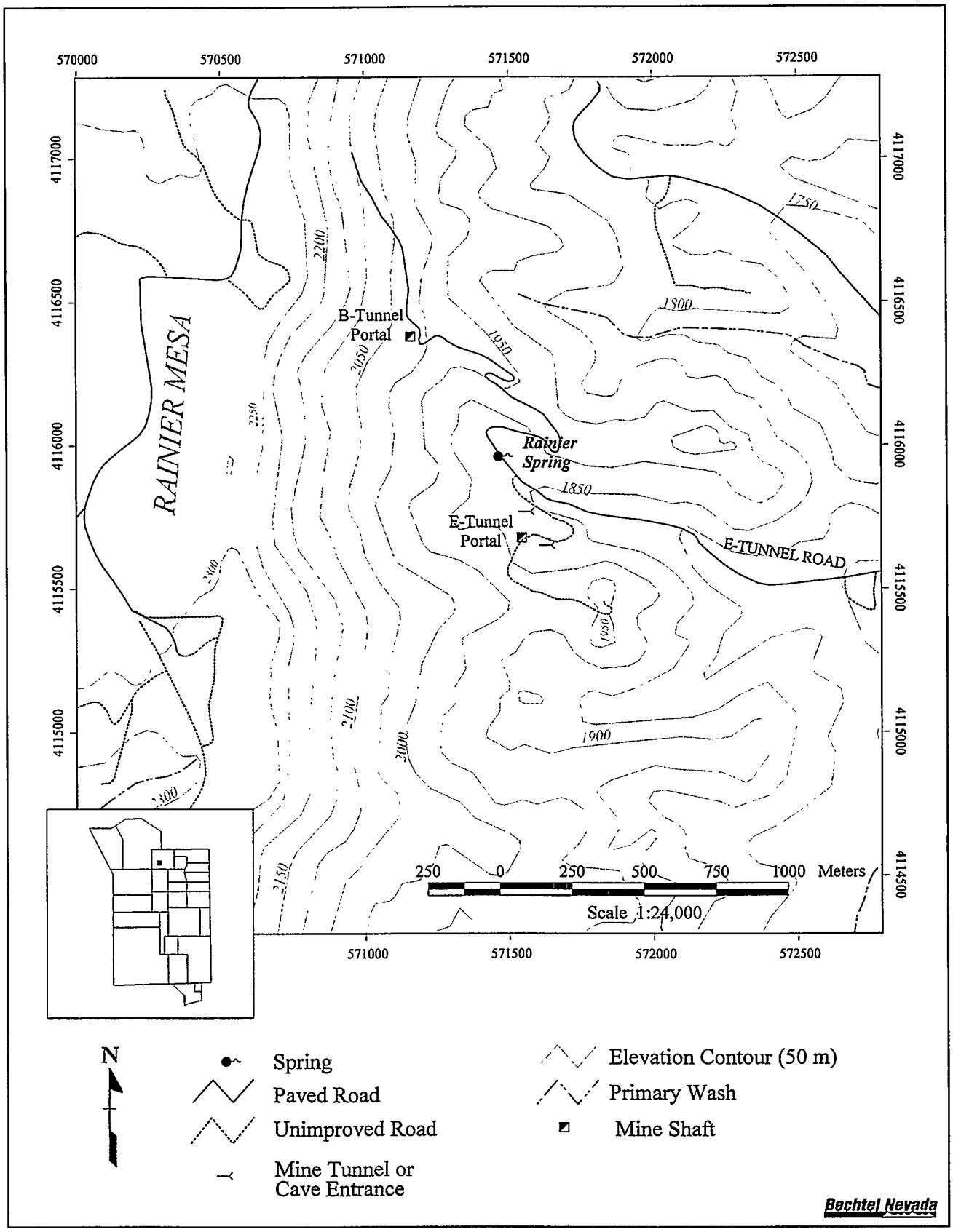

Figure 4-11 Location of Rainier Spring

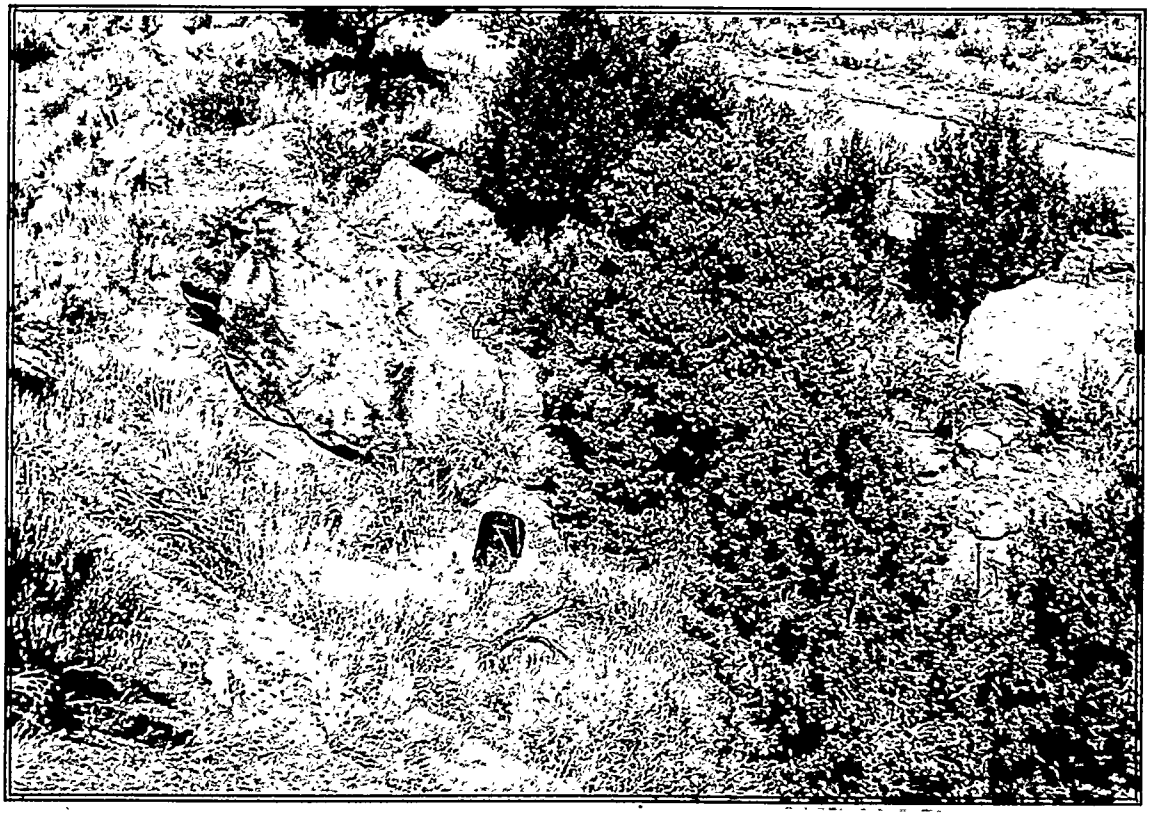

Photo 4-29 Habitat at Rainier Spring looking north on February 20, 1997 (RAINIER1.TIF)

Photo 4-30 Closeup of vegetation at Rainier Spring on February 20, 1997 (RAINIER2.TIF)

1900s to water livestock, as evidenced by the presence of metal water tanks. Several metal pipes exist in the wash. One outflow pipe was inserted into the rocks about 10 m (33 ft) above several water guzzlers which were made from 55-gallon (208-ℓ) drums and were filled partially with sediment (Photo 4-30). A wooden post was inserted into the wash sediment apparently to secure or stabilize one of the tanks. An overturned stock tank about 1.8 m (6 ft) long × 0.6 m (2 ft) wide was located about 10 m (33 ft) further down the wash from the drums.

4.2.11.2 *Hydrophytic Vegetation*

The wetlands survey performed on December 18, 1996, showed that basin wildrye, a nonhydrophytic plant, was the only dominant plant species present in the wash at Rainier Spring and comprised about 30 percent of the cover in the wash (Table 4-12). The area of the wash where basin wildrye occurred was about 22 m^2 (237 ft^2). Plant species in the surrounding upland included big sagebrush, mormon tea, rubber rabbitbrush, Utah juniper, and singleleaf pinyon. It was concluded that hydrophytic vegetation did not occur at this site at the time of the survey, although basin wildrye is indicative of mesic areas elsewhere on the NTS.

Table 4-12 Rainier Spring wetland vegetation as surveyed on December 18, 1996

Habitat: Wash

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Leymus cinereus	basin wildrye	FACU	**30**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 0 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

4.2.11.3 *Hydrology*

Rainier Spring was reported to have water on September 18, October 4, and October 15, 1957 (Moore, 1961). This site was sampled for water quality and radioactivity at that time. Rainier Spring was reported to be dry on November 10, 1960 (Moore, 1961). No flow was observed from the outflow pipe in 1996. A dirt road leading to B Tunnel exists within 20 m (66 ft) of the spring site. The construction of this road may have influenced

drainage and recharge patterns of the area by intercepting rainfall and directing water flow down the road. This could have decreased spring discharge. Surface water was absent at Rainier Spring on December 18, 1996, and no water quality measurements were taken.

4.2.11.4 *Hydric Soils*

No field indicators of hydric soils (such as surface water or saturated soils) were observed at Rainier Spring.

4.2.11.5 *Jurisdictional Wetland Determination*

Rainier Spring would probably not be considered a jurisdictional wetland because it lacked all three characteristics of a jurisdictional wetland: hydrophytic vegetation, wetland hydrology, and hydric soils.

4.2.11.6 *Wildlife Use*

The Rainier Spring site has little value for wildlife use because it lacks surface hydrology. No wildlife or their sign were observed at the site during the wetland survey.

4.2.12 Reitmann Seep

4.2.12.1 *Site Description and Historical Use*

Reitmann Seep was also known as Green Spring (Giles, 1976); however, this site is unnamed (i.e., referred to as "spring") on the Paiute Ridge USGS 7.5-Minute Series quadrangle map (1986). The name "Reitmann Seep" has been commonly used in past DOE reports. It is about 3 km (2 mi) east of Yucca Flat and southwest of Slanted Buttes (Figure 4-12, Photo 4-31). The seep forms a very small pool (Photo 4-32) and contains about 23 ℓ (6 gal) of water throughout the year (Giles, 1976). The pool and surrounding vegetation have an area of about 1 m^2 (11 ft^2). The slope above Reitmann Seep is moderately steep and heavy rainfall commonly fills the pool with sediment. Little information on historical use of Reitmann Seep by humans is known. The seep was improved by man during recent times, apparently for the purpose of supplying water to wildlife. A 55-gallon (208-ℓ) drum (now heavily rusted) is cut open on one side and buried flush with the soil surface. It was installed about 10 m (33 ft) downslope from the spring pool and is fed water through a pipe. The pipe from the pool to the drum is buried in a narrowly excavated channel.

4.2.12.2 *Hydrophytic Vegetation*

Wetlands vegetation at Reitmann Seep includes Parish's spikerush (*Eleocharis parishii*) and annual rabbitsfoot grass. From the survey observation point at the spring pool, about 66 percent of the dominant plant species around the seep were wetland species (Table 4-13), indicating that hydrophytic vegetation was present at Reitmann Seep. This area of

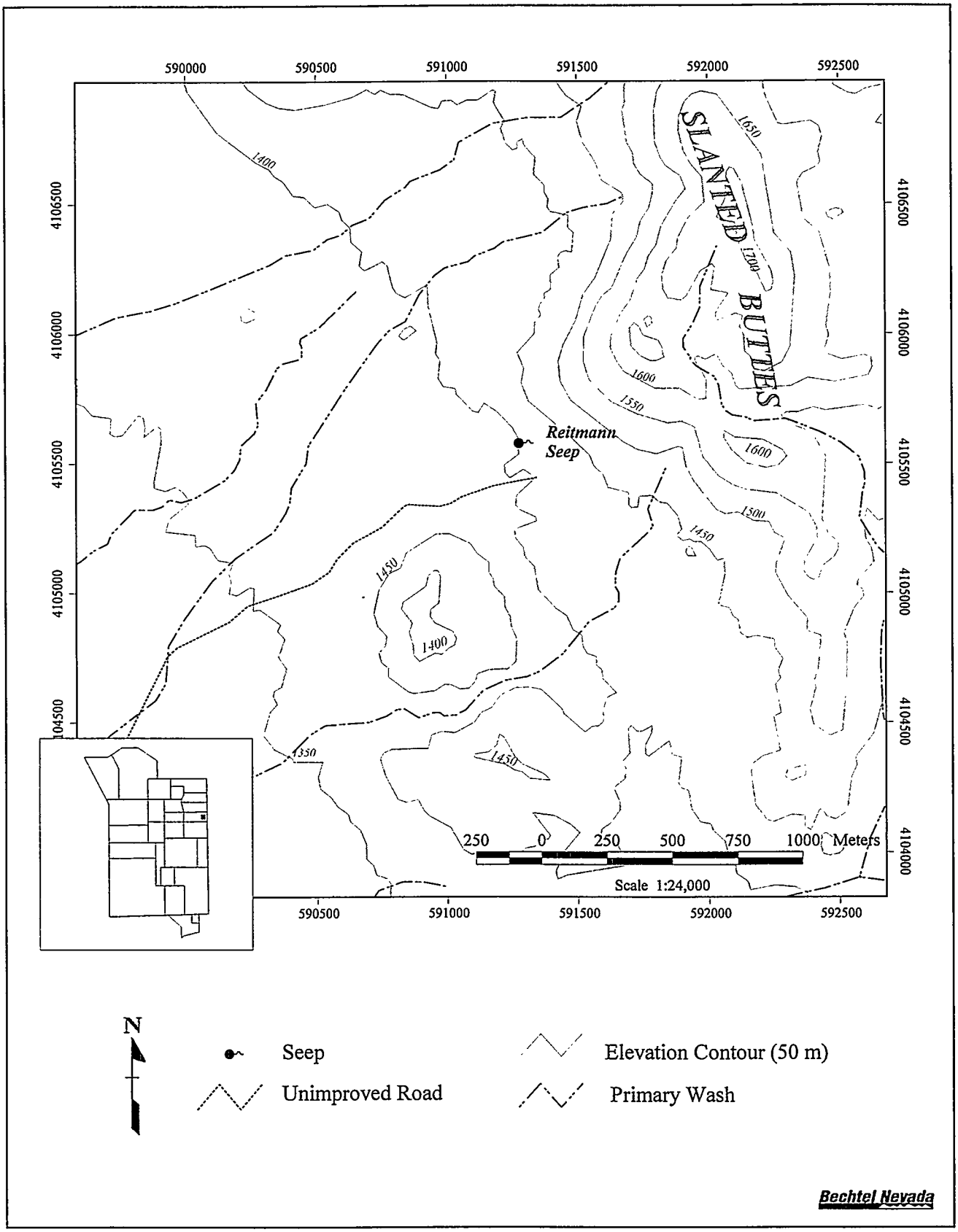

Figure 4-12 Location of Reitmann Seep

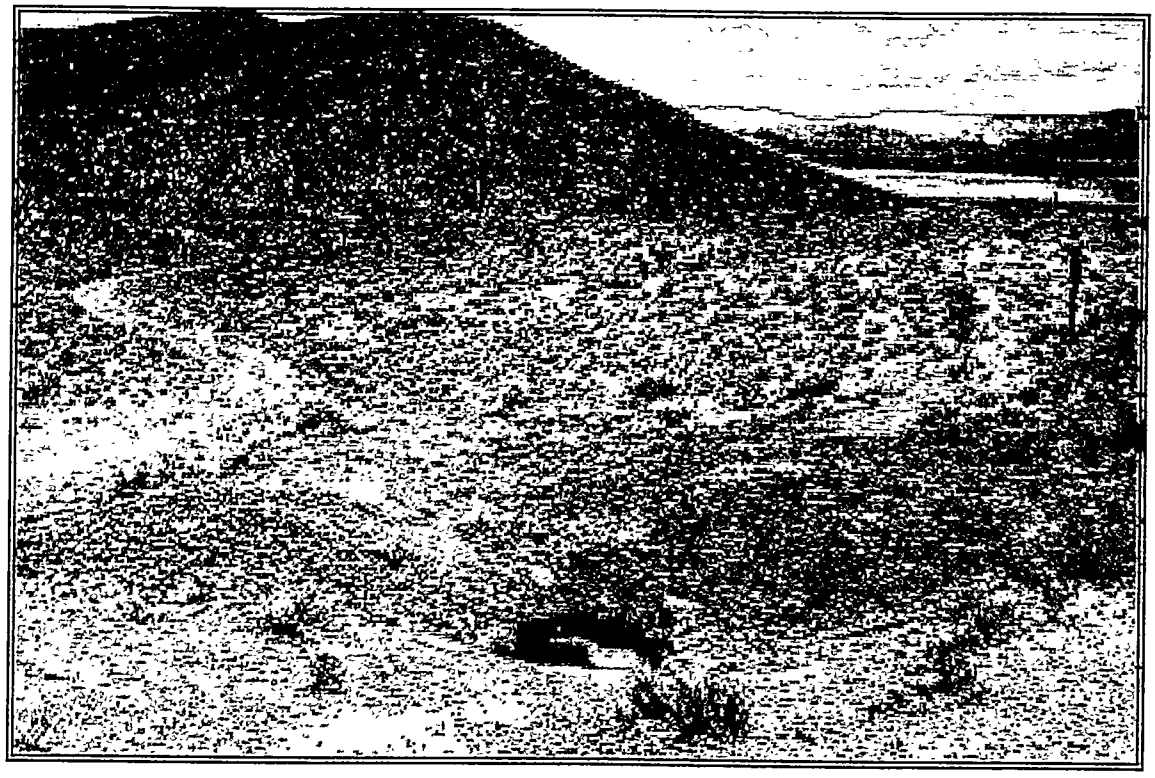

Photo 4-31 Habitat of Reitmann Seep looking southwest on June 2, 1989 (WS110-22.TIF)

Photo 4-32 Pool at Reitmann Seep on June 2, 1989 (WS110-23.TIF)

Table 4-13 Reitmann Seep wetland vegetation as surveyed on June 19, 1996

Habitat: Spring Pool

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Bromus rubens	foxtail brome	FACU	**10**
Eleocharis parishii	Parish's spikerush	OBL	**50**
Polypogon monspeliensis	annual rabbitsfoot grass	FACW+	**40**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 66 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

wetland vegetation is very small (about 1 m^2 [11 ft^2]). Vegetation of the upland plant community adjacent to the wetland included fourwing saltbush, foxtail brome, blackbrush, and Joshua tree (*Yucca brevifolia*).

4.2.12.3 *Wetland Hydrology and Water Quality*

Surface water is present throughout the year at Reitmann Seep in a small pool and a guzzler whose combined area is approximately 1.5 m^2 (12 ft^2). The pool is located at the base of a fractured, rocky hillside in an earthen basin that appears to have been formed by runoff water from the hillside above the pool. Flow rates measured from an existing pipe inserted into the ground at the spring were low and varied from 0.03 ℓ/min (0.007 gal/min) in September 1996 to 0.2 ℓ/min (0.05 gal/min) in November 1996 (Table 5-1, Section 5.0). Water quality measurements were taken in June, July, September, and November 1996. Data are presented in Table 5-2 (Section 5.0).

4.2.12.4 *Hydric Soils*

Hydric soils were restricted to the saturated soils at the spring pool at Reitmann Seep. These soils appear to be saturated for more than seven days during the plant growing season, indicating the presence of hydric soil. Soils are very black and appear high in decaying organic matter, most of which appears to be plant litter that has blown into the pool from adjacent upland vegetation.

4.2.12.5 *Determination of Jurisdictional Status*

The spring pool at Reitmann Seep, although very small in size, meets the criteria to be considered a jurisdictional wetland based on the presence of all three required parameters: wetland hydrology, hydrophytic vegetation, and hydric soils.

4.2.12.6 *Wildlife Use*

Wildlife commonly using Reitmann Seep include coyotes, mule deer, mourning doves, Gambel's quail, and passerine birds such as sage sparrows (*Amphispiza belli*). Invertebrates observed at the site include ostracods.

4.2.13 Rock Valley Tank

4.2.13.1 *Site Description and Historical Use*

Rock Valley Tank is located at the western edge of Rock Valley near the base of a limestone ridge (Figure 4-13, Photo 4-33). Little is known about human use of this water tank. It is likely that Native Americans used the site because Native American artifacts occur within 3 km (1.9 mi of the water source near the southwest base of Skull Mountain (Colleen Beck [DRI], personal communication, 1992). Little evidence of human disturbance was observed at this site. Near the water source, some rocks had been moved and stacked into a pile.

4.2.13.2 *Hydrophytic Vegetation*

Hydrophytic vegetation was absent from the Rock Valley Tank site. Foxtail brome was the dominant plant growing in dark soils near the tank (Table 4-14). This mesic area below the tank covered about 25 m^2 (269 ft^2) surface area. Plant species in the surrounding upland area included white burrobush, Nevada jointfir, and creosotebush.

4.2.13.3 *Hydrology*

Surface water was present at the Rock Valley Tank on January 7, 1997, and was observed in the small rock opening measuring about 20 × 30 cm (8 × 12 in) at the base of a limestone ridge (Photo 4-34). No water flow from the rock cavity was observed. The depth of water inside the rock cavity near the surface was about 30 cm (1 ft). The water-filled cavity extended more than 1 m (3.3 ft) horizontally into the rock formation. It appears that the cavity may have been formed by a combination of standing water from runoff gradually dissolving the rock substrate, freezing and thawing of the water in the winter, and perhaps by water seeping through fractures in the rock formation. In the rock formation above the tank, several small 0.03-m^3 (1-ft^3) depressions appear to have been formed by similar processes, and water in these depressions may seep through the rock to the tank below. Narrow erosion channels in the rock were also frequently observed in the area along fractures. No water quality measurements were taken.

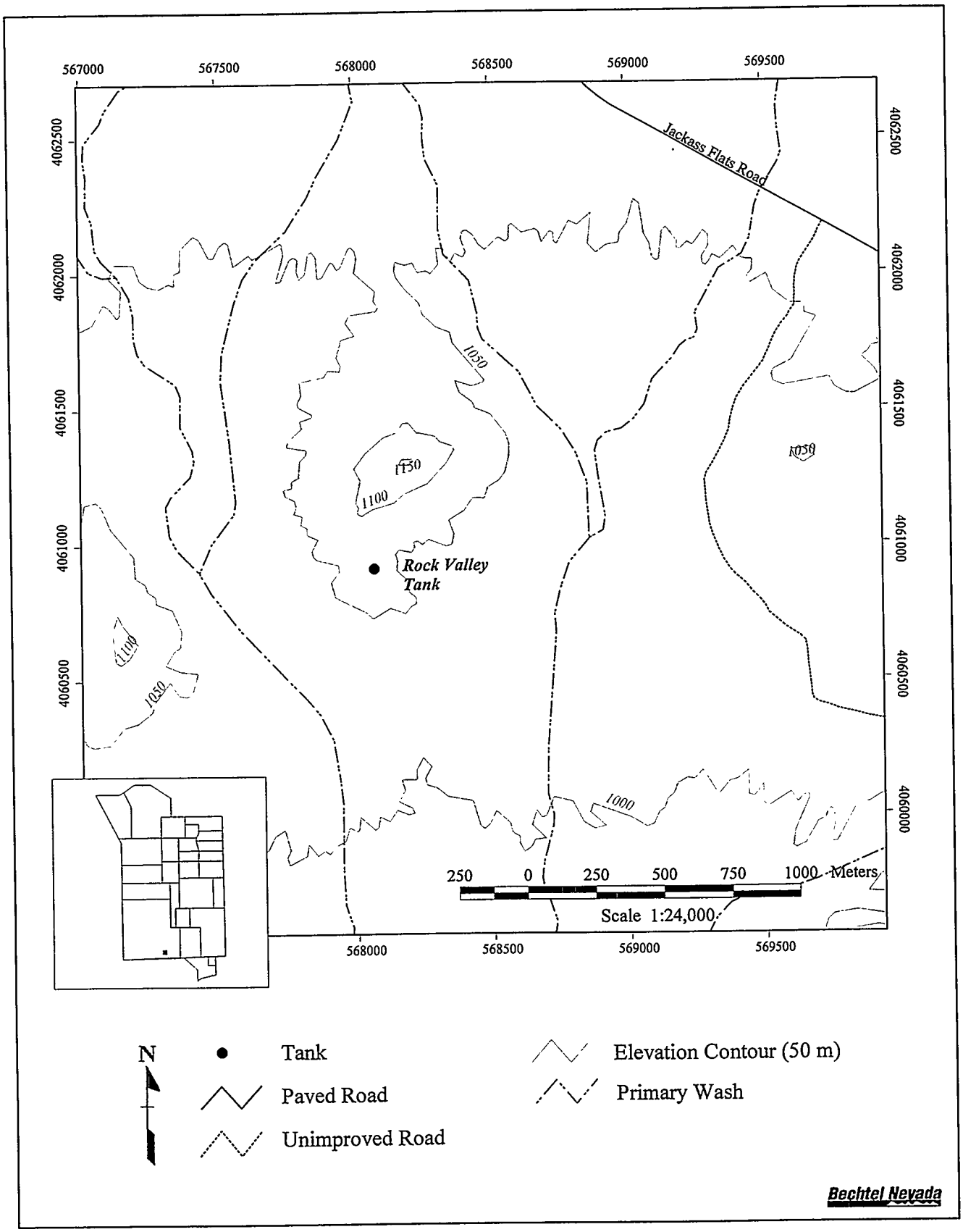

Figure 4-13 **Location of Rock Valley Tank**

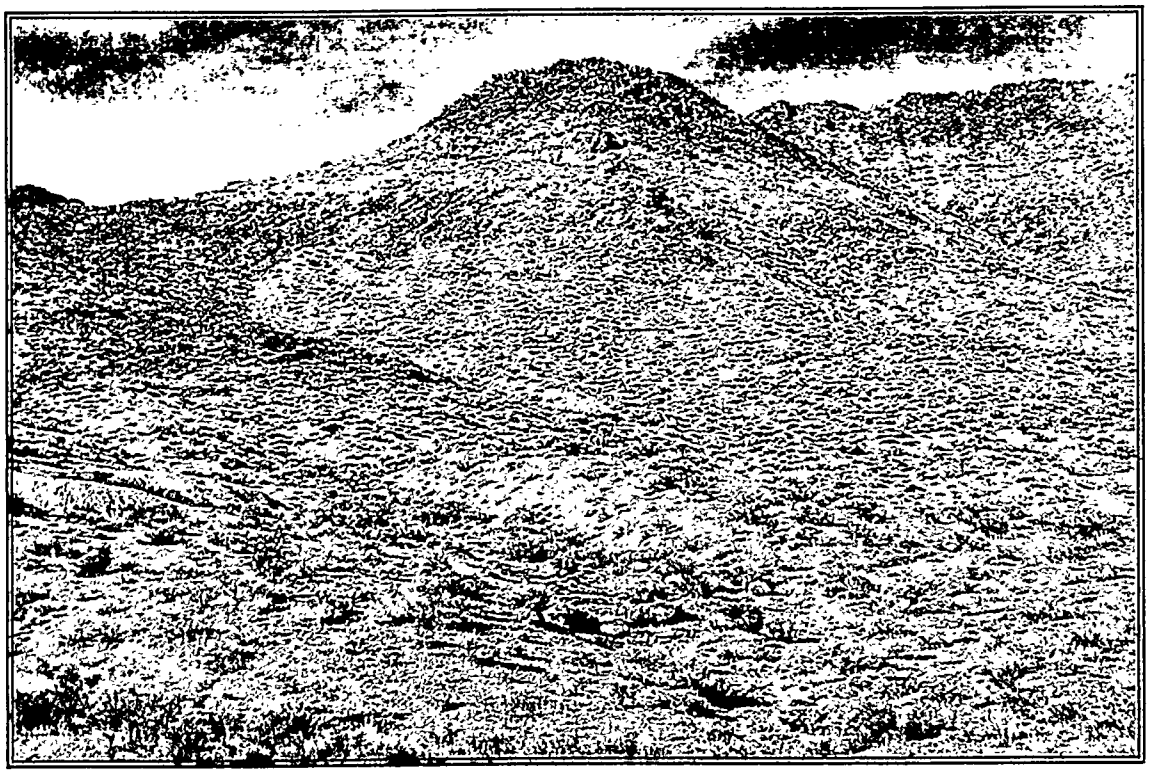

Photo 4-33 Habitat in the vicinity of Rock Valley Tank looking northwest on January 7, 1997 (WS346-24.TIF)

Photo 4-34 Tank opening (center) at Rock Valley Tank looking west on January 7, 1997 (WS340-20.TIF)

Table 4-14 Rock Valley Tank wetland vegetation as surveyed on January 7, 1997

Habitat: Limestone Outcrop

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Bromus rubens	foxtail brome	FACU	**20**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 0 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

4.2.13.4 *Hydric Soils*

The Rock Valley Tank site lacked field indicators for hydric soils. The soil found below the tank was not saturated. The soil appeared dark, probably due to erosion of the dark limestone rock.

4.2.13.5 *Jurisdictional Wetland Determination*

Rock Valley Tank would probably not be considered a jurisdictional wetland because it lacked hydrophytic vegetation and hydric soils.

4.2.13.6 *Wildlife Use*

Wildlife known to use this site include bobcats, coyotes, and the desert tortoise (Greger and Romney, 1994). Coyote scat was abundant at the water source in January 1997.

4.2.14 Tippipah Spring

4.2.14.1 *Site Description and Historical Use*

Tippipah Spring lies at the base of a northeast ridge of Shoshone Mountain (Figure 4-14). This area was occupied by Native Americans who had winter camps near the spring, probably during the late 1800s to early 1900s (Stoffle *et al.*, 1990a). An old stone building and foundation, scattered debris, pipes, a corral with a large water storage tank, and barbed wire fences attest that this area was once used by cattlemen and wild horse hunters (Worman, 1969). A gently sloping tunnel was excavated into the hillside, creating

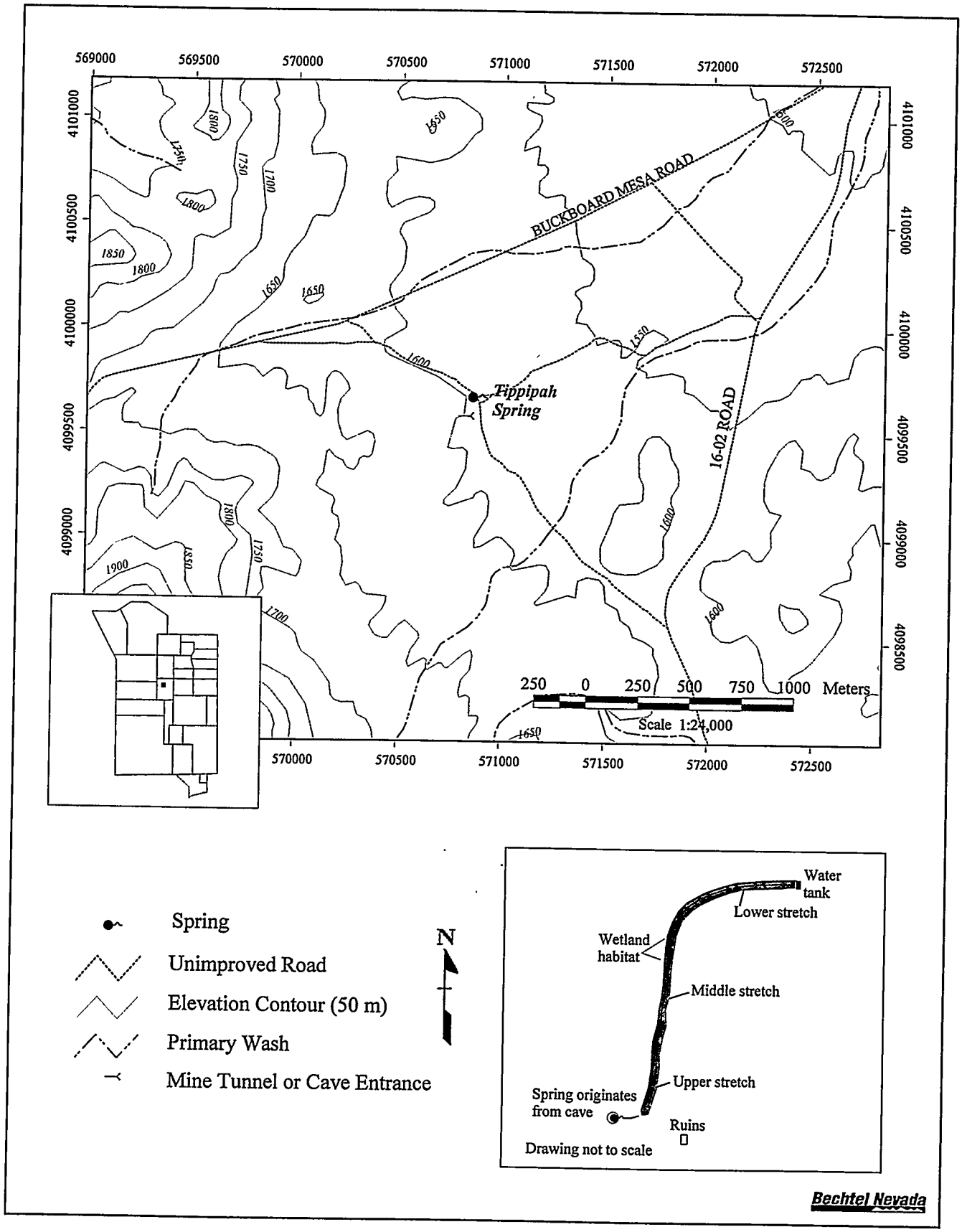

Figure 4-14 **Location and sketch of Tippipah Spring**

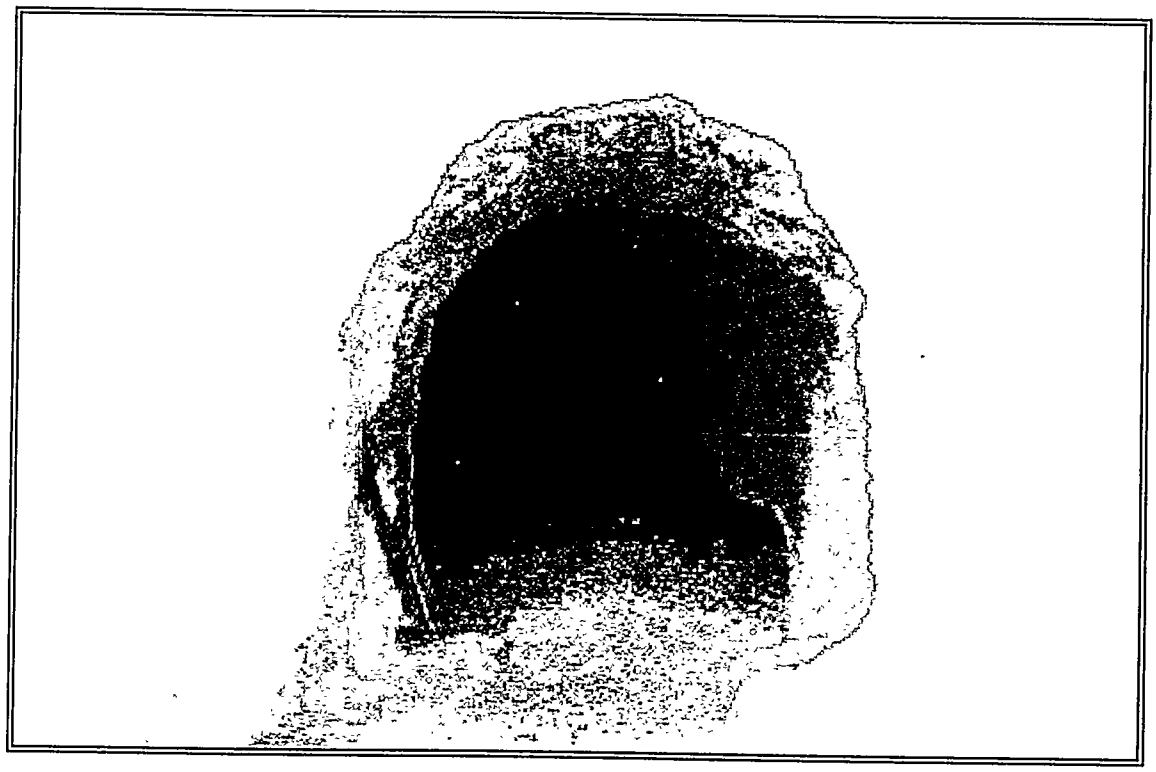

Photo 4-35 Tippipah Spring cave on October 5, 1988 (WS041-17.TIF)

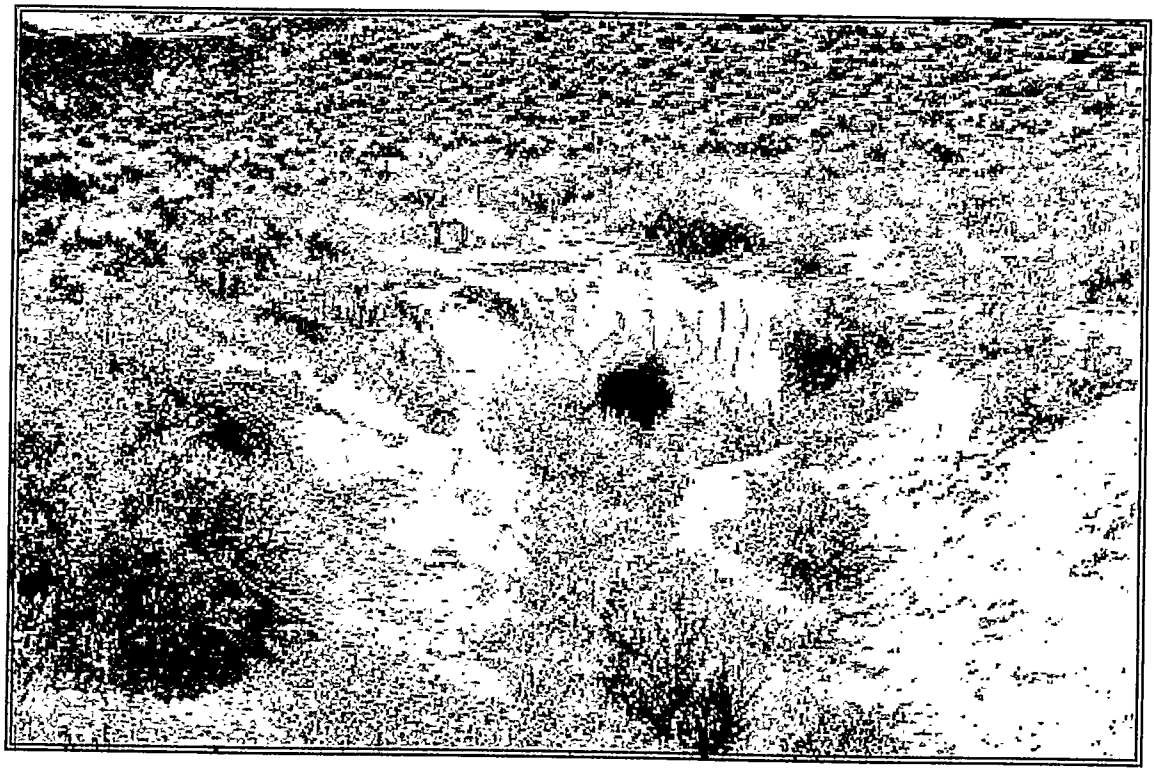

Photo 4-36 Habitat surrounding Tippipah Spring looking west on October 5, 1988 (WS501-01.TIF)

a cave approximately 9 m (30 ft) long (Giles, 1976). Spring water accumulates in the tunnel in a pool about 4 m (13 ft) from the cave entrance (Photo 4-35). The back of the tunnel is under water when the pool is full. The remaining 6 m (20 ft) of the adit are only visible when water levels in the pool are low. Water from the cave pool flows for about 40 m (130 ft) through subsurface strata and emerges in a long surface channel (Photo 4-36). The channel flows north for varying distances depending on seasonal rainfall (Figure 4-14). It appears that the upper portion of the spring channel has been excavated periodically by man judging from the mounds of dirt on either side of the channel. The upper spring channel was nearly dry during the Fall of 1990 resulting in a visible decline in cover of riparian plants (Photo 4-37). The same habitat showed recovery of the wetland vegetation during 1992 (Photo 4-38), a wet year which broke a three-year drought period.

4.2.14.2 *Hydrophytic Vegetation*

During June 1996, the wetland vegetation consisted of a narrow, linear corridor that extended for 170 m (558 ft). Three locations along its length were sampled: upper channel, mid-channel (Photo 4-39) and lower channel (Photo 4-40). Eleven species of wetland plants were recorded at these observation points. The dominant wetland species were Baltic rush, biennial cinquefoil, annual rabbitsfoot grass, and water speedwell (Tables 4-15 to 4-17). There were minor differences in the plant communities sampled at the three observation points. The number and composition of wetland plant species varies along the watercourse with distance from the spring source. Annual rabbitsfoot grass was present in the lower two sections and was not observed in the upper section. Biennial cinquefoil was present only in the lower channel. Other species within the jurisdictional wetland boundary were trefoil (*Lotus* sp.) and southern cattail. Louisiana sagewort and rubber rabbitbrush were encroaching on the edge of the wetland boundary. The overall wetland habitat was dominated by Baltic rush. The total surface area of this wetland, as defined by wetland vegetation, was approximately 500 m^2 (5,380 ft^2) (Table 5-1, Section 5.0). Common upland plant species in the area included big sagebrush, blackbrush, rubber rabbitbrush, fourwing saltbush, Nevada jointfir, and desert bitterbrush.

Surveys from the observation points in the upper channel, mid-channel, and lower channel all determined that 100 percent of the dominant plant species were wetland species indicating that Tippipah Spring has hydrophytic vegetation (Tables 4-15 to 4-17). However, no vascular plants were observed at the spring pool, possibly because the pool lies within the cave where light is limited.

4.2.14.3 *Wetland Hydrology and Water Quality*

Field indicators of wetland hydrology were restricted to the cave pool and the three channel areas. Surface water was present at Tippipah Spring during the wetland survey in June 1996. The estimated area of surface inundation was approximately 190 m^2 (2,044 ft^2) (Table 5-1, Section 5.0). Flow rates in the mid channel were estimated to be approximately 2.7 ℓ/min (0.7 gal/min) on November 15, 1996. Water quality measurements were taken at the open channel pool in June, September, and November 1996. Measurements were taken at the cave pool in September and November 1996. Data are presented in Table 5-2 (Section 5.0).

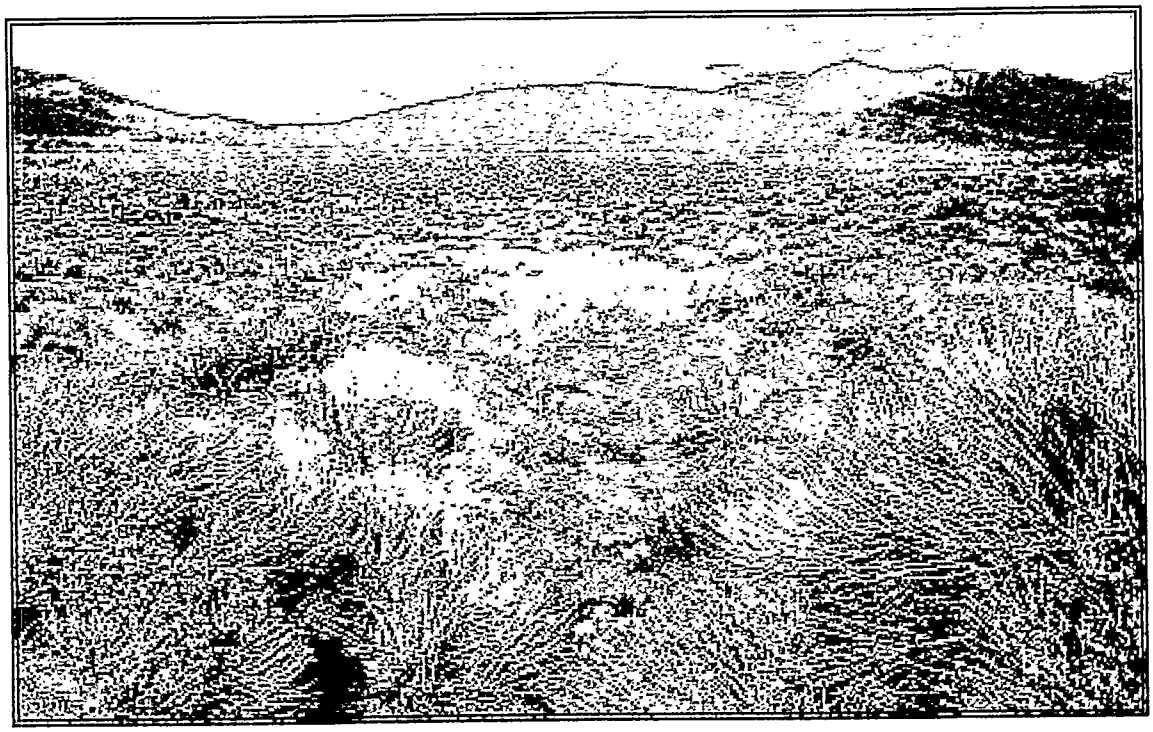

Photo 4-37 Tippipah Spring channel nearly dry, with drought-stressed vegetation, looking north on November 29, 1990 (WS231-03.TIF)

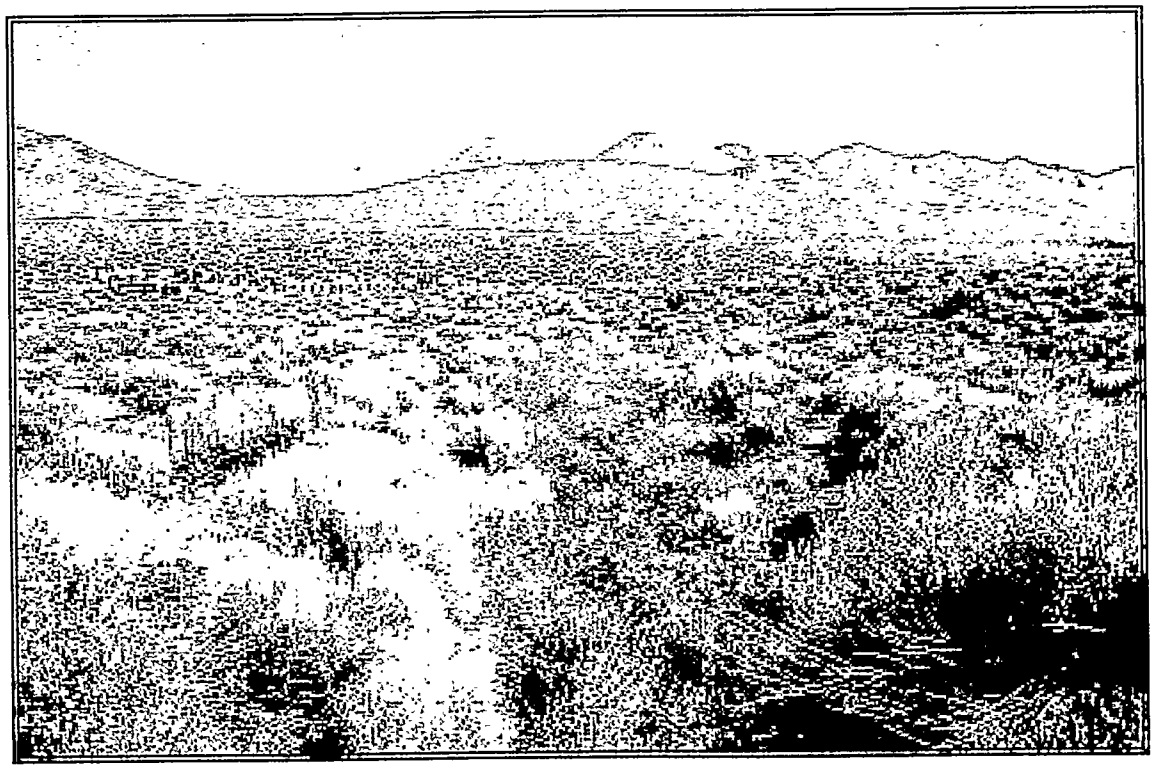

Photo 4-38 Upper reach of Tippipah Spring channel showing recovery of vegetation following drought, looking north on June 4, 1992 (WS310-09.TIF)

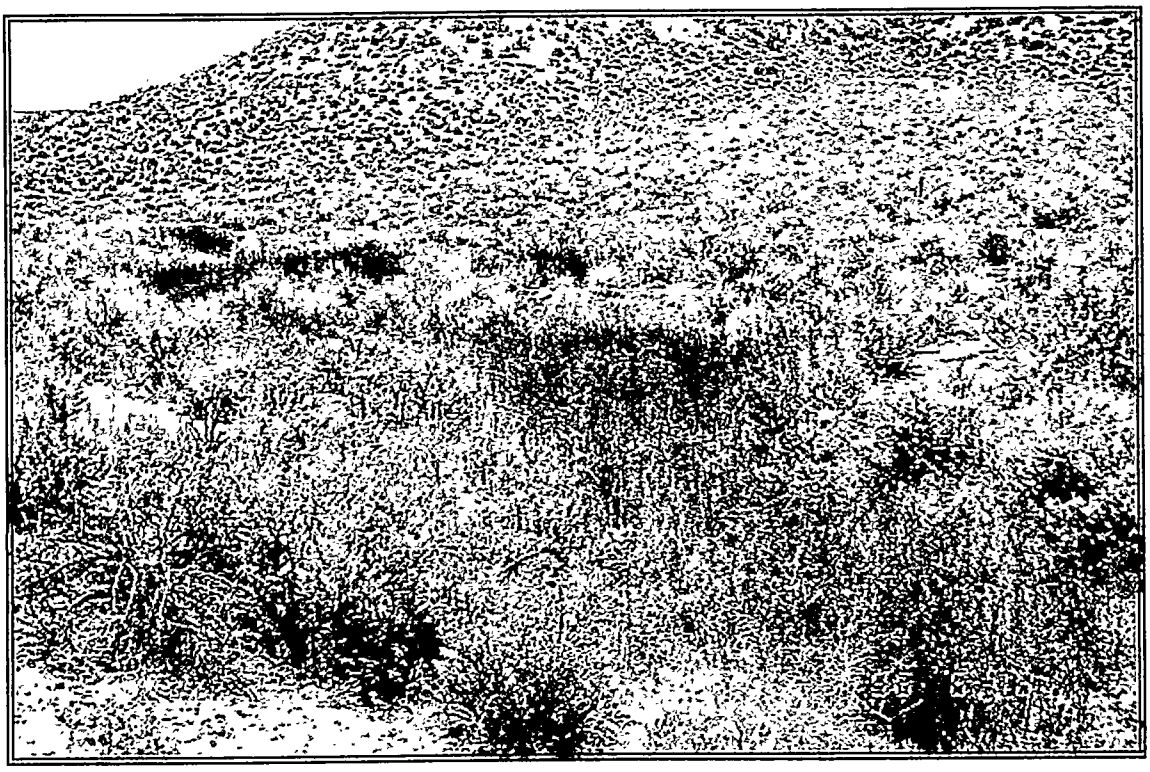

Photo 4-39 Middle reach of Tippipah Spring channel looking southwest on June 18, 1996 (WS341-25.TIF)

Photo 4-40 Lower reach of Tippipah Spring channel looking northwest on June 18, 1996 (WS341-24.TIF)

Table 4-15 Tippipah Spring wetland vegetation as surveyed on June 18, 1996

Habitat: Upper Stretch of the Spring Channel

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Carex praegracilis	clustered field sedge	FACW-	2
Eleocharis palustris	common spikerush	OBL	Tr
Heliomeris multiflora var. *nevadensis*	Nevada goldeneye	NL	Tr
Juncus balticus	Baltic rush	FACW	**49**
Polypogon monspeliensis	annual rabbitsfoot grass	FACW+	Tr
Veronica anagallis-aquatica	water speedwell	OBL	**49**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values. Tr = trace, <1% absolute cover.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

Table 4-16 Tippipah Spring wetland vegetation as surveyed on June 18, 1996

Habitat: Middle Stretch of Spring Channel

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Bromus rubens	foxtail brome	FACU	Tr
Bromus tectorum	cheatgrass	NL	2
Castilleja sp.	unidentified Indian paintbrush	UNKN	Tr
Deschampsia danthonioides	annual hairgrass	FACW	Tr
Eleocharis parishii	Parish's spikerush	OBL	Tr
Epilobium glaberrimum	smooth willowweed	FACW	2
Heliomeris multiflora var. *nevadensis*	Nevada goldeneye	NL	2
Juncus balticus	Baltic rush	FACW	**40**
Juncus longistylis	longstyle rush	FACW+	Tr
Lactuca serriola	prickly lettuce	FACU	2
Polypogon monspeliensis	annual rabbitsfoot grass	FACW+	**30**
Verbena bracteata	bigbract verbena	FACU	2
Veronica anagallis-aquatica	water speedwell	OBL	**20**

Percentage of dominant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values. Tr = trace, <1% absolute cover.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

Table 4-17 Tippipah Spring wetland vegetation as surveyed on June 18, 1996

Habitat: Lower Stretch of Spring Channel

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Bromus tectorum	cheatgrass	NL	Tr
Erodium cicutarium	redstem stork's bill	NL	Tr
Heliomeris multiflora var. *nevadensis*	Nevada goldeneye	NL	2
Juncus balticus	Baltic rush	FACW	**40**
Lactuca serriola	prickly lettuce	FACU	2
Polypogon monspeliensis	annual rabbitsfoot grass	FACW+	**10**
Potentilla biennis	biennial cinquefoil	FAC	**20**
Verbena bracteata	bigbract verbena	FAC	1
Veronica anagallis-aquatica	water speedwell	OBL	**25**

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold values for Absolute % Cover. Tr = trace, <1% absolute cover.
[a]For Region 8 indicator status codes for plants, see Section 3.2.4).

Hydrophytic vegetation: Yes

4.2.14.4 *Hydric Soils*

Field indicators of hydric soils were also restricted to areas at the cave pool and the three channel areas where soils appeared to be saturated for seven days or more during the plant growing season, indicating the presence of hydric soil. Several soil pits were dug to examine soils for other field indicators for hydric soils. No evidence of soil mottling was found. Because the upper spring outflow area appears to have been dug out or possibly blasted due to the presence of rock immediately adjacent to the channel, this site may represent an atypical situation for soils evaluation.

4.2.14.5 *Determination of Jurisdictional Status*

The three channel areas at Tippipah Spring would probably qualify as jurisdictional wetlands because they had field indicators for all three required parameters: hydrophytic vegetation, wetland hydrology, and hydric soils. The cave pool lacks hydrophytic vegetation and would probably not be considered as a jurisdictional wetland. It may, however, be protected under the CWA as waters of the United States.

4.2.14.6 *Wildlife Use*

Wildlife species observed at Tippipah Spring include chukar, coyotes, Gambel's quail, southern pocket gophers (*Thomomys umbrinus*), black-tailed jackrabbits, mourning doves, mule deer, raptors, and about 15 species of passerine birds. Invertebrates were abundant and included ostracods (seed shrimp), copepods (crustaceans), and aquatic insects.

4.2.15 Tongue Wash Tank

4.2.15.1 *Site Description and Historical Use*

Tongue Wash Tank is located in rock ledges southeast of Rainier Mesa within 500 m (1,641 ft) of the intersection of Holmes Road and Rainier Mesa Road (Figure 4-15). The cave entrance is about 2 m (6 ft) high by 1.5 m (5 ft) wide, large enough to permit entry by people or large animals (Photo 4-41). Native American use of the site is certain due to the petroglyphs on the rocks at the site. There was no evidence of human disturbance or modification of the hydrology of the site.

4.2.15.2 *Hydrophytic Vegetation*

No wetland or upland plants were observed at the observation point located at the tank on September 10, 1996. A small 2-m^2 (22-ft^2) vegetated area with soil fines and upland plants existed several meters downslope from the tank. Plant species in the surrounding upland included big sagebrush, mormon tea, Utah juniper, and singleleaf pinyon.

4.2.15.3 *Hydrology*

The Tongue Wash Tank exists in a natural cave in a tuff rock formation. Water appears to collect from internal fractures within the tuff. The pool of water in the tank measured about 3 m (10 ft) long by 1.5 m (5 ft) wide and 25 cm (10 in) deep. A dark water line mark observed in the tank indicates long-standing water and a pool depth of 46 cm (18 in) when full (Photo 4-42). There was no water flow observed from the tank; however, water line marks indicate that water could reach a level that may result in an overflow of the tank. No water quality measurements were taken.

4.2.15.4 *Hydric Soils*

The Tongue Wash Tank site lacks hydric soils because the surface water is confined to rock substrate.

4.2.15.5 *Jurisdictional Wetland Determination*

Tongue Wash Tank would probably not be considered a jurisdictional wetland because it lacked hydrophytic vegetation and hydric soils. The water in the tank may, however, be considered waters of the United States protected under the CWA.

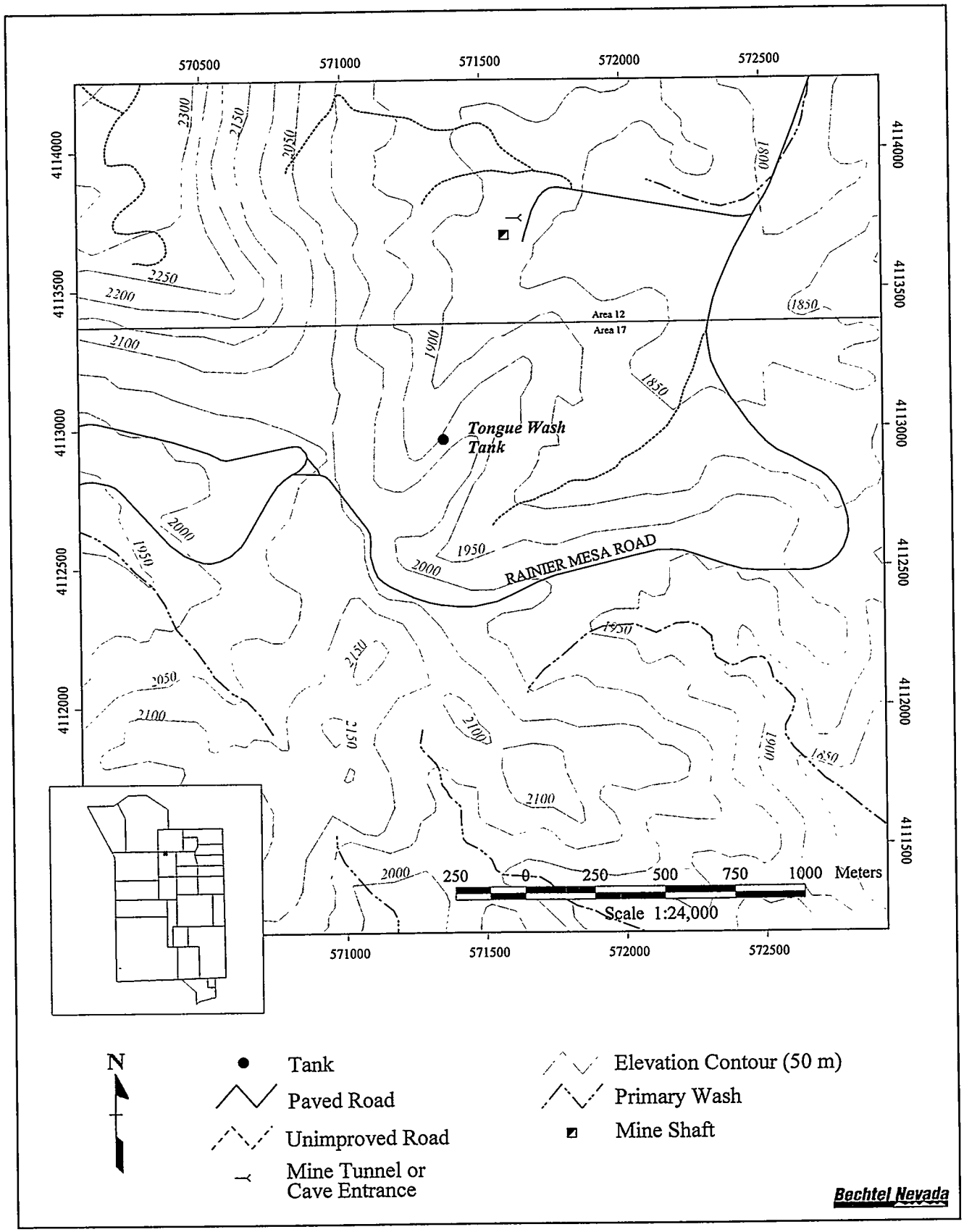

Figure 4-15 Location of Tongue Wash Tank

Photo 4-41 Cave opening at Tongue Wash Tank looking south on January 10, 1997 (WS340-24.TIF)

Photo 4-42 Tank inside cave at Tongue Wash Tank on January 10, 1997 (WS340-22.TIF)

4.2.15.6 *Wildlife Use*

Little is known about wildlife use of Tongue Wash Tank. Several species of birds, including ravens, were observed drinking from the water tank on September 10, 1996.

4.2.16 Topopah Spring

4.2.16.1 *Site Description and Historical Use*

Topopah Spring is located on a south-facing slope in a box canyon of Topopah Wash southwest of Shoshone Peak (Figure 4-16). Native Americans used this area as a winter camp during the late 1800s or early 1900s (Stoffle *et al.*, 1990a). A rock shelter exists on the hill slope opposite the spring. Remnants of human habitation including a concrete foundation, pipes, and water tanks occur immediately to the west of the spring. Evidence of some excavation exists on the hillside meadow where some seeps emanate (Photo 4-43). A cave pool (Photo 4-44) occurs at the base of a small man-made tunnel (Worman, 1969). A pipe was installed in the ground about 15 m (49 ft) downslope from the cave pool. Water flows out the end of this pipe forming a second, much smaller shallow pool (Photo 4-45). The upland vegetation near the spring was modified by a wildfire burn that occurred in Topopah Wash many years ago.

4.2.16.2 *Hydrophytic Vegetation*

Two observation points at Topopah Spring were sampled: the area around the cave pool and the hillside meadow. These two areas form a discontinuous wetland site. A total of 11 wetland species of plants were recorded from both areas at Topopah Spring (Tables 4-18 and 4-19). There were differences in the vegetation between the two areas sampled. The cave pool area had fewer plant species (10) compared to the hillside meadow (17). Species composition (based on percent absolute cover and dominance) was also different between sites. The cave pool area had three dominant wetland species including seep monkeyflower, willow dock, and water speedwell. The dominant wetland species on the hillside meadow included Baltic rush and Rocky Mountain rush (*Juncus saximontanus*) (Photo 4-46). Eleven species in the sample area of the hillside meadow were not present at the cave pool sample area. Upland species in the area near the spring habitats included Utah serviceberry (*Amelanchier utahensis*), big sagebrush, mormon tea, basin wildrye, desert almond (*Prunus fasciculata*), Stansbury cliffrose, Gambel's oak, and skunkbush sumac.

One hundred percent of the dominant plant species in the cave pool area (Table 4-18) were hydrophytic species, indicating that field indicators for hydrophytic vegetation are present at this area. At the hillside meadow sample area, only two of the four dominant plants (50 percent) were wetland species (Table 4-19). Normally, greater than 50 percent of the dominant plants must be hydrophytic to conclude that field indicators for hydrophytic vegetation are present. However, it is appropriate to conclude that such field indicators were present at the hillside meadow area because hydrophytic species at this site (the nine species categorized as FAC, FACW, or OBL [Table 4-19]) comprised 63 percent of the cover, whereas nonhydrophytic species comprised only 43 percent of the cover. It is therefore concluded that Topopah Spring has field indicators for hydrophytic vegetation

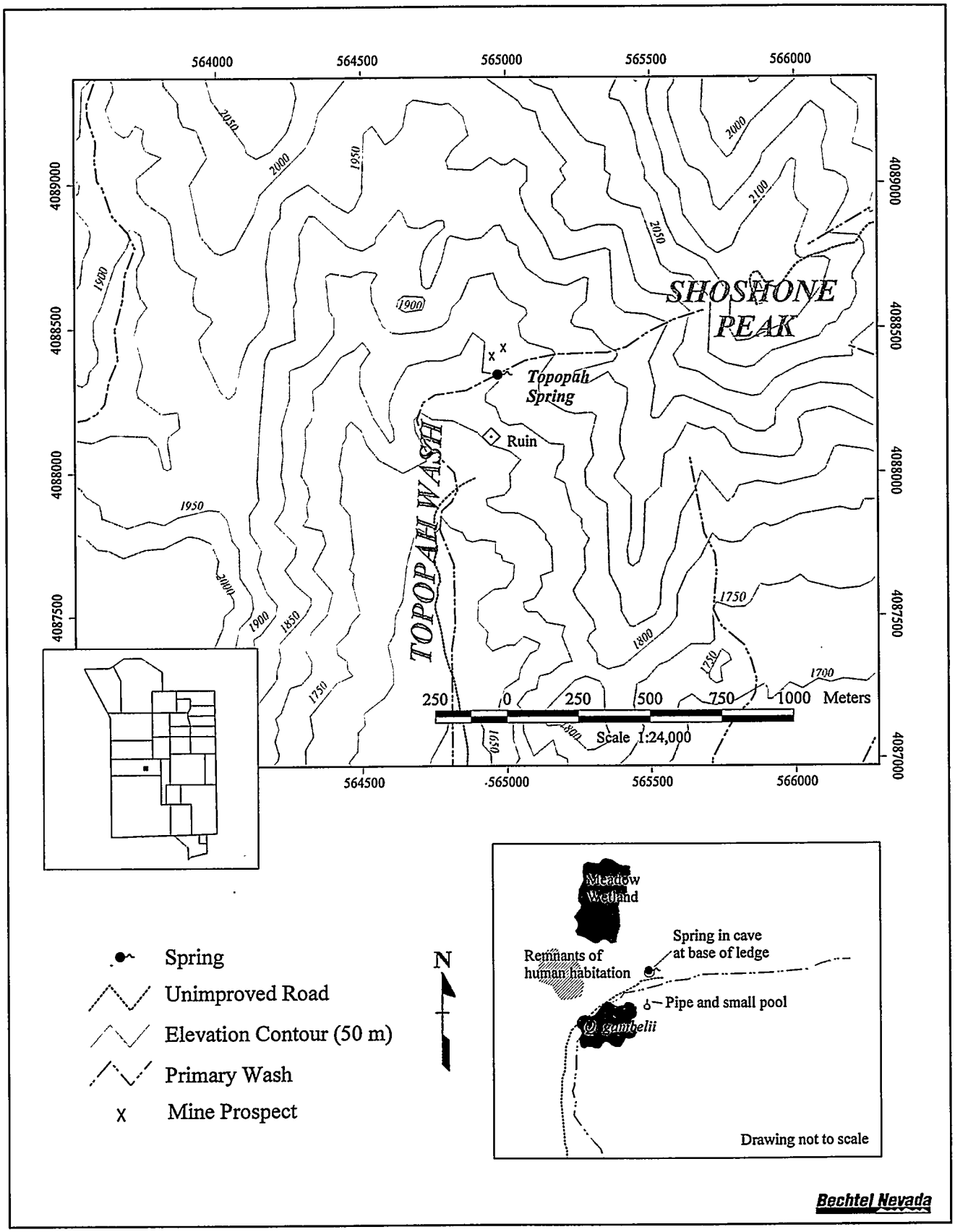

Figure 4-16 Location and sketch of Topopah Spring

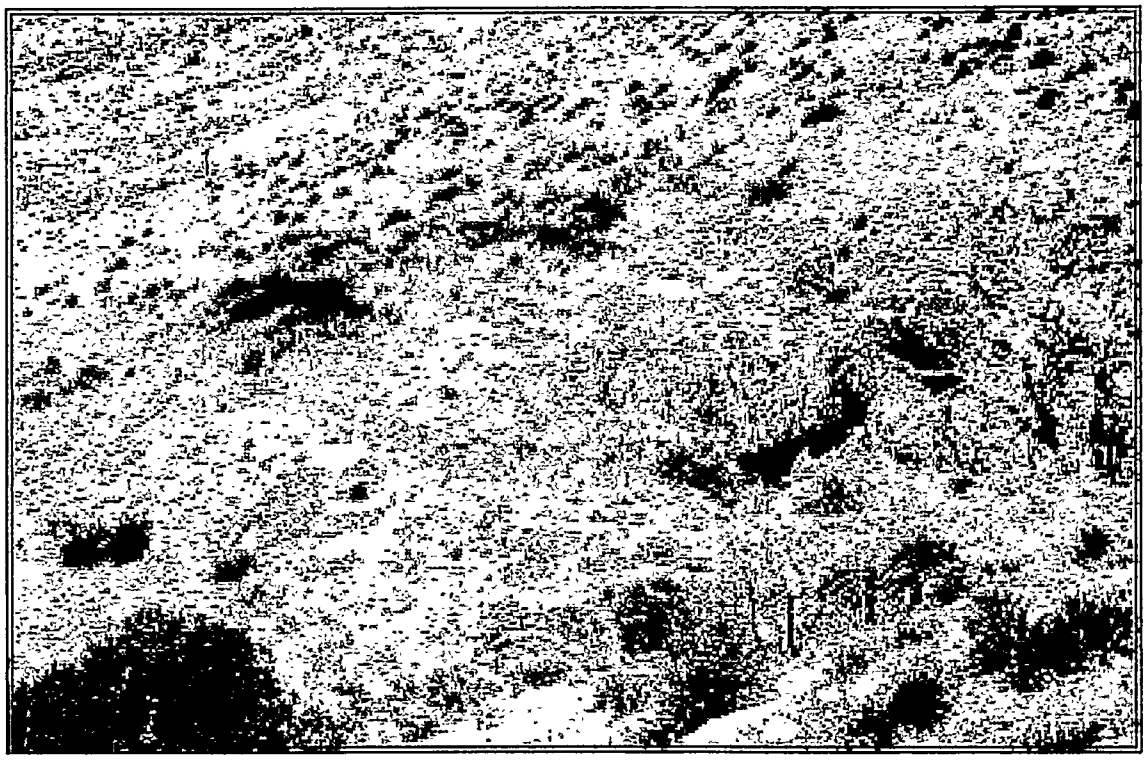

Photo 4-43 Topopah Spring wetland area looking north on June 27, 1988 (WS012-13.TIF)

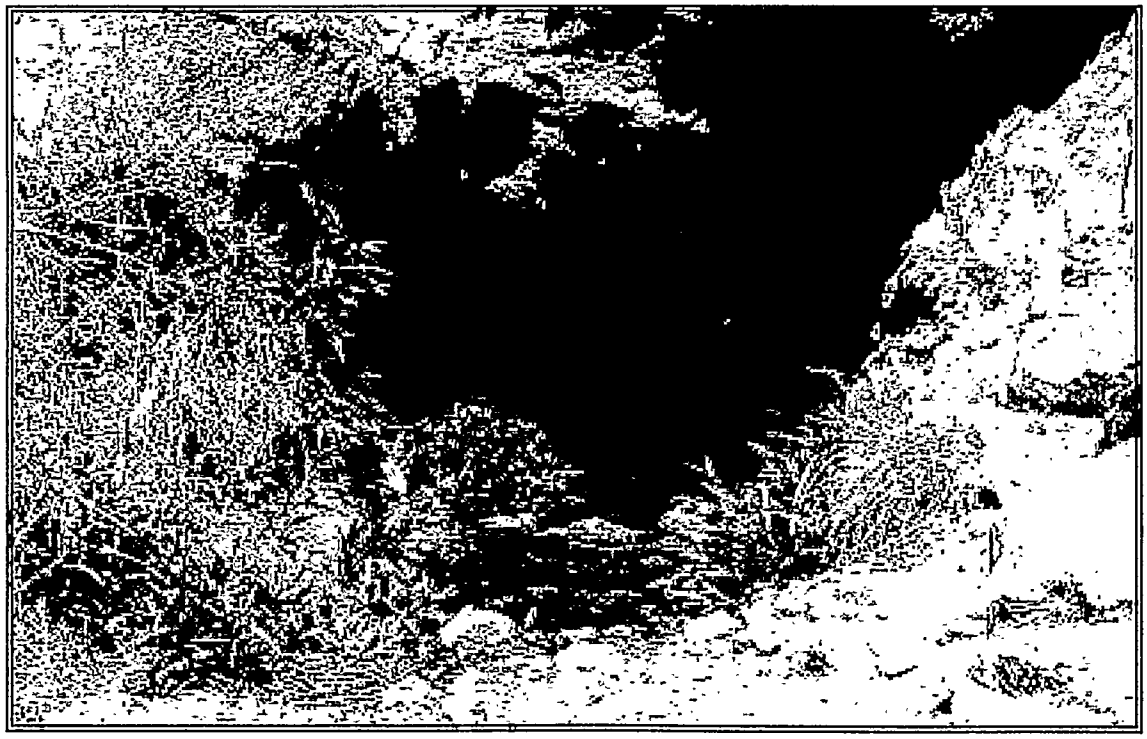

Photo 4-44 Vegetation of Topopah Spring cave pool on April 18, 1989 (WS109-15.TIF)

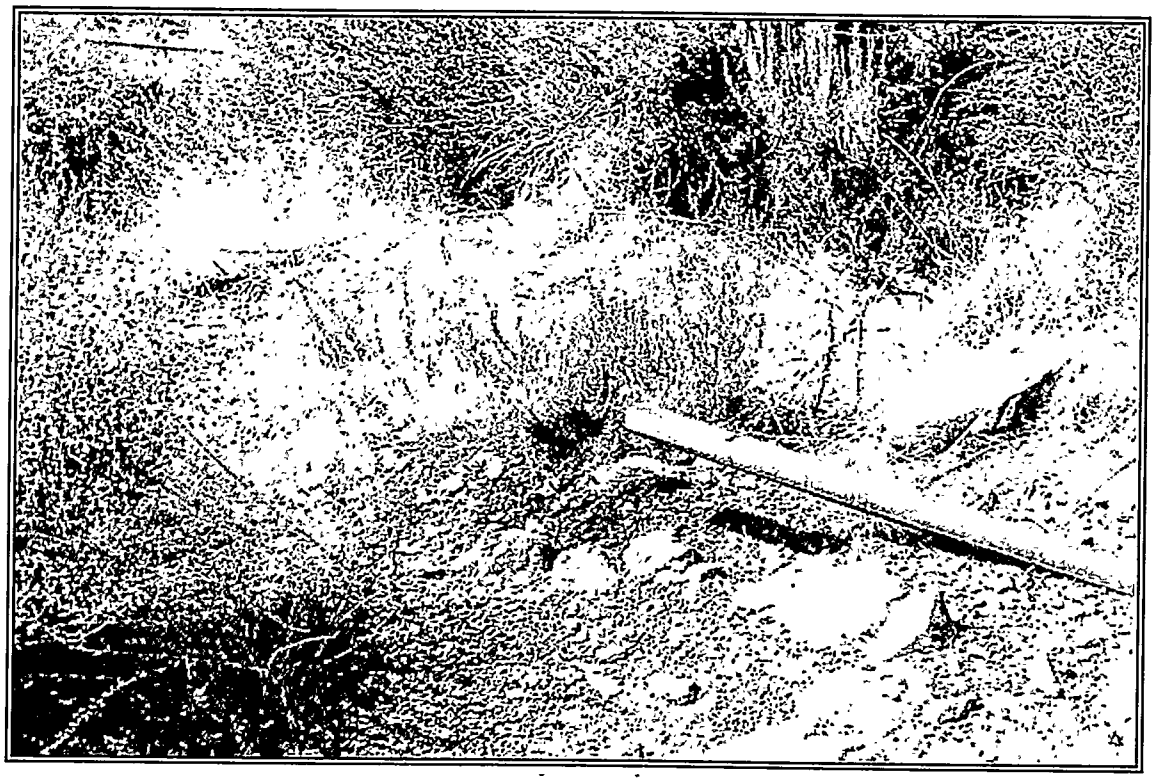

Photo 4-45 Outflow pipe at Topopah Spring on September 9, 1996 (WS340-10.TIF)

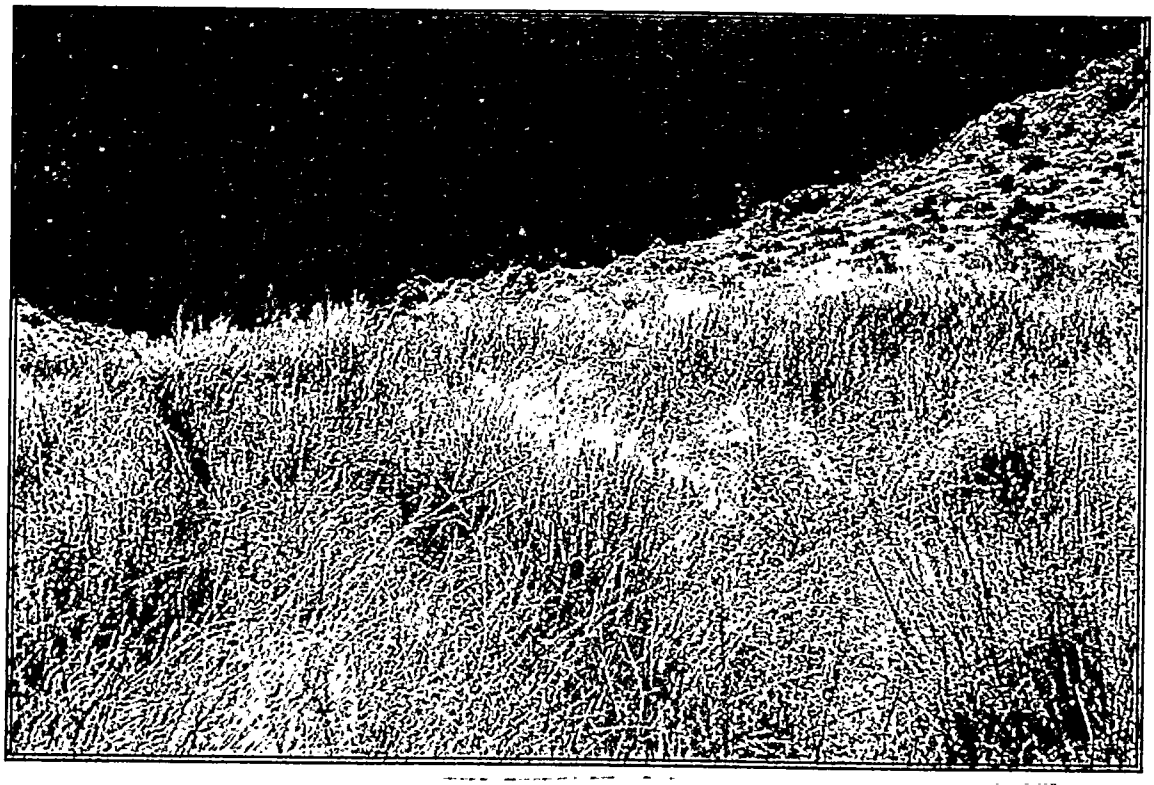

Photo 4-46 Hillside meadow at Topopah Spring looking north on June 20, 1996 (WS339-18.TIF)

Table 4-18 Topopah Spring wetland vegetation as surveyed on June 20, 1996

Habitat: Cave Pool

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Artemisia ludoviciana	Louisiana sagewort	FACU	5
Bromus diandrus	ripgut grass	NL	1
Epilobium glaberrimum	smooth willowweed	FACW	5
Mimulus guttatus	seep monkeyflower	OBL	**10**
Polypogon monspeliensis	annual rabbitsfoot grass	FACW+	1
Potentilla biennis	biennial cinquefoil	FAC	2
Pseudognaphalium stramineum	straw falsecudweed	NL	5
Rumex salicifolius	willow dock	FAC*	**15**
Sisymbrium altissimum	tall tumblemustard	FACU	1
Veronica anagallis-aquatica	water speedwell	OBL	**20**

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

Table 4-19 Topopah Spring wetland vegetation as surveyed on June 20, 1996

Habitat: Hillside Meadow

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Agrostis exarata var. *monolepis*	monolepis bentgrass	FACW	5
Artemesia ludoviciana	Louisiana sagewort	FACU	**10**
Bromus diandrus	ripgut grass	NL	2
Carex praegracilis	clustered field sedge	FACW	5
Castilleja sp.	unidentified Indian paintbrush	UNKN	2
Conyza canadensis	Canadian horseweed	NL	2
Eleocharis parishii	Parish's spikerush	OBL	5
Epilobium glaberrimum	smooth willowweed	FACW	2
Erigeron divergens	spreading fleabane	NL	5
Juncus balticus	Baltic rush	FACW	**27**
Juncus saximontanus	Rocky Mountain rush	FACW+	**10**
Lactuca serriola	prickly lettuce	FACU	Tr
Mimulus guttatus	seep monkeyflower	OBL	2
Poa secunda	Sandberg bluegrass	FACU	**20**
Polypogon monspeliensis	annual rabbitsfoot grass	FACW+	5
Potentilla biennis	biennial cinquefoil	FAC	2
Pseudognaphalium stramineum	straw falsecudweed	NL	2

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 50 %.
Absolute % cover due to all hydrophytic species present: 63 %.
Dominant plant species are indicated by bold Absolute % Cover values. Tr = trace, <1% absolute cover.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes*

*Because the number of dominant hydrophytic species was equal to the number of dominant nonhydrophytic species, an alternative method for determining the presence of hydrophytic vegetation was used (Williams, 1992; see Section 3.2.4).

at both the cave pool area and the hillside meadow. The area of wetland vegetation at Topopah Spring comprised a much larger area of about 200 m^2 (2,152 ft^2) (Table 5-1, Section 5.0).

4.2.16.3 *Wetland Hydrology and Water Quality*

Field indicators for wetland hydrology were observed at both the cave pool area and the hillside meadow. Surface water was present at the site on June 20, 1996, and the combined area of standing water was estimated to be about 8 m^2 (86 ft^2). Flow rates at Topopah Spring, measured from the existing pipe, were very low (0.14 ℓ/min [0.04 gal/min]) (Table 5-1, Section 5.0). Water flow was widely distributed on the hillside meadow and was not measured. Water quality measurements were taken in the spring pool in June and September 1996. Data are presented in Table 5-2 (Section 5.0).

4.2.16.4 *Hydric Soils*

Field indicators of hydric soils were observed at both the cave pool area and the hillside meadow and consisted of saturated or inundated soils which appeared to be inundated for seven days or longer during the plant growing season, indicating the presence of hydric soil. Two soil pits were dug to examine soils for field indicators for hydric soils. Mottling was not observed in the soil exposed from these soil pits.

4.2.16.5 *Determination of Jurisdictional Status*

Both the cave pool area and the hillside meadow at Topopah Spring would probably be considered jurisdictional wetlands because they had field indicators for all three required parameters: hydrophytic vegetation, wetland hydrology, and hydric soils.

4.2.16.6 *Wildlife Use*

Wildlife commonly using this spring include coyote, mountain lion, mule deer, raptors, and passerine birds. Upland game birds are common including chukar, Gambel's quail, and mourning dove. Extensive use of this spring is made by chukar in the summer. Biologists have observed hundreds of these birds around the cave pool during numerous visits.

4.2.17 Tub Spring

4.2.17.1 *Site Description and Historical Use*

Tub Spring is located in a wash on a southeast-facing slope on the east side of Oak Spring Butte, north of Yucca Flat (Figure 4-17, Photo 4-47). Access to water at Tub Spring was developed by local mining operations located about 1.6 km (1 mi) southwest of the spring (Giles, 1976). After the spring was developed, it was probably used to water cattle that grazed in the region before 1950. A tunnel 0.6 to 0.9 m (2 to 3 ft) wide was excavated about 9 m (30 ft) into the hillside. Water collects in a pool within the tunnel throughout the year behind a small earthen dam at the tunnel entrance. The depth of the water is approximately 0.6 m (2 ft) (Giles, 1976). A 7.6-cm- (3-in)-diameter pipe had been installed from the tunnel down slope about 60 m (197 ft) to a large metal watering tank. In 1975, the spring and pipeline system was renovated after a rock slide plugged the pipeline (Smith *et al.*, 1978). Additionally, a wire screen was placed over the pipe entrance to prevent recurrence of the blockage. The original pipeline and watering tank

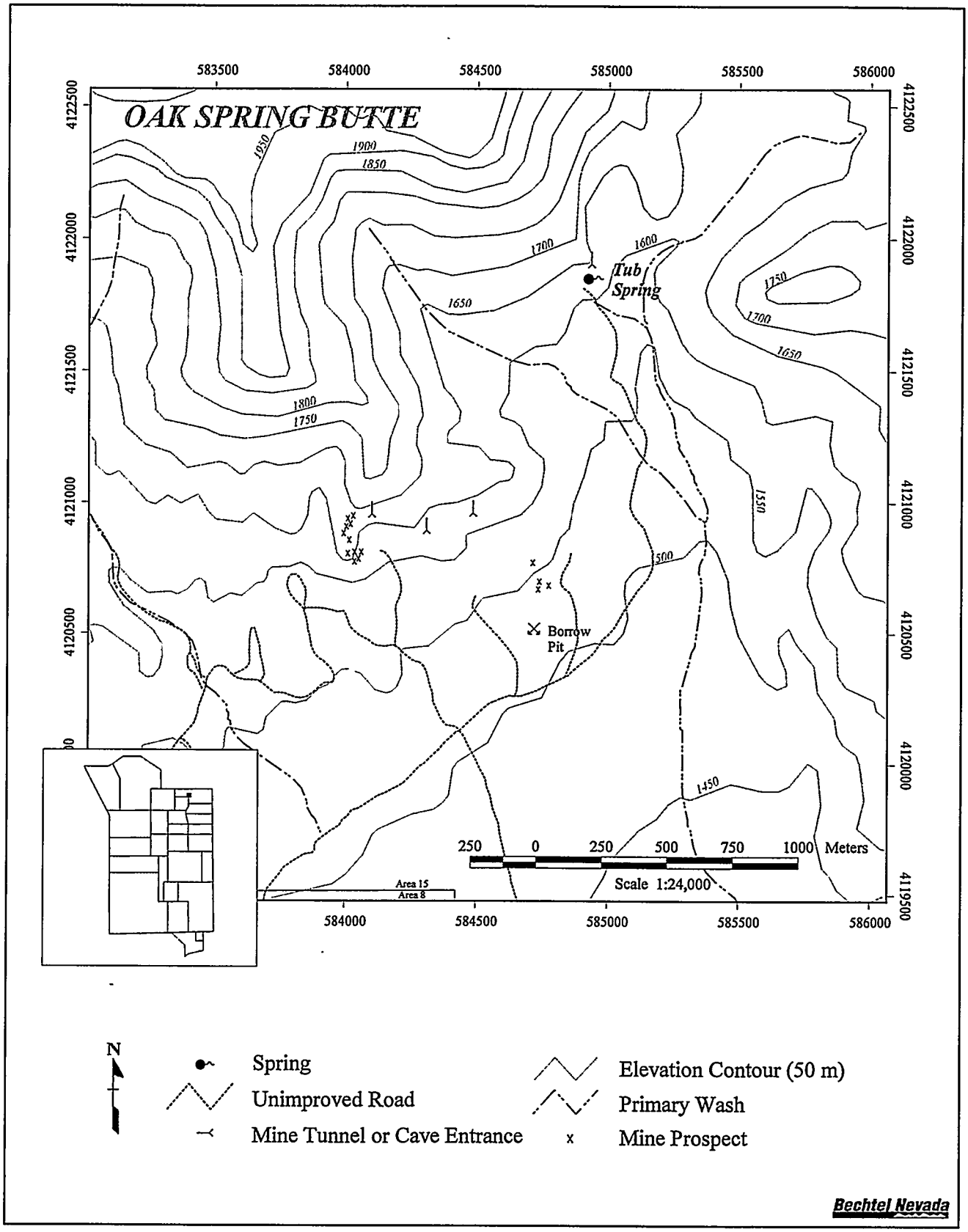

Figure 4-17 Location of Tub Spring

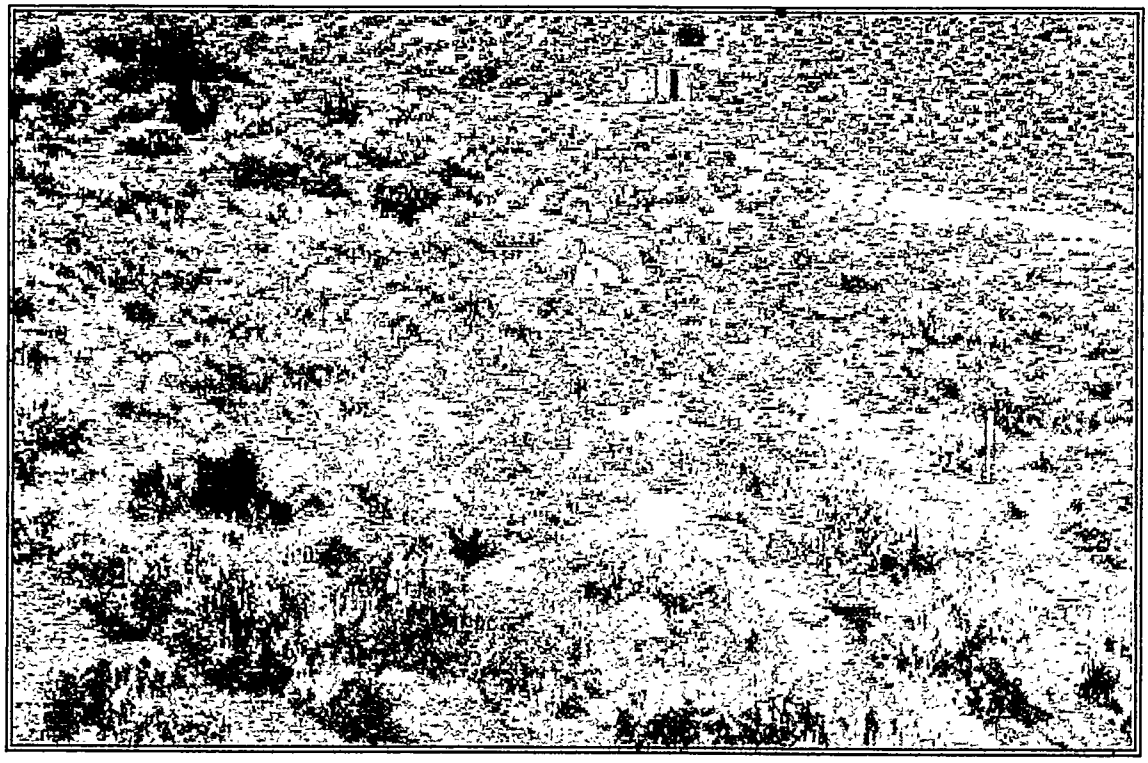

Photo 4-47 Habitat at Tub Spring looking northwest on November 10, 1988 (WS046-20.TIF)

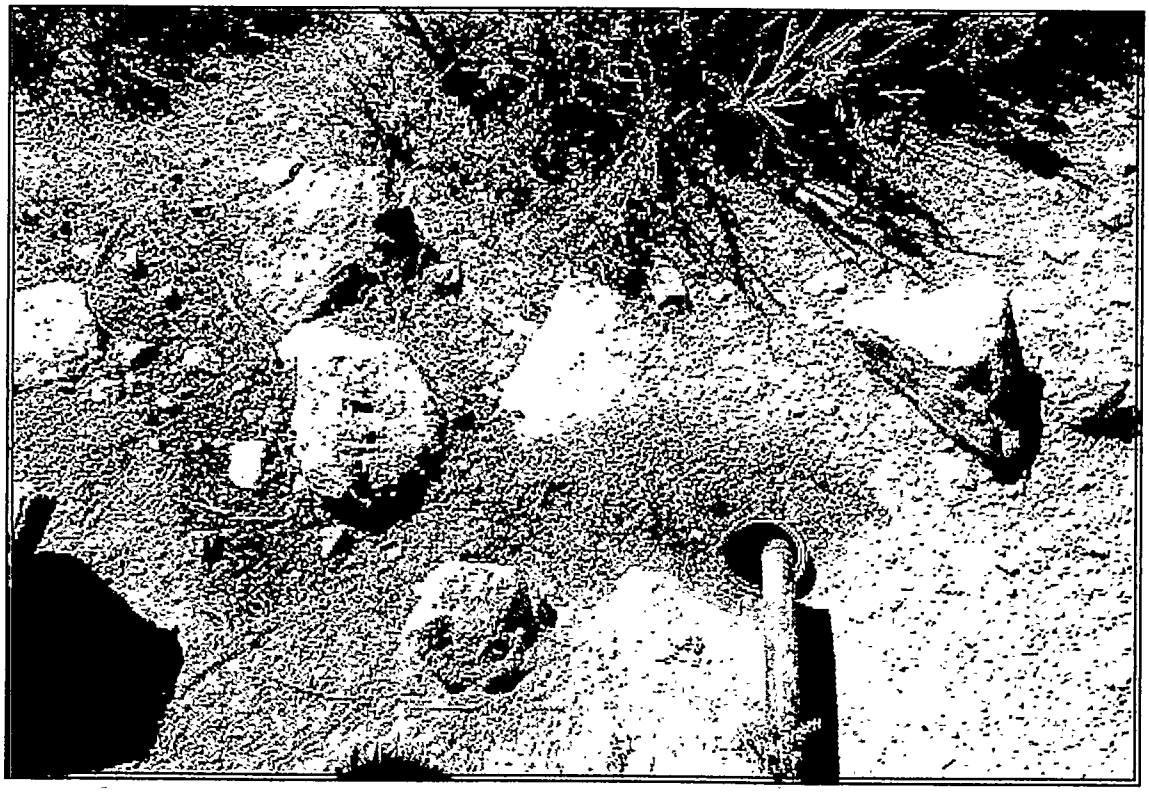

Photo 4-48 Vegetation around Tub Spring on August 24, 1996 (WS046-20.TIF)

were reused. In the 1980s, biologists conducting wildlife surveys at the site observed that the pipe was broken and that no water was flowing into the metal watering tank. Some time in the early 1990s, a 3.8-ℓ (1-gal) tin can was installed in the ground under the broken end of the pipe which was about 10 m (33 ft) upslope from the watering tank. Water currently runs through the pipe, fills the tin can, and overflows onto the ground forming a wetted area of about 1 m^2 (11 ft^2) (Photo 4-48).

4.2.17.2 *Hydrophytic Vegetation*

Only two plant species, skunkbush sumac, and an unidentified grass, were observed growing in a small moist area around the tin can (Table 4-20). Upland vegetation near this area includes desert needlegrass (*Achnatherum speciosum*), fourwing saltbush, big sagebrush, foxtail brome, cheatgrass, blackbrush, mormon tea, Nevada jointfir, Cooper's heathgoldenrod, rubber rabbitbrush, and Stansbury cliffrose. Hydrophytic vegetation was absent from this site and at the cave pool.

Table 4-20 Tub Spring wetland vegetation as surveyed on November 7, 1996

Habitat: Tin Can Area

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Rhus trilobata	skunkbush sumac	NI	**10**
Herb Layer:			
unidentified grass		UNKN	1

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 0 %.
Dominant plant species are indicated by bold values for Absolute % Cover.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

4.2.17.3 *Wetland Hydrology and Water Quality*

Field indicators of wetland hydrology were limited to the cave pool and the saturated area around the tin can where surface water was present. It is likely that the area around the tin can would be dry if it had not been developed by the recent activities of man. Flow rate measured from the broken pipe on September 20, 1996 was 0.1 ℓ/min (0.03 gal/min) (Table 5-1, Section 5.0). Water quality measurements were taken in the guzzler can in June and September 1996 and are presented in Table 5-2 (Section 5.0).

4.2.17.4 *Hydric Soils*

Field indicators of hydric soils were observed at the cave pool and around the tin can. Soils in these areas appeared to have been saturated for more than seven days during the growing season, indicating the presence of hydric soil. However, because the soils around the can are dependent on water being delivered by the pipe, this area is considered artificially wet. No soil pits were dug due to the small size of the area and the evidence of prior disturbance. Soils appeared to be poorly developed in undisturbed areas around the site.

4.2.17.5 *Determination of Jurisdictional Status*

No area at Tub Spring would be considered a jurisdictional wetland because all areas lacked field indicators for hydrophytic vegetation. Although the cave pool would not be considered a jurisdictional wetland, it may be considered waters of the United States.

4.2.17.6 *Wildlife Use*

Chukar, coyotes, Gambel's quail, mourning doves, mountain lions, mule deer, and passerine birds drink water at the site.

4.2.18 Tupapa Seep

4.2.18.1 *Site Description and Historical Use*

This site was identified as "Tupapa Seep Spring" on the Camp Desert Rock USGS 7.5-Minute Series quadrangle map (1961). No spring could be found at the site and it was renamed for this report as "Tupapa Seep." It is located in a wash in a remote area about 1 km (0.6 mi) southeast of Hampel Hill and 3.2 km (2 mi) southwest of Frenchman Flat (Figure 4-18). The site appears to be unaltered by man (Photo 4-49), and no historical accounts of human activity at the spring were found.

4.2.18.2 *Hydrophytic Vegetation*

A vegetation survey from an observation point located within the wash was conducted at Tupapa Seep on November 7, 1996 (Photo 4-50). From the observation point only one dominant species was classified as a hydrophytic plant, foxtail barley (*Hordeum jubatum*). Cheatgrass, an upland grass, was the only other dominant species observed in the sample area (Table 4-21). Other plants in the sample area included: shadscale saltbush, rubber rabbitbrush, and Mexican bladdersage. Based on the weak showing of hydrophytic species at this site, it was concluded that the criteria for hydrophytic vegetation were lacking.

4.2.18.3 *Wetland Hydrology and Water Quality*

Field indicators of wetland hydrology were lacking at this site. No evidence of surface water or saturated soils was detected during visits to Tupapa Seep in September and November 1996. This seep is probably seasonally intermittent in flow and appears to

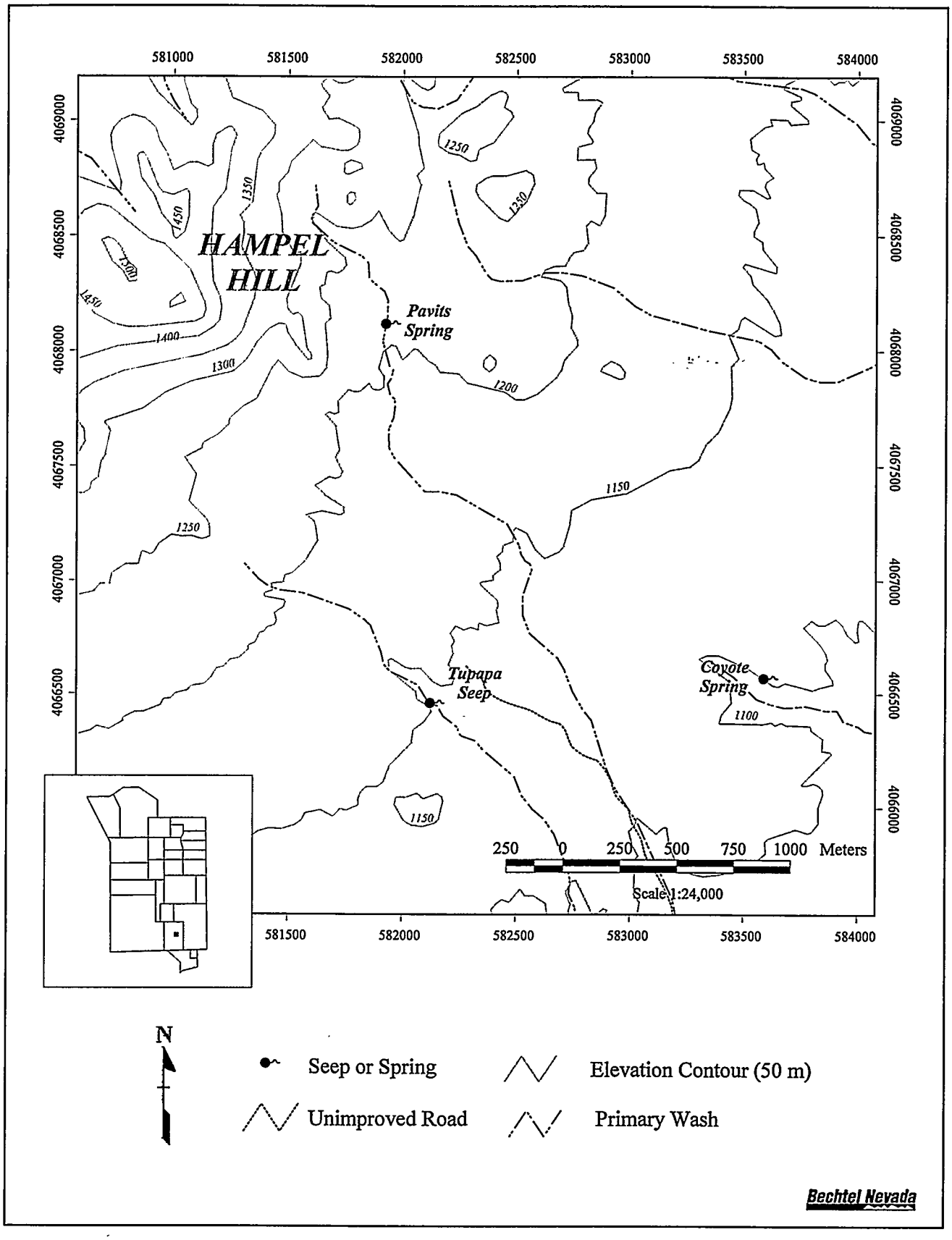

Figure 4-18 Location of Tupapa Seep

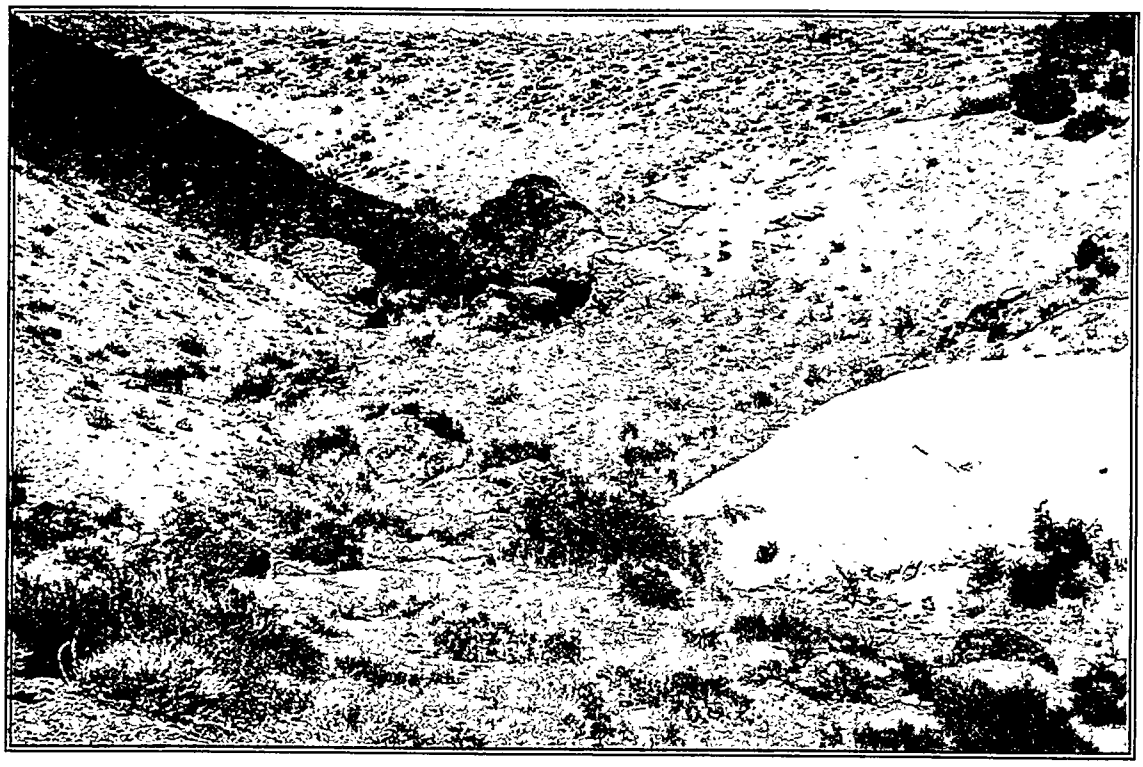

Photo 4-49 Habitat around Tupapa Seep looking north on September 4, 1996 (WS505-01.TIF)

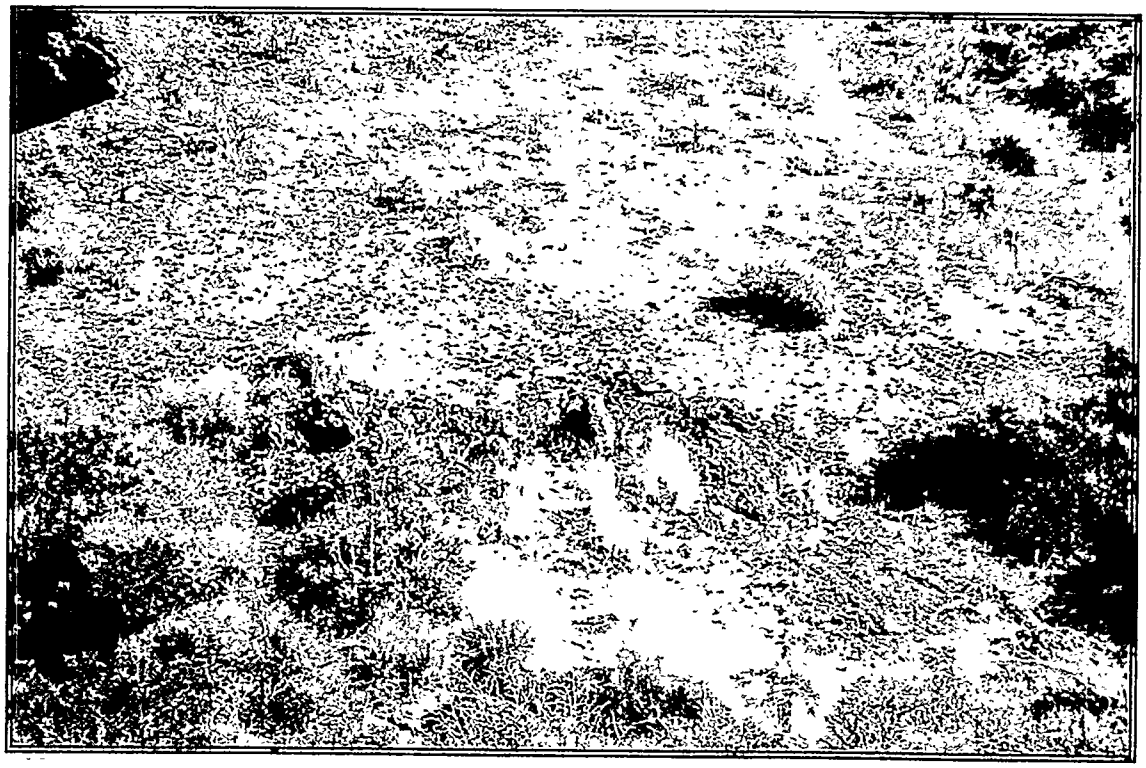

Photo 4-50 Closeup of vegetation at Tupapa Seep looking east on November 4, 1996 (WS505-03.TIF)

Table 4-21 Tupapa Seep wetland vegetation as surveyed on November 7, 1996

Habitat: Wash

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Atriplex confertifolia	shadscale saltbush	NL	2
Ericameria nauseosa	rubber rabbitbrush	NL	2
Salazaria mexicana	Mexican bladdersage	NL	2
Herb Layer:			
Bromus tectorum	cheatgrass	NL	**20**
Hordeum jubatum	foxtail barley	FAC*	**60**

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 50 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

remain dry in low rainfall years. Knowledge of seasonal availability of water at this site is lacking because of limited prior study. No water quality measurements were taken at this site.

4.2.18.4 *Hydric Soils*

No field indicators for hydric soils were observed at this site in 1996. Soils appeared dry at the time of the survey and no soil pits were dug. Soils in the area did appear to be dark with a low chroma value.

4.2.18.5 *Determination of Jurisdictional Status*

This site would probably not qualify as a jurisdictional wetland based on a lack of field indicators for all three required parameters: hydrophytic vegetation, wetland hydrology, and hydric soils. Some seepage may occur in wet years and sustain plant species that are occasionally found in wetlands. However, during dry years few wetland species persist. The lack of archaeological and historical features at the site also suggests that this site did not provide a dependable supply of water.

4.2.18.6 *Wildlife Use*

Because of limited study, little is known about wildlife use of the area; however, coyote scat and a common raven were observed near the seep area.

4.2.19 Twin Spring

4.2.19.1 *Site Description and Historical Use*

This site is shown as an unnamed spring on the Topopah Spring USGS 7.5-Minute Series quadrangle map (1961), but has been referred to in the literature as "Twin Springs" (Stoffle *et al.*, 1990b). For purposes of this report, the site is referred to as "Twin Spring" because only one spring with surface inundation was apparent at the site. Twin Spring is located in Fortymile Canyon about 91 m (300 ft) above the canyon floor on a steep (40 percent) west-facing slope (Figure 4-19, Photo 4-51). The area is believed to have been used as a trappers' camp by Native Americans until recent times (Stoffle *et al.*, 1990b). Numerous prehistoric artifacts exist near the spring and on the slope below the spring, including a petroglyph boulder, stone chips, grinding slabs, rock rings, rock coyote trap, and rock weights to hold nets and trap wildlife. Rock shelters also exist on the opposite side of the canyon (Stoffle *et al.*, 1990b).

Much Euroamerican activity has been reported in Fortymile Canyon including mining, prospecting, and travel. During the period of 1870 to 1900, there were freight and mail routes (i.e., Emigrant Trail) that passed through Fortymile Canyon, with relay stations at Whiterock Spring, Tippipah Spring, and Fortymile Canyon (Stoffle *et al.*, 1990a). The Twin Spring site may have been the location of the relay station, although direct evidence for this is lacking (Henton and Pippin, 1988). A lead-silver mine was also worked in the Fortymile Canyon area during the 1880s and was rediscovered and worked again in 1905 (Stoffle *et al.*, 1990a).

The most conspicuous human impact at Twin Spring is a man-made cave dug about 18 m (98 ft) into the hillside and located about 30 m (98 ft) north of the existing spring. This cave occurs at the same elevation as the existing spring and could be the original site of the second spring. The tailings from this cave were leveled off and a rock wall or foundation was built on it. A cave-in was noted about 3 m (10 ft) inside the entrance. Historic artifacts found at the cave include round nails, lumber, and a condensed milk can (Henton and Pippin, 1988). The purpose of the cave is unclear, but Henton and Pippin (1988) suggest it was not dug for mining purposes but as an improvement to the second spring.

Water was piped from the existing spring to the bottom of the wash, a distance of about 300 m (984 ft), as shown by the presence of metal pipes and a large cement water tank. The tank measured about 2 m (6 ft) wide by 3 m (10 ft) long and is inscribed with the date "1921" (Henton and Pippin, 1988).

4.2.19.2 *Hydrophytic Vegetation*

A wetlands vegetation survey was conducted on December 12, 1996, from an observation point located at the base of a rock ledge where water flows out and forms a small pool (referred to as the wash slope area). One hundred percent of the dominant plants in this area were hydrophytic species indicating that hydrophytic vegetation was present at Twin Spring (Table 4-22). *T. domingensis* was the only dominant wetland species growing in a small, inundated area within the sample area. Other wetland species which accounted for

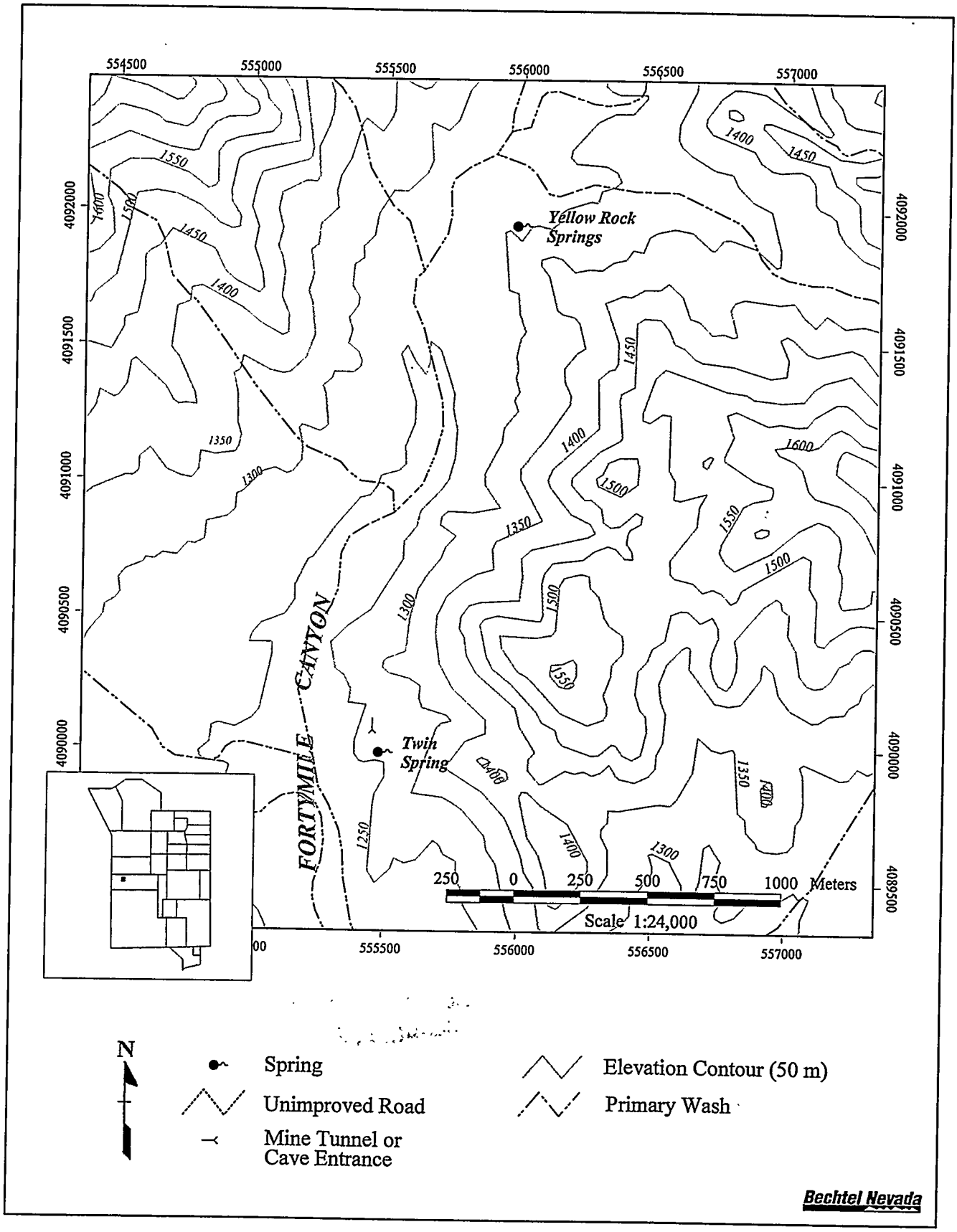

Figure 4-19 Location of Twin Spring

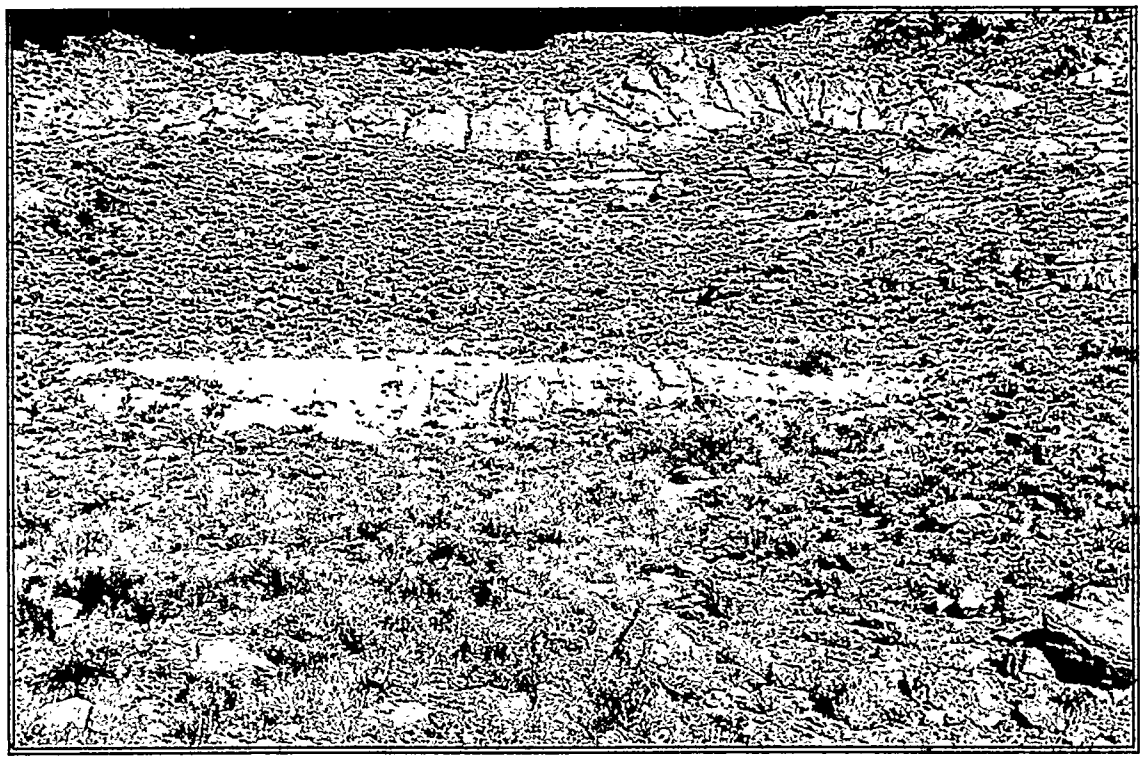

Photo 4-51 Habitat around Twin Spring looking east on January 8, 1997 (WS347-19.TIF)

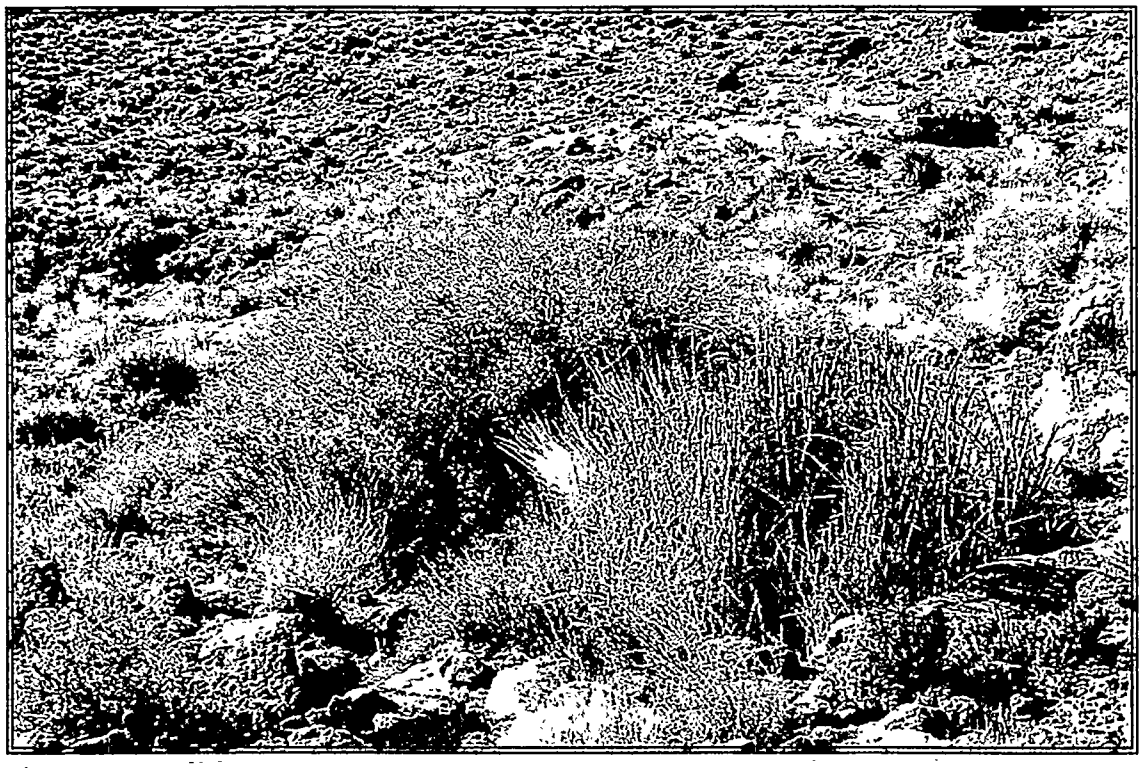

Photo 4-52 Wetland vegetation at Twin Spring looking north on January 8, 1997 (WS347-22.TIF)

Table 4-22 Twin Spring wetland vegetation as surveyed on December 12, 1996

Habitat: Wash Slope Area

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Polypogon monspeliensis	annual rabbitsfoot grass	FACW+	Tr
Rumex salicifolius	willow dock	FACW*	5
Typha domingensis	southern cattail	OBL	90

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold values for Absolute % Cover. Tr = trace, <1% absolute cover.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

less than 6 percent of the absolute cover at the site were willow dock and annual rabbitsfoot grass The wetland area was limited to about 27 m^2 (291 ft^2) (Table 5-1, Section 5.0). Plants growing in a transitional area on the edge of the inundated area included wormwood, Louisiana sagewort, and skunkbush sumac. The other wet area at Twin Spring was a man-made cave (see Section 4.2.19.3 below) which did not contain hydrophytic vegetation and represented an atypical situation because of prior disturbance. Vegetation in the upland area surrounding the spring included fourwing saltbush, cheatgrass, green rabbitbrush, Virgin River brittlebush (*Encelia virginensis*), Nevada jointfir, mormon tea, eastern Mojave buckwheat, spiny hopsage (*Grayia spinosa*), and Mexican bladdersage.

4.2.19.3 *Wetland Hydrology and Water Quality*

This site has been referred to as "Twin Springs" (Stoffle *et al.*, 1990b), which suggests that there were two spring sources at the site. However, only one spring with surface inundation is apparent at the site. Currently, water flows out from the base of a rock ledge and forms a small pool which measures about 2 m^2 (22 ft^2) (Photo 4-52). This area is referred to as the wash slope area. The maximum depth of the pool within the wash slope area was about 10 cm (4 in) in December 1996. Minimal surface flow occurred down the slope from the pool, but this was not measured. Flow was visible below the wetland area for about 4 m (13 ft) in a steep rocky wash. Water quality measurements were taken in January 1997, and the data are presented in Table 5-2 (Section 5.0).

The man-made cave which occurs at the same elevation as the existing spring could be the original site of the second spring. The cave-in here could have stopped water flow from

the cave, and the tailings removed from the cave could also be concealing the spring discharge area. Saturated soils occurred on the floor of this cave.

4.2.19.4 *Hydric Soils*

Field indicators for hydric soils were present at Twin Spring and were confined to the wash slope area and to the man-made cave. Soils in these areas appeared to have been saturated for seven days or more during the plant growing season, indicating the presence of hydric soil. The soils in the cave area may be considered atypical because of disturbance by man.

4.2.19.5 *Determination of Jurisdictional Status*

The wash slope area at Twin Spring would probably qualify as a jurisdictional wetland because it has field indicators of all three wetland parameters: hydrophytic vegetation, wetland hydrology, and hydric soils. The man-made cave area did not support hydrophytic vegetation and probably would not be considered a jurisdictional wetland.

4.2.19.6 *Wildlife Use*

Use of the spring by wild burros (*Equus asinus*) was evidenced by the presence of scat near the cave. Coyote and mule deer scat also occurred around the spring. Deer remains were found at the spring, indicating that mountain lions may also frequent the site.

4.2.20 Wahmonie Seep 1

4.2.20.1 *Site Description and Historical Use*

Wahmonie Seep 1 is located in a wash bottom north of Skull Mountain about, 1 km (0.6 mi) south of Cane Spring Road (Figure 4-20). A mine shaft and some prospect markers (piles of rock) are located near the seep. This seep shows no impacts from man, and is not marked on any USGS topographic map. This wetland has not been previously studied because no current or historical references concerning this seep were found.

4.2.20.2 *Hydrophytic Vegetation*

The slope of the wash is gentle (5 percent) and wetland boundaries are easily distinguished from the boundaries of the surrounding upland plant community (Photo 4-53). A vegetation survey was conducted at the bottom of the wash channel on June 20, 1996. The dominant wetland species observed from the observation point were Emory's baccharis (*Baccharis emoryi*), Baltic rush, and water speedwell. Saltcedar occurred in the wash about 30 m (98 ft) downstream from the observation point. Unidentified mosses were common in the wash channel. Sixty percent of the dominant species at the observation point were wetland species indicating the presence of hydrophytic vegetation at the site (Table 4-23). The total area of the wetland as defined by hydrophytic vegetation within the wash channel is approximately 250 m^2 (2,690 ft^2) (Table 5-1, Section 5.0). Plant species in the adjacent upland included blackbrush, Cooper's heathgoldenrod, rubber rabbitbrush, basin wildrye, and Mexican bladdersage.

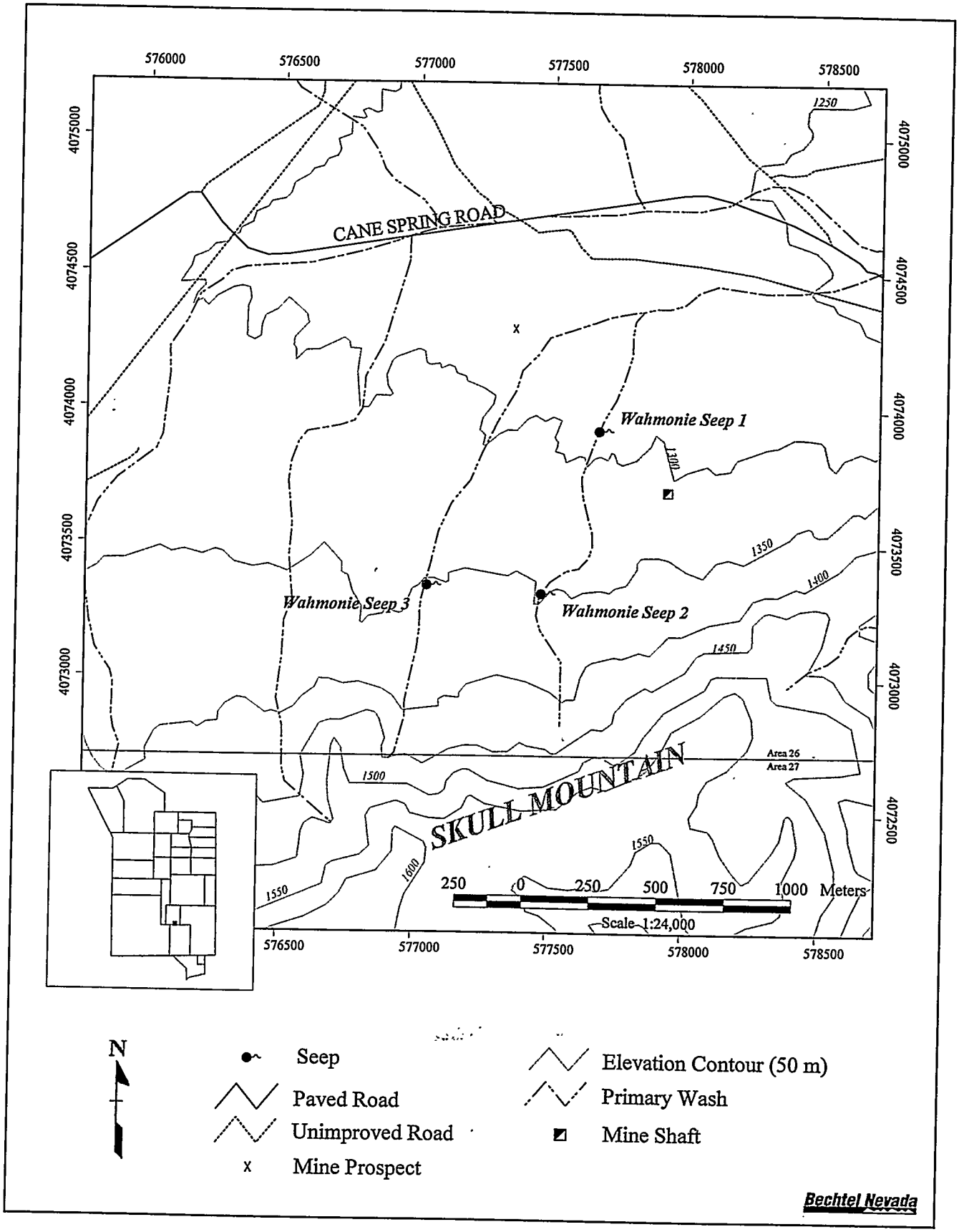

Figure 4-20 **Location of Wahmonie Seep 1**

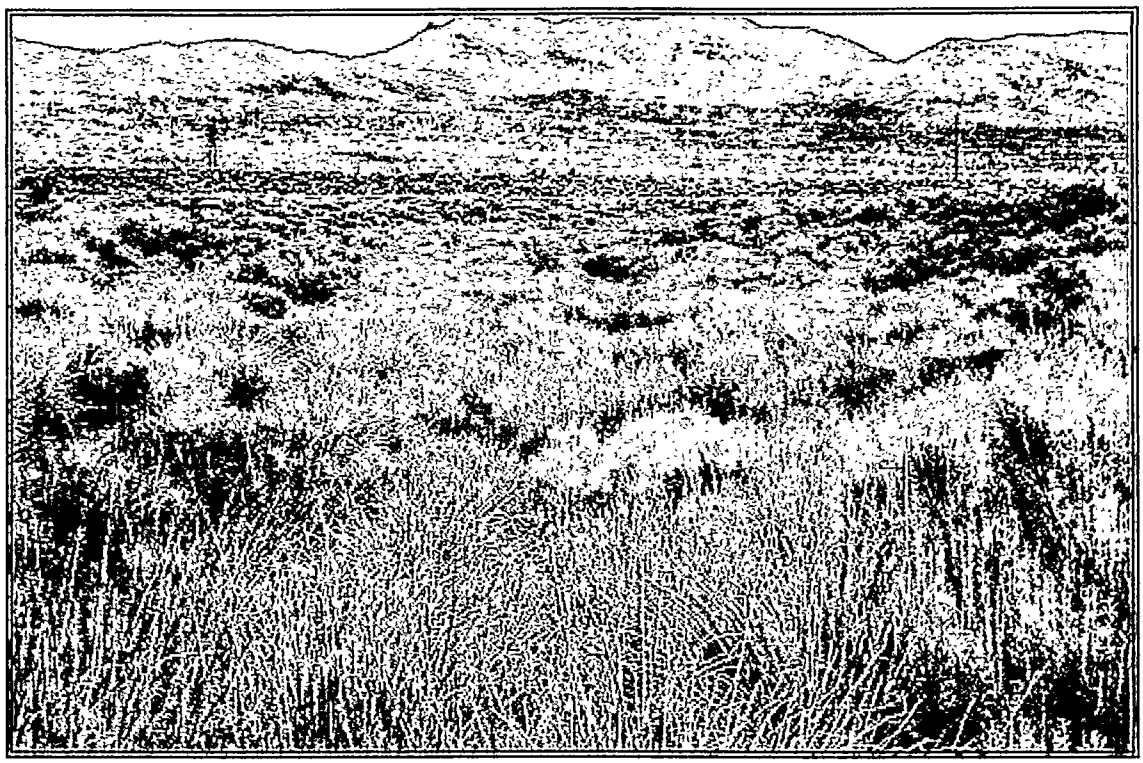

Photo 4-53 Wahmonie Seep 1 looking north on June 20, 1996 (WS339-09.TIF)

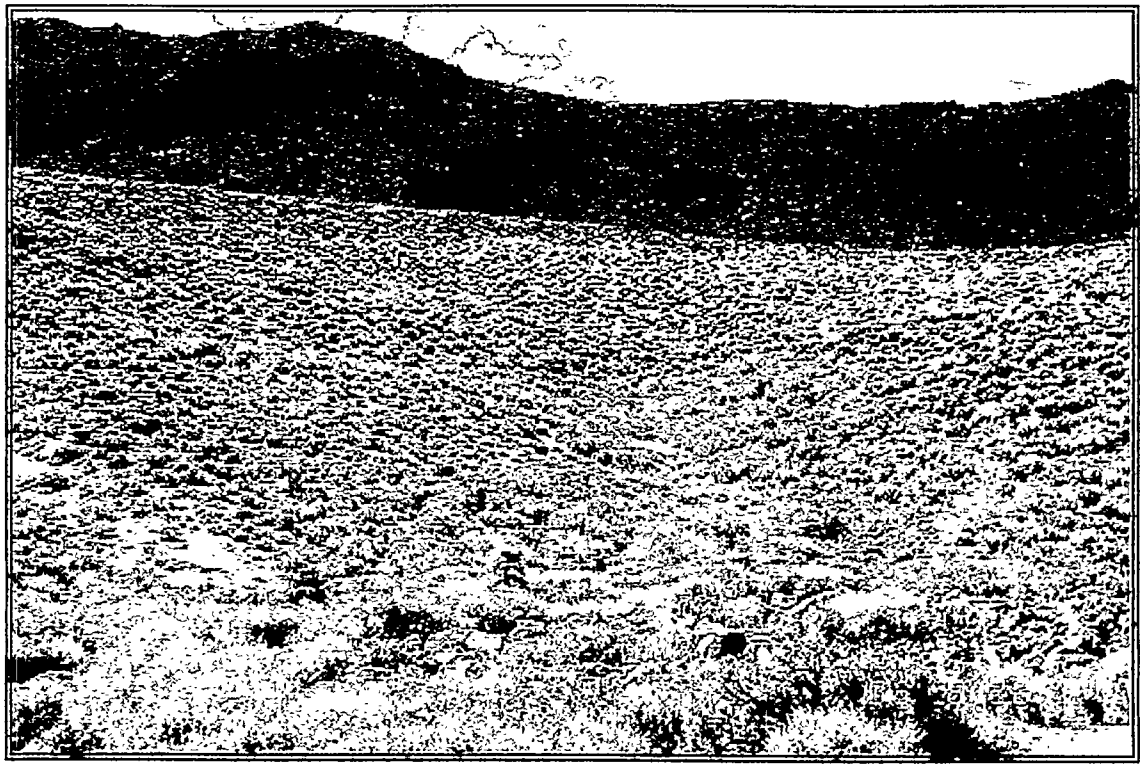

Photo 4-54 Wahmonie Seep 2 looking south on June 20, 1996 (WS339-12.TIF)

Table 4-23 Wahmonie Seep 1 wetland vegetation as surveyed on June 20, 1996

Habitat: Wash Channel

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Baccharis emoryi	Emory's baccharis	FACW	**40**
Ericameria nauseosa	rubber rabbitbrush	NL	**10**
Herb Layer:			
Artemisia ludoviciana	Louisiana sagewort	FACU	1
Juncus balticus	Baltic rush	FACW	**30**
Leymus cinereus	basin wildrye	FACU	**15**
Mimulus guttatus	seep monkeyflower	OBL	2
Polypogon monspeliensis	annual rabbitsfoot grass	FACW+	1
Veronica anagallis-aquatica	water speedwell	OBL	**10**
unidentified moss		UNKN	1

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 60 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

4.2.20.3 *Wetland Hydrology and Water Quality*

Field indicators of wetland hydrology were restricted to an area characterized by saturated soils in a narrow corridor along the wash channel. Surface water existed at this site in one isolated pool at the time of the survey. This pool was only 5 m^2 (54 ft^2) and had a depth of approximately 7 cm (3 in). Surface flow was low in the bottom of the wash but was not measured. There was evidence (e.g., dry algae) to suggest that several small pools existed within the wash channel earlier in the year. Water quality measurements were taken in the wash pool in June 1996 and these data are presented in Table 5-2 (Section 5.0).

4.2.20.4 *Hydric Soils*

Field indicators at Wahmonie Seep 1 consisted of saturated soils for what appeared to be more than seven days during the growing season, indicating the presence of hydric soil. A soil pit was dug to determine the presence of other field indicators of hydric soils. Soils lacked evidence of mottling and dark colors (low chroma values).

4.2.20.5 *Determination of Jurisdictional Status*

The wash channel of Wahmonie Seep 1 would probably be considered a jurisdictional wetland because it has field indicators for all three required parameters: hydrophytic vegetation, wetland hydrology, and hydric soils.

4.2.20.6 *Wildlife Use*

Information on wildlife use of this site is limited. Desert cottontails, coyotes, Gambel's quail, mule deer scat, and passerine species of birds have been observed at the site.

4.2.21 Wahmonie Seep 2

4.2.21.1 *Site Description and Historical Use*

Wahmonie Seep 2 is located in a wash channel on the north-facing slope of Skull Mountain (Figure 4-21), about 2.1 km (1.3 mi) south of Cane Spring Road (Photo 4-54) and about 500 m (1,640 ft) up the drainage from Wahmonie Seep 1. A mine shaft is located east of Wahmonie Seeps 1 and 2 and some prospect markers (piles of rock) are also located in the area. There is no evidence, however, of disturbance of the seep by man.

4.2.21.2 *Hydrophytic Vegetation*

A wetland survey was conducted within the upper end of the wash channel on June 20, 1996. One dominant hydrophytic species, Emory's baccharis, was observed within the wetland plant community (Photo 4-55). Absolute canopy cover for this species was estimated to be 85 percent (Table 4-24). No dominant upland plant species were observed at this site; Louisiana sagewort and an unidentified moss were observed at the observation point but comprised only about 3 percent of the absolute canopy cover. The site was therefore dominated by hydrophytic vegetation which was restricted to a narrow corridor in the wash bottom comprising an area of about 150 m^2 (1,614 ft^2) (Table 5-1, Section 5.0). Plant species observed in the adjacent upland area included Louisiana sagewort, blackbrush, Nevada jointfir, Cooper's heathgoldenrod, eastern Mojave buckwheat, and Mexican bladdersage.

4.2.21.3 *Wetland Hydrology and Water Quality*

Field indicators of wetland hydrology were observed in the wash channel and consisted of surface water and saturated soils. On June 6, 1996, surface water less than 5 cm (2 in) deep was observed in isolated small pools less than 0.25 m^2 (2.7 ft^2) in the wash bottom, but surface water was not observed on June 20, 1996. Based on the presence of wetland species, surface water, and saturated soils as late in the growing season as June 6, it was concluded that indicators of wetland hydrology were present. No water quality measurements were taken at this site.

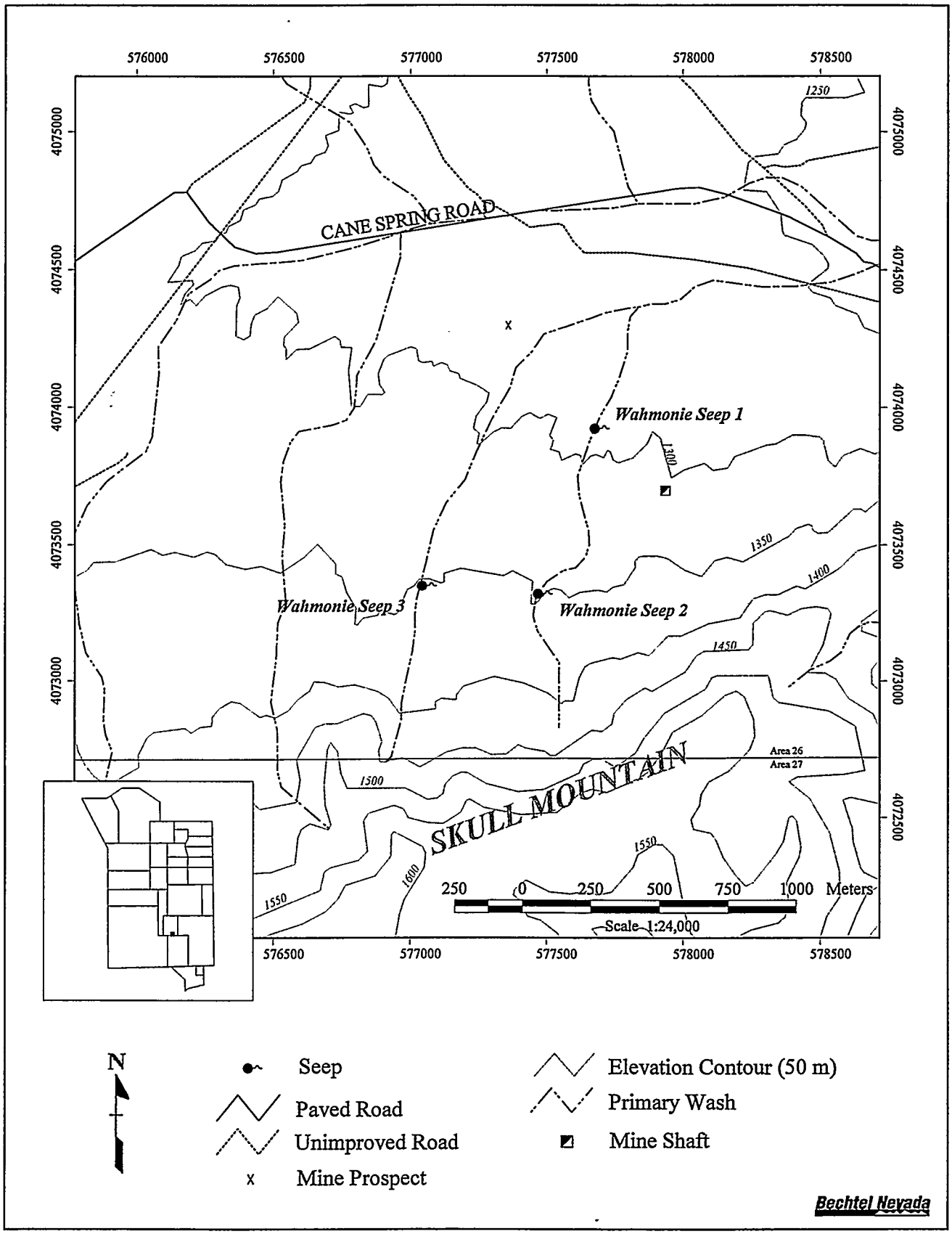

Figure 4-21 **Location of Wahmonie Seep 2**

Photo 4-55 Wetland vegetation at Wahmonie Seep 2 looking south on June 20, 1996 (WS339-12.TIF)

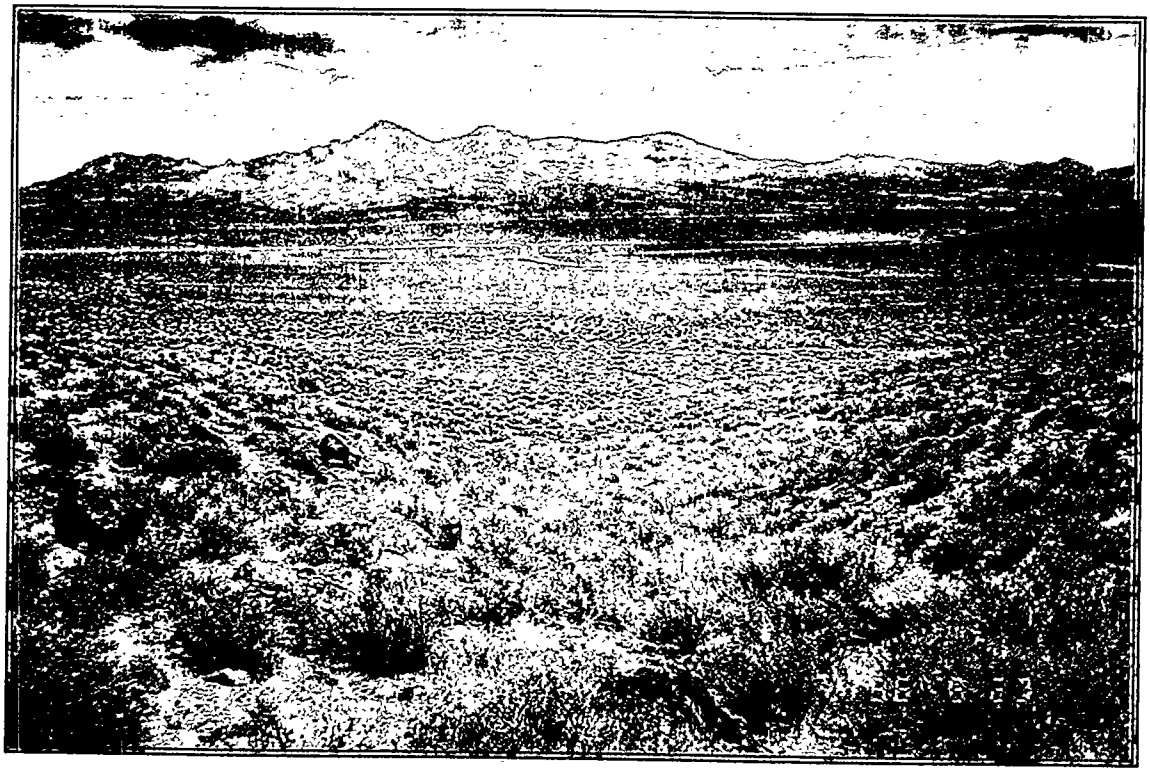

Photo 4-56 Wahmonie Seep 3 looking north on June 20, 1996 (WS339-13.TIF)

Table 4-24 Wahmonie Seep 2 wetland vegetation as surveyed on June 20, 1996

Habitat: Wash Channel

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Baccharis emoryi	Emory's baccharis	FACW	85
Herb Layer:			
Artemesia ludoviciana	Louisiana sagewort	FACU	2
unidentified moss		UNKN	1

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values.
[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

4.2.21.4 *Hydric Soils*

Biologists dug a soil pit and found saturated soils. No other hydric soil field indicators were observed. The soils were shallow, rocky, exhibited no mottling, and had little organic matter. Soils in the bottom of the wash channel at the seep appeared to have been saturated for more than seven days during the growing season, indicating the presence of hydric soils. The area of soil saturation appeared to correspond to the area dominated by Emory's baccharis.

4.2.21.5 *Determination of Jurisdictional Status*

A portion of the wash channel at Wahmonie Seep 2 would probably be considered a jurisdictional wetland because it has field indicators for all three required parameters: hydrophytic vegetation, wetland hydrology, and hydric soils.

4.2.21.6 *Wildlife Use*

Little is known about wildlife use of this seep. A bobcat skull was found near the seep suggesting use by this species. Desert cottontails, mule deer scat, and Gambel's quail were observed in the area on June 6, 1996.

4.2.22 Wahmonie Seep 3

4.2.22.1 *Site Description and Historical Use*

Wahmonie Seep 3 is located on the north slope of Skull Mountain in a wash about 0.6 km (0.4 mi) due west of Wahmonie Seep 2 (Figure 4-22, Photo 4-56). There is no evidence that this seep has been used or developed by man.

4.2.22.2 *Hydrophytic Vegetation*

One dominant hydrophytic species (Emory's baccharis) and two dominant nonhydrophytic species (Louisiana sagewort and foxtail brome) were observed at this site within the wetland plant community (Table 4-25). Emory's baccharis comprised 60 percent of the absolute canopy cover, Louisiana sagewort comprised about 10 percent, and foxtail brome comprised about 30 percent. Louisiana sagewort was limited to the seep area and was not observed in the surrounding upland area. This species appeared dependent on the moisture from the seep. The presence and high percentage of cover of foxtail brome, an annual grass, is probably due to the fact that 1996 was a rather dry year which reduced soil saturation at the site, facilitating the invasion of foxtail brome into the seep. It was concluded that the vegetation of the site meets the criteria established for being considered hydrophytic vegetation. This was based on the fact that hydrophytic species comprised the largest proportion (60 percent) of the absolute canopy cover at the site (Williams, 1992). Hydrophytic vegetation was restricted to a narrow corridor in the wash channel of 180 m^2 (1,937 ft^2) occupied by Emory's baccharis (Table 5-1, Section 5.0). Plant species in the upland area surrounding the seep included foxtail brome, blackbrush, eastern Mojave buckwheat, Virgin River brittlebush, Cooper's heathgoldenrod, rubber rabbitbrush, and Mojave yucca (*Yucca schidigera*).

4.2.22.3 *Wetland Hydrology and Water Quality*

Field indicators of wetland hydrology were observed on June 6, 1996, in a narrow corridor along the wash channel. These indicators consisted of surface water, water marks on rocks and vegetation, and salt encrustations observed along the bottom of the wash for a width of 3 m (10 ft) and a length of about 50 m (164 ft). The total area of surface water at the time of the survey was about 0.1 m^2 (1 ft^2). No water quality measurements were taken at this site.

4.2.22.4 *Hydric Soils*

Field indicators of hydric soils were present and restricted to a narrow of about 150 m^2 (1,615 ft^2) corridor along the wash channel. This corridor had soils that appeared to have been saturated for longer than seven days during the growing season, indicating the presence of hydric soils. At the time of the survey, however, these soils were not saturated (Table 5-1, Section 5.0). Soils at this seep were shallow, rocky, and poorly developed.

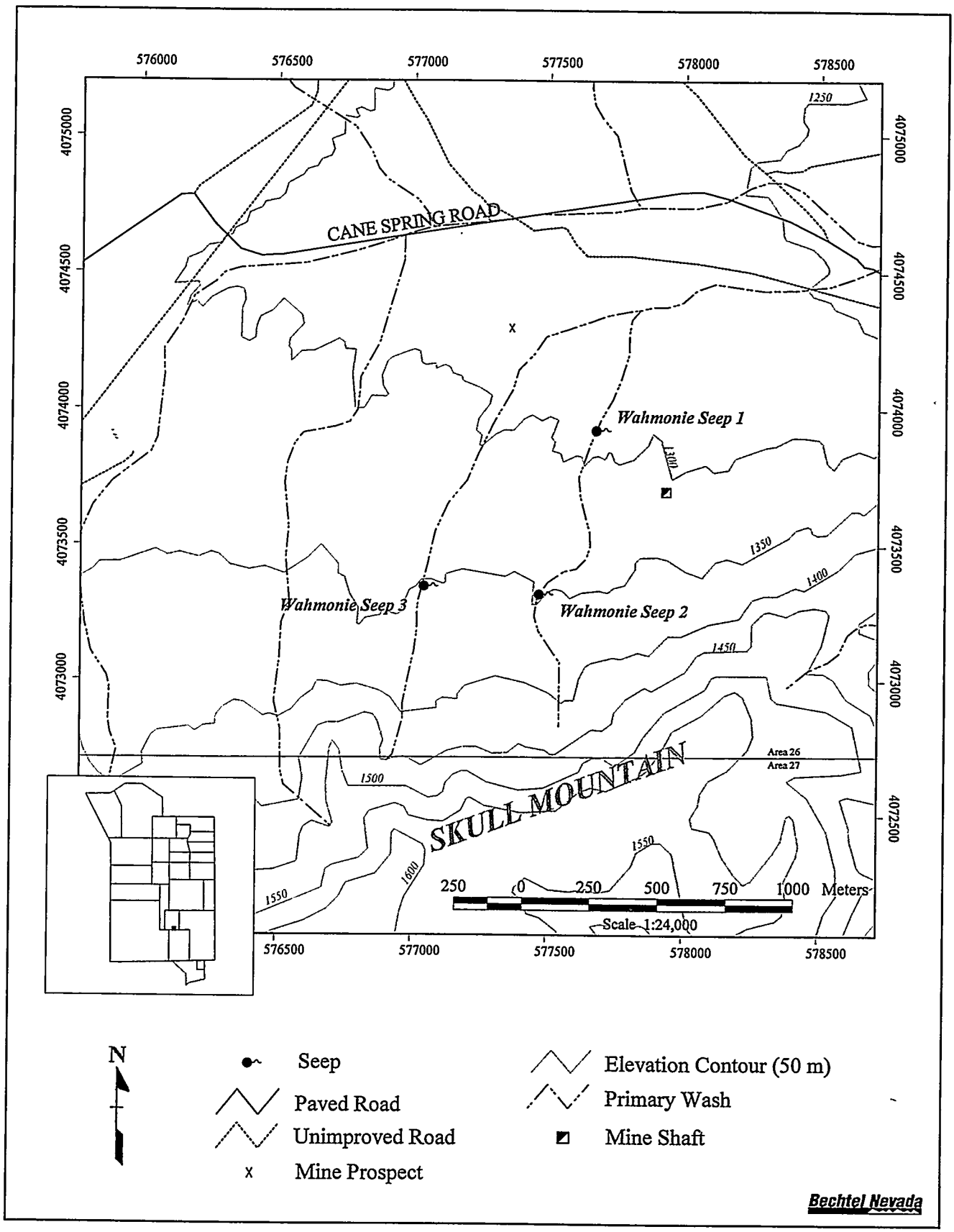

Figure 4-22 **Location of Wahmonie Seep 3**

Table 4-25 Wahmonie Seep 3 wetland vegetation as surveyed on June 20, 1996

Habitat: Wash Channel

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Baccharis emoryi	Emory's baccharis	FACW	**60**
Herb Layer:			
Artemesia ludoviciana	Louisiana sagewort	FACU	**10**
Bromus rubens	foxtail brome	UPL	**30**

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 33 %.
Absolute % cover due to all hydrophytic species present: 60 %. Dominant plant species are indicated by bold Absolute % Cover values.
[a]For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes*

*Because the number of dominant hydrophytic species were equal to or less than the number of dominant nonhydrophytic species, an alternative method for determining the presence of hydrophytic vegetation was used (Williams, 1992; see Section 3.2.4).

4.2.22.5 *Determination of Jurisdictional Status*

The narrow corridor in the wash channel at Wahmonie Seep 3 would probably be considered a jurisdictional wetland because it had field indicators for all three required parameters: hydrophytic vegetation, wetland hydrology, and hydric soils.

4.2.22.6 *Wildlife Use*

Mule deer scat were located near the seep indicating use by this species. Other species use this area, but no observations were made during the limited sampling period.

4.2.23 Whiterock Spring

4.2.23.1 *Site Description and Historical Use*

Whiterock Spring is located in a wash at the northern end of Yucca Flat about 2.3 km (1.4 mi) east of the base of Rainier Mesa (Figure 4-23). This site was used as a winter camp by Native Americans from the Belted Range during the late 1800s to early 1900s (Stoffle *et al.*, 1990a). A stone cabin and corral occur near the site which were used during the 1920s (Worman, 1969). Sixty mining claims were recorded from the Whiterock Spring area in 1928 (Stoffle *et al.*, 1990a), suggesting that mining in the area occurred then. Ranching may have occurred in the area in the 1930s. Early ranchers or

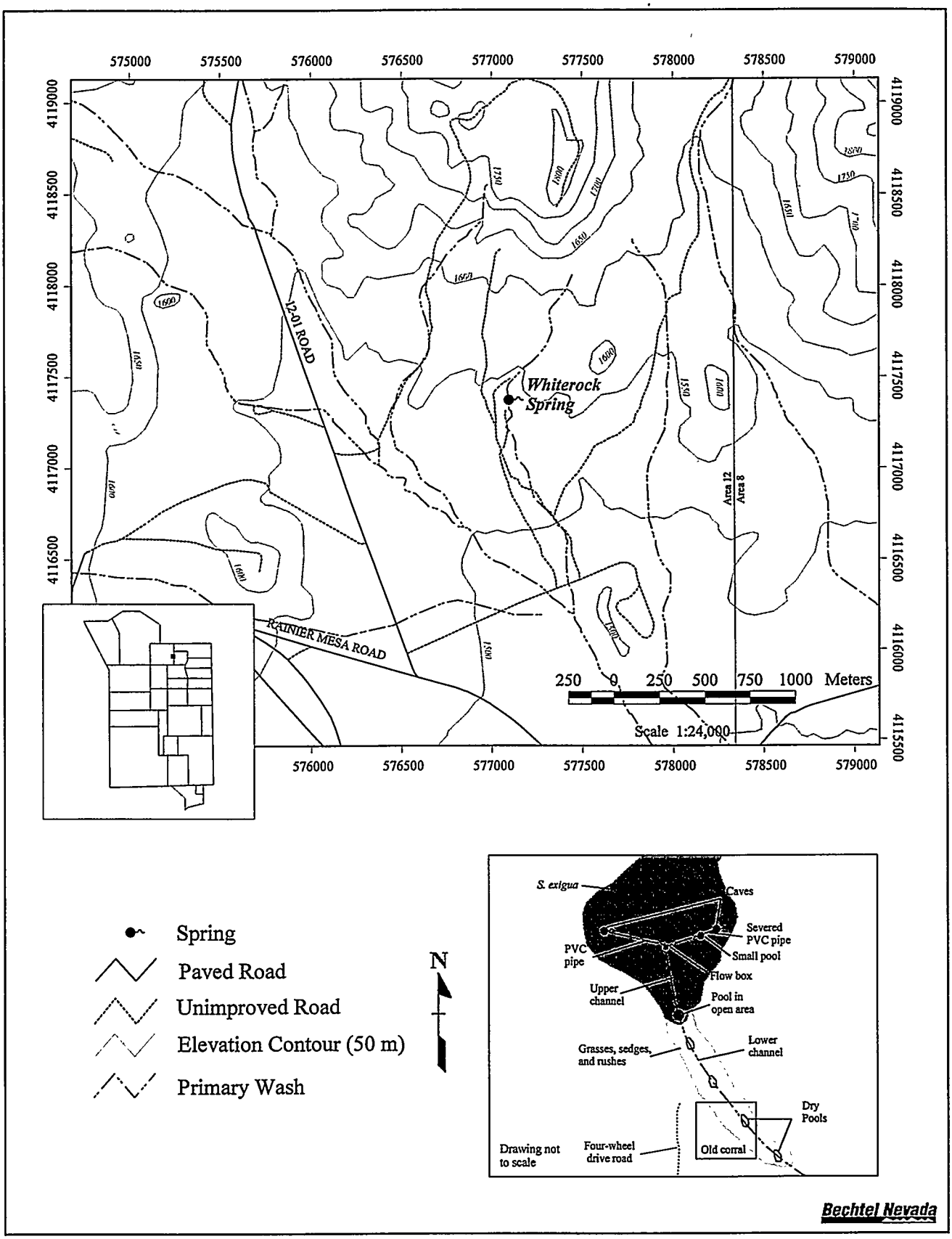

Figure 4-23 Location and sketch of Whiterock Spring

miners tunneled into the hillside and installed pipes from the springs to a watering tank (Photos 4-57 and 4-58) (Worman, 1969). Two caves, one located on each side of the wash, were excavated (both about 5 m [16.4 ft] long by 1 m [3.3 ft] wide) to improve flow or store water. The east cave contained water 8 cm (3 in) in depth as determined by the height of the check dam. The east cave was open to sunlight and supported mosses and aquatic plants (Photo 4-59). The west cave was heavily shaded, contained water about 15 cm (6 in) deep, and supported no aquatic plants.

4.2.23.2 *Hydrophytic Vegetation*

Two plant communities were surveyed at Whiterock Spring (Tables 4-26 and 4-27). One community in the upper stretch of the wash was dominated by sandbar willow. There was an opening in the trees where a small surface pool occurs in dense grasses, sedges, and rushes (Photo 4-60). The other plant community in the lower stretch of the wash was dominated by Baltic rush. Other species present in the lower stretch of the wash outside the observation point included clustered field sedge, rubber rabbitbrush, basin wildrye, annual yellow sweetclover (*Melilotus indicus*), annual rabbitsfoot grass, and southern cattail. Beatley (1976) also recorded annual hairgrass (*Deschampsia danthonioides*), hairy willowherb (*Epilobium ciliatum*), foxtail barley, seep monkeyflower, willow dock, and broadleaf cattail (*Typha latifolia*) from Whiterock Spring. Plant species in the upland surrounding the spring included blackbrush, Gambel's oak, skunkbush sumac, and desert snowberry (*Symphoricarpos longiflorus*). One hundred percent of the dominant plant species were categorized as hydrophytic species at sampling locations in both the upper and lower stretches of the spring channel at Whiterock Spring. Hydrophytic emergent vegetation dominated by seep monkeyflower was observed in the west cave, but not the east cave. Whiterock Spring is the second largest wetland on the NTS, 1,800 m^2 (19,369 ft^2), based on the area occupied by wetland vegetation (Table 5-1, Section 5.0).

4.2.23.3 *Wetland Hydrology and Water Quality*

Field indicators were observed at the two cave pools and the upper and lower stretches of the spring channel, indicating the presence of wetland hydrology at the site. Presently, one PVC pipe leads from each cave pool to a flow gauge box located in the middle of the wash. Flow from the east cave pours onto the ground from a broken pipe, forming a small pool about 3 cm (1 in) deep and 0.1 m^2 (1.1 ft^2) in area which drains through gravel. Flow from the west cave fills the flow box and overflows into the rocky, permeable substrate. The combined flow rate from both cave pools measured in September 1996 was approximately 1.9 ℓ/min (0.5 gal/min). Depth to inundation was measured through a partially buried pipe in the ground and was 45.7 cm (18 in). Downstream in the lower stretch of the wash, several dry ephemeral pools exist that contained field indicators of wetland hydrology such as dried algae on rocks. Water quality measurements were taken in the flow box in June and September 1996 and in the west cave pool in September 1996. These water quality data are presented in Table 5-2 (Section 5.0).

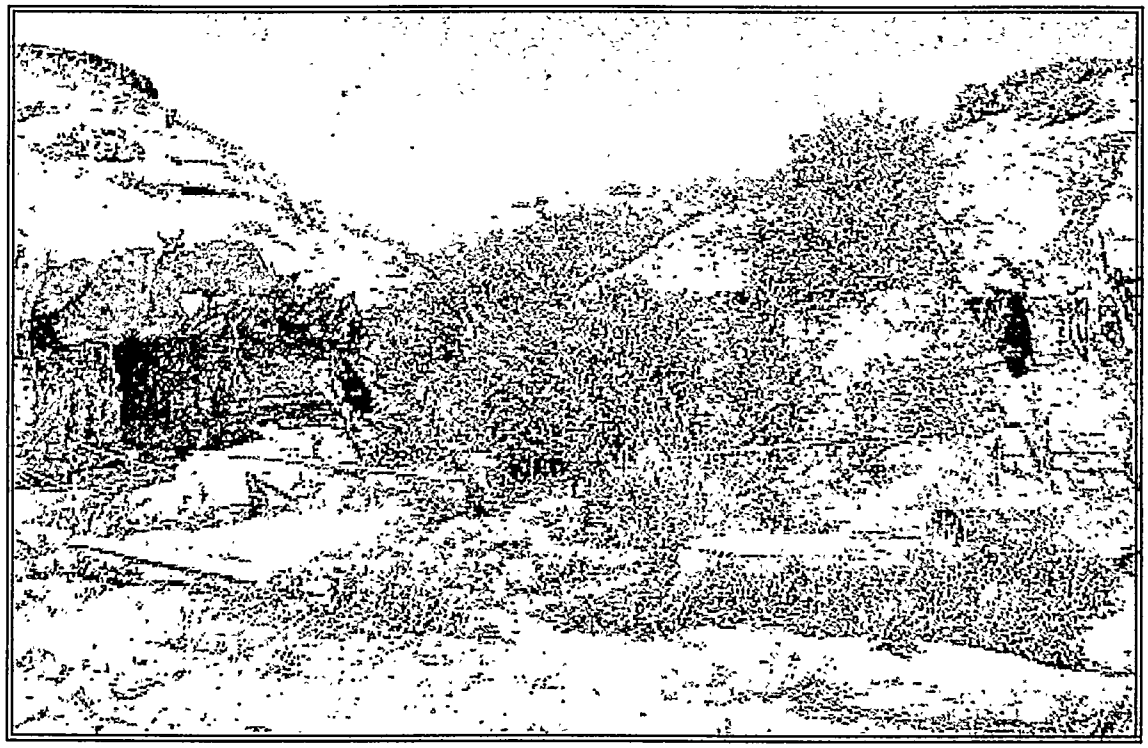

Photo 4-57 Whiterock Spring with grazed vegetation looking north about 1968 (WS505-02.TIF)

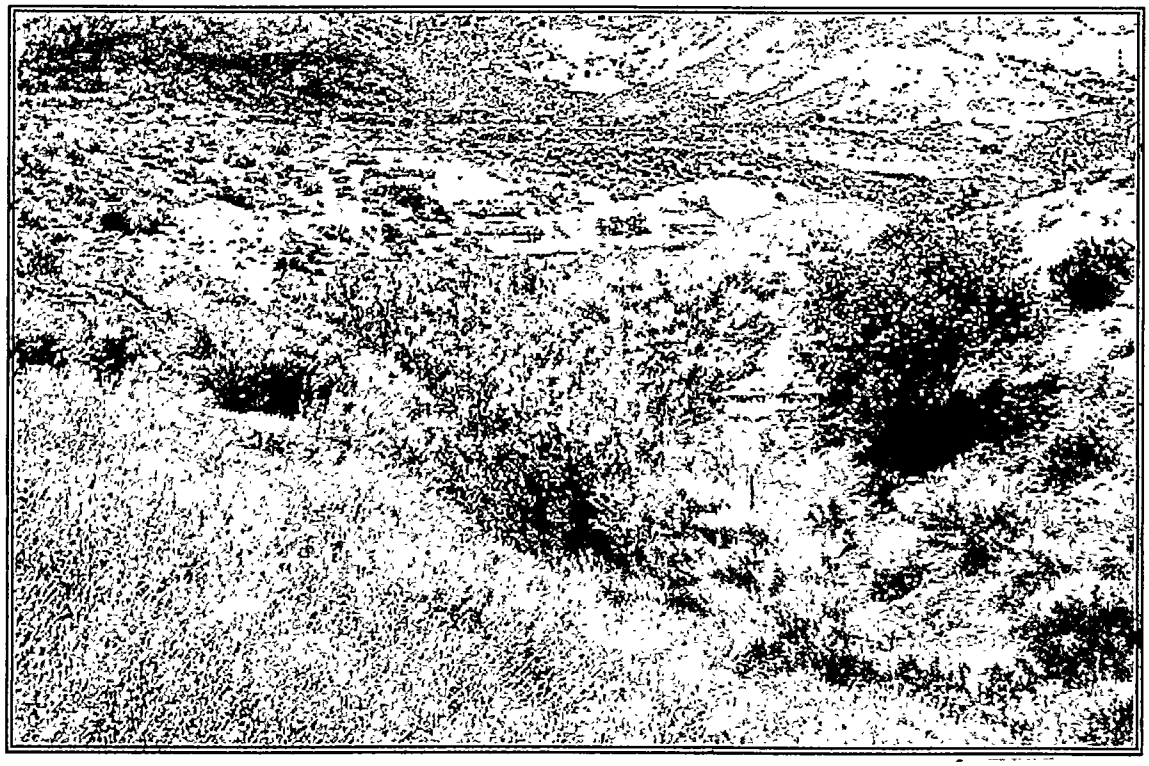

Photo 4-58 Whiterock Spring without grazing looking north on June 18, 1996 (WS341-31.TIF)

Photo 4-59 Emergent vegetation in the east cave of Whiterock Spring on December 7, 1990 (WS213-19.TIF)

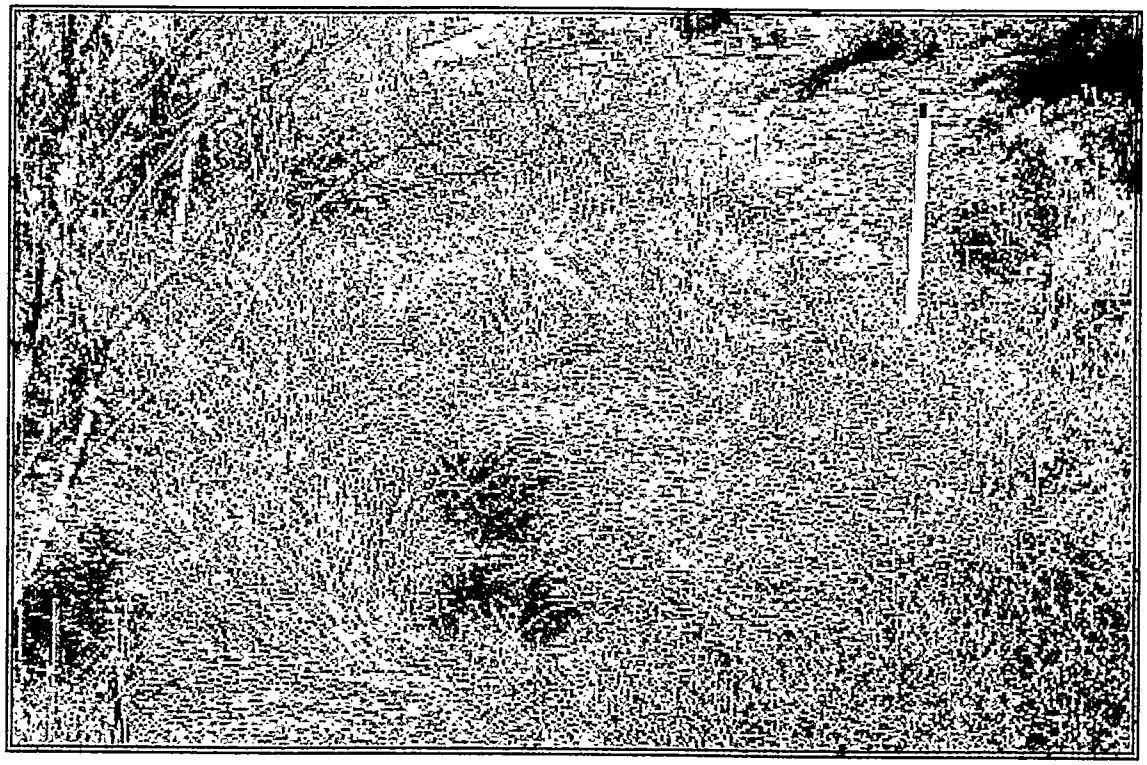

Photo 4-60 Surface pool at Whiterock Spring looking north on December 7, 1990 (WS213-17.TIF)

Table 4-26 Whiterock Spring wetland vegetation as surveyed on June 18, 1996

Habitat: Upper Stretch of Spring Channel

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Salix exigua	sandbar willow	FACW	**80**
Herb Layer:			
Potentilla biennis	biennial cinquefoil	FAC	Tr
Rumex salicifolius	willow dock	FACW*	5

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values. Tr = trace, <1% absolute cover.
[a]For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

Table 4-27 Whiterock Spring wetland vegetation as surveyed on June 18, 1996

Habitat: Lower Stretch of Spring Channel

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
no species			
Herb Layer:			
Artemesia ludoviciana	Louisiana sagewort	FACU	2
Juncus balticus	Baltic rush	FACW	**94**
Linum lewisii	prairie flax	NL	1
Potentilla biennis	biennial cinquefoil	FAC	1
Rumex salicifolius	willow dock	FACW*	Tr
Sporobolus airoides	alkali sacaton	FAC-	Tr

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values. Tr = trace, <1% absolute cover.
[a]For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: Yes

4.2.23.4 *Hydric Soils*

Field indicators of hydric soils were observed at the cave pools and in the upper and lower stretches of the spring channel. Soils at these locations appeared to have been saturated for more than seven days during the growing season, indicating the presence of hydric soils. Soils at this site were very rocky and poorly developed. Soil pits were not dug at this site.

4.2.23.5 *Determination of Jurisdictional Status*

The eastern cave pool and the upper and lower stretches of the spring channel at Whiterock Spring meet the criteria to be considered jurisdictional wetlands. Field indicators for all three required parameters (hydrophytic vegetation, wetland hydrology, and hydric soils) were present at these sites. The western cave pool lacked hydrophytic vegetation, perhaps because of reduced light reaching the cave. This cave pool may be considered waters of the United States.

4.2.23.6 *Wildlife Use*

Wildlife species known to use this site include desert cottontails, black-tailed jackrabbits, mule deer, raptors, upland game species, and 12 species of passerine birds. Giles (1976) reported use of the area by horses, although no horses have been observed at the spring since horse monitoring began in 1988. The willow grove offers significant cover to migrating birds and raptors such as Cooper's hawks and long-eared owls.

4.2.24 Yellow Rock Springs

4.2.24.1 *Site Description and Historical Use*

The Yellow Rock Springs site occurs below a yellow tuff formation near the base of Fortymile Canyon (Figure 4-24, Photo 4-61). There appears to be little evidence of human disturbance at the spring except for numerous Native American rock shelters in the area. These rock shelters are located about 23 m (75 ft) above the canyon floor (Stoffle *et al.*, 1990b). One rock shelter contained grinding slabs and a rock wall. It is believed that this area was used temporarily by Native Americans traveling through the area. The wash north of the site is believed to be the likely route used by Native Americans for collecting pinyon nuts on Shoshone Mountain (Stoffle *et al.*, 1990b).

4.2.24.2 *Hydrophytic Vegetation*

A wetland vegetation survey was conducted at the Yellow Rock Springs site on December 19, 1996. From the observation point in the rocky wash, no wetland plant species were observed, indicating that hydrophytic vegetation was absent from this site (Table 4-28). Skunkbush sumac was the most dominant plant species and, although it is not considered a hydrophytic species, it appears to be restricted to moist soil habitats on the NTS. Skunkbush sumac and basin wildrye have not been observed in upland habitat around any of the NTS springs visited, and therefore these plants may serve as indicators

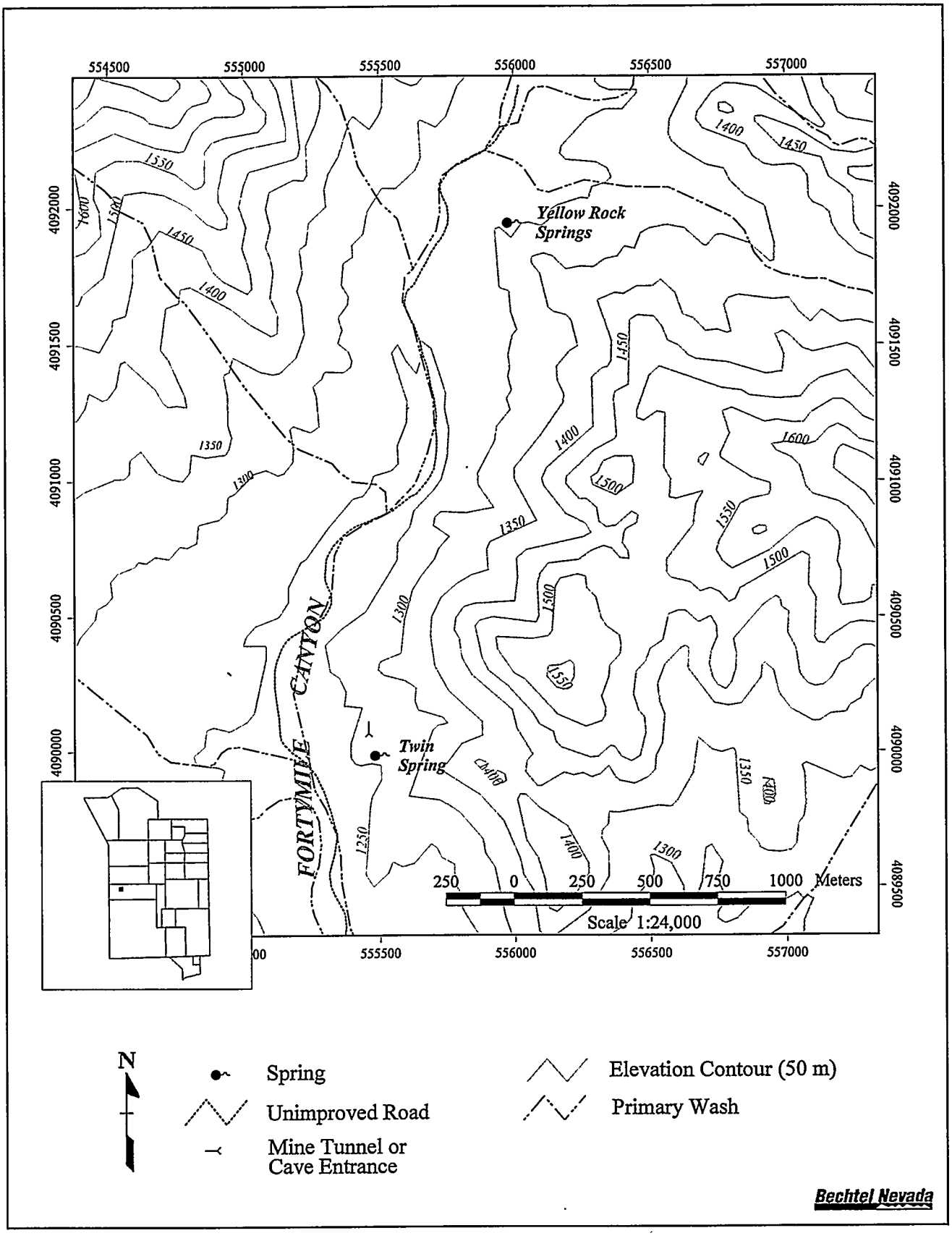

Figure 4-24 Location of Yellow Rock Springs

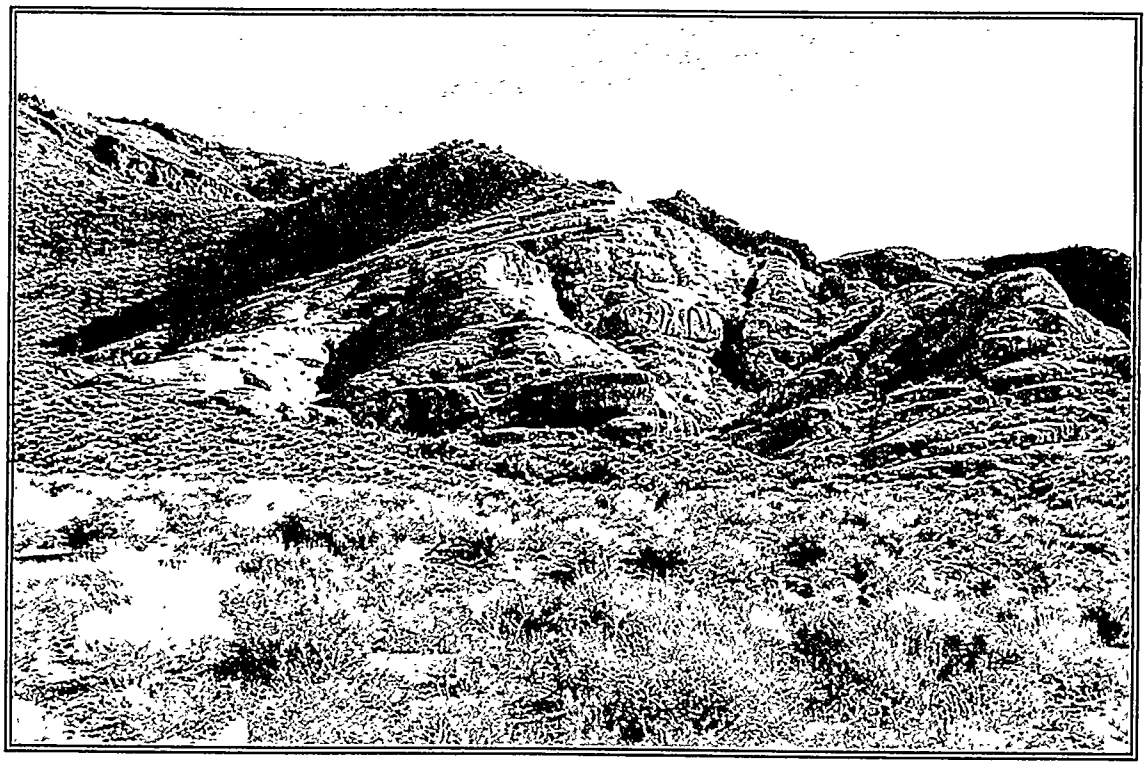

Photo 4-61 Habitat around Yellow Rock Spring looking southeast on January 29, 1997 (WS348-8.TIF)

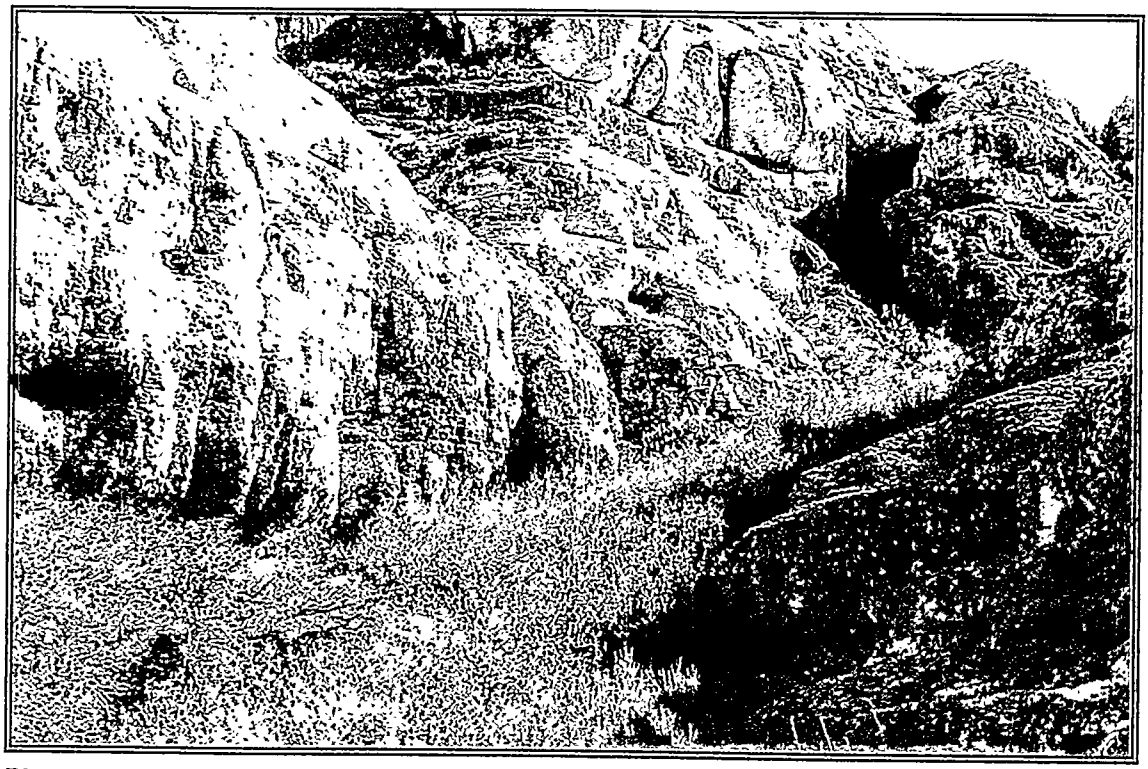

Photo 4-62 Drainage channel at Yellow Rock Spring looking southeast on January 29, 1997 (WS348-11.TIF)

Table 4-28 Yellow Rock Springs wetland vegetation as surveyed on December 19, 1996

Habitat: Rocky Wash

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
no species			
Shrub Layer:			
Rhus trilobata	skunkbush sumac	NI	**60**
Herb Layer:			
Bromus tectorum	cheatgrass	NL	**10**

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: __0__ %. Dominant plant species are indicated by bold Absolute % Cover values.

[a] For Region 8 indicator status codes for plants, see Section 3.2.4.

Hydrophytic vegetation: No

of moist soil conditions. Other plants observed in the upland area surrounding the sample area included cheatgrass, green rabbitbrush, mormon tea, and desert bitterbrush.

4.2.24.3 *Wetland Hydrology and Water Quality*

Field indicators of wetland hydrology were restricted to three narrow drainage channels at Yellow Rock Springs. Three spring sources were found in December 1996 corresponding to three spring symbols shown on the Topopah Spring USGS 7.5-Minute Series quadrangle map (1961). Water seeps out of rock fissures and flows down three drainage channels to the northwest for about 40 m (131 ft) (Photo 4-62). Numerous small surface pools occur in these rocky washes. The average pool size was about 1 m (3 ft) long by 0.25 m (0.8 ft) wide and 15 cm (6 in) deep. The pools were frozen at the time of the survey, and water quality measurements were not taken. The surface area of inundation was estimated to be about 30 m^2 (323 ft^2) (Table 5-1, Section 5.0).

4.2.24.4 *Hydric Soils*

Field indicators for hydric soils were present and appeared to be confined to isolated pockets of soil within bedrock fissures located in the three drainage channels. The floor of all three channels appeared to have been saturated for more than seven days during the plant growing season, indicating the presence of hydric soils. These drainage channels were predominantly rocky with little accumulation of soil fines.

4.2.24.5 *Determination of Jurisdictional Status*

Yellow Rock Springs would probably not be considered a jurisdictional wetland because it lacked field indicators for hydrophytic vegetation.

4.2.24.6 *Wildlife Use*

Little is known about wildlife use of the spring. Mule deer appear to use the area, as indicated by the presence of scat found near the spring. Many species of passerine birds probably benefit from drinking at this site during summer months.

4.2.25 Yucca Playa Pond

4.2.25.1 *Site Description and Historical Use*

Yucca Playa Pond occurs west of Mercury Highway (Figure 4-25), about 50 m (164 ft) west of the Yucca Lake airplane landing strip and about 50 m (164 ft) north of Yucca Lake weather station. The ephemeral pond occurs in a low spot on the west side of Yucca Lake playa where water appears to collect naturally from playa drainage (Photo 4-63). It is comprised of four to five connecting lobes or smaller attached ponds. Water depth determines the extent to which the ponds are connected into one larger pond. It is not known if this pond is natural or human-enhanced, although evidence suggests that it is natural. Four fault lines converge beneath the pond and may have caused subsidence from earth movement associated with these faults (Fernald *et al.*, 1968; McKeown *et al.*, 1976). The pond area is labeled the "Railroad Tanks" on the Yucca Lake USGS 7.5-Minute Series quadrangle map (1986). The pond appears to be one of the lowest spots on Yucca Lake playa, based on elevational contour lines. The pond was present in black and white aerial photographs taken in 1964 (photos in the possession of Dennis Gustafson, Senior Geologist/Hydrologist with BN). The 1964 photos did not show evidence of human disturbance except for construction of a small rectangular berm about 70 m (230 ft) long by 21 m (69 ft) wide, positioned diagonally within the northernmost lobe of the pond. No other evidence of excavation or berms around the pond was observed during the site survey.

4.2.25.2 *Hydrophytic Vegetation*

From the observation point at the south edge of the pond, 100 percent of the dominant plants were hydrophytic species (Table 4-29). Saltcedar was the dominant wetland species at the site. Trees were inundated to a depth of 0.6 m (2 ft) at the time of the survey on January 7, 1997. There were approximately 50 trees growing around the pond with each tree having an average area of about 34 m^2 (366 ft^2). About 6 percent of the total pond area was covered with trees. The narrow band of saltcedar around the edges of the ephemeral pond defines the wetland plant community dominated by hydrophytic vegetation. Aerial photographs taken in 1964 did not reveal the same pattern of trees around the pond as are seen in aerial photographs taken in 1994, suggesting that saltcedar has colonized the site since 1964. Photo interpretation of the 1964 photos suggest that there may have been about six large shrubs around the pond at that time, and it is unknown if these shrubs were saltcedar or other plant species. Only one other species was observed around the pond edge, southern cattail, which was limited to one small clump of about 1 m^2 (11 ft^2) in the north end of the pond. There was no evidence of other herbaceous vegetation within the pond during the site survey in January 1997. The hydrophytic vegetation surrounding Yucca Playa Pond covered an estimated area of 3,400 m^2 (36,597 ft^2) (Table 5-1, Section 5.0).

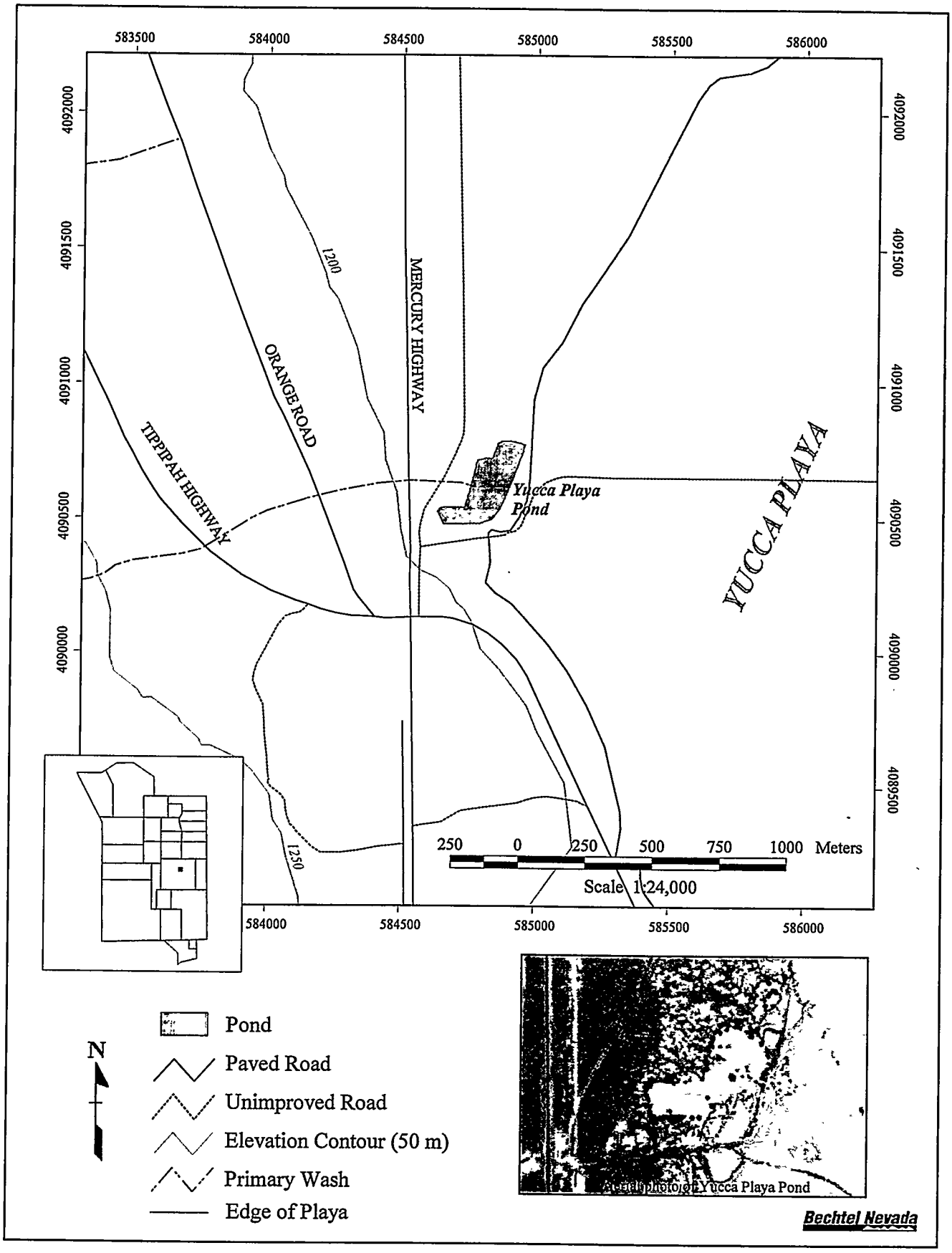

Figure 4-25 Location and aerial photo of Yucca Playa Pond

Photo 4-63 Emergent vegetation at Yucca Playa Pond looking north on January 7, 1997 (WS346-10.TIF)

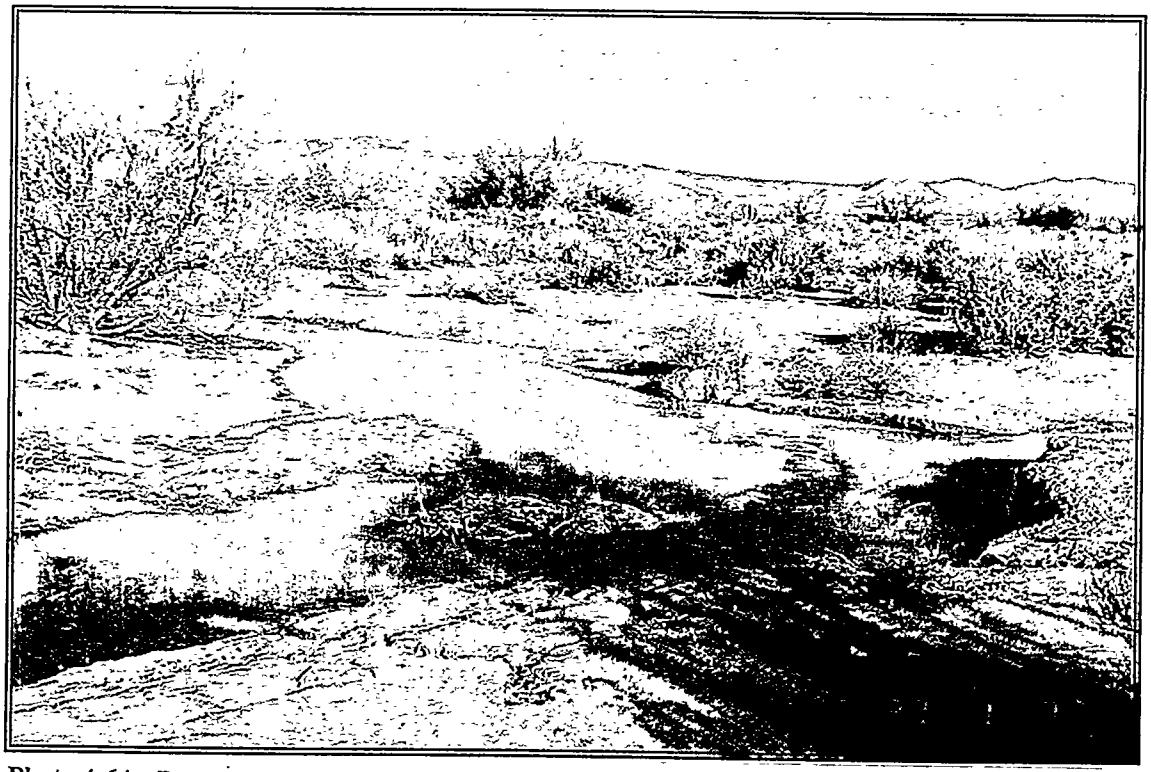

Photo 4-64 Drainage channel entering Yucca Playa Pond looking northwest on January 7, 1997 (WS346-06.TIF)

Table 4-29 Yucca Playa Pond wetland vegetation as surveyed on January 7, 1997

Habitat: Playa Pond

Species	Common Name	Indicator Status[a]	Absolute % Cover
Tree Layer:			
Tamarix ramosissima	saltcedar	FACW	**20**
Shrub Layer:			
no species			
Herb Layer:			
Typha domingensis	southern cattail	OBL	Tr

Percentage of dominant plant species that are OBL, FACW, or FAC indicator status: 100 %.
Dominant plant species are indicated by bold Absolute % Cover values. Tr = trace, <1% absolute cover.
[a]For Region 8 indicator status codes for plants see Section 3.2.4.

Hydrophytic vegetation: Yes

Upland vegetation surrounding Yucca Playa Pond was quite diverse and somewhat weedy. Key species of plants included fourwing saltbush, cheatgrass, bottlebrush squirreltail, halogeton (*Halogeton glomerata*), prickly Russian thistle (*Salsola paulsensii*), tall tumblemustard (*Sisymbrium altissimum*), Joshua tree, and several herbs and grasses that were not identified because of a lack of distinguishing taxonomic characteristics at the time of the site survey in January of 1997.

4.2.25.3 *Wetland Hydrology and Water Quality*

Field indicators of wetland hydrology were present at Yucca Playa Pond. Field indicators included surface water at the pond (also observed in previous years) and a well-eroded shoreline, apparently from wave action, which was barren of vegetation. Several drainage channels direct water off the playa into the pond (Photo 4-64). The surface area of the pond measured approximately 22,930 m^2 (246,840 ft^2) or 2.3 ha (5.7 ac) (Table 5-1, Section 5.0). Depth of water in January 1997 appeared to be about 150 cm (59 in), although the exact depth could not be determined because of ice. No springs or seeps are known to contribute water to the pond, and water supply appears to be primarily from surface runoff from precipitation events during winter months. It is likely that water persists within the ephemeral pond during the spring but dries during the summer. Water quality measurements were taken on January 7, 1996, and data are presented in Table 5-2 (Section 5.0).

4.2.25.4 *Hydric Soils*

Field indicators of hydric soils consisted of saturated soil within the pond. The soil appeared to remain saturated for more than seven days during the plant growing season

(although persistence of the water into the growing season was not actually observed, but estimated), indicating the presence of hydric soils. Hydric soils were confined to the edges and bottom of the pond. The soil appeared to contain abundant clays and silts and may have been saline during the summer when evaporating water would concentrate soluble salts.

4.2.25.5 *Determination of Jurisdictional Status*

The pond edges of Yucca Playa Pond meet the criteria to be considered a jurisdictional wetland because they have field indicators of all three wetland parameters: hydrophytic vegetation, wetland hydrology, and hydric soils. The jurisdictional wetland zone around the pond is located between the uplands and the deeper unvegetated areas of the pond. It is characterized by the presence of saltcedar which grows in a narrow band around the edge of the pond. The deeper areas of the pond were inundated at the time of the survey and contained no evidence of vegetation. These areas would not be considered jurisdictional wetlands because they lack hydrophytic vegetation, but may be considered waters of the United States. The length of time water persists within the pond into the plant growing season and the colonization of the pond bottom and sides by herbaceous vegetation is unknown and will require further study to determine site conditions during spring and summer months.

4.2.25.6 *Wildlife Use*

Many birds are known to use this pond including chukar, great blue herons (*Ardea herodias*), great-horned owls (*Bubo virginianus*), and many species of ducks (Romney and Greger, 1992). In the past, flocks of up to 40 ducks have been observed on the pond at one time. Mule deer and coyotes use the area as indicated by the presence of scat found near the pond. Many species of passerine birds probably benefit from drinking at this site during summer months following precipitation events. Three kinds of shrimp (fairy, tadpole, and clam) have been identified from the pond (Starkweather, 1996).

4.2.26 Potential Man-Induced Wetlands

In addition to the natural seeps, springs, and Yucca Playa Pond, there are numerous wetlands on the NTS that are man-induced. These sites are mentioned in general in this section, but no field surveys of these sites were conducted to determine their jurisdictional status. A man-induced wetland is an area that has developed at least some characteristics of naturally occurring wetlands due to either intentional or incidental human activities. Examples of man-induced wetlands include sumps, lagoons, ponds, and ditches fed by wells, and wetlands resulting from excavation. In virtually all cases, man-induced wetlands involve a significant change in the hydrologic regime, which may either increase or decrease the wetness of the area. Indicators of hydric soils are usually poorly represented or absent, while indicators of hydrophytic vegetation and wetland hydrology are more apparent. As mentioned in Section 3.1, some man-induced wetlands are not subject to Section 404 of the CWA. For example, if hydrophytic vegetation is maintained only by wetland hydrology that would no longer exist if an activity (e.g., irrigation) were to be terminated, the area is not considered a jurisdictional wetland. Two areas on the NTS known to support man-induced wetlands include Frenchman Lake and Yucca Flat.

Within Frenchman Lake, more than 24 known areas have been excavated during construction of instrumentation sheds and other support facilities associated with historic aboveground nuclear tests conducted on the playa. These excavations vary in size and shape and are estimated to range between 1 ha (2.5 ac) and 100 m^2 (1,076 ft^2) with a depth of from 1 m (3 ft) to 10 m (33 ft). The excavations intercept and collect surface runoff after storms and periodically fill with water. One of the three field indicators needed for a site to be considered a jurisdictional wetland is the presence of hydrophytic vegetation, which around these excavations consists almost exclusively of saltcedar trees. The presence of the other two required field indicators, wetland hydrology and hydric soils, is questionable and will require further study to determine if ponded water and saturated soils persist long enough into the growing season to be considered wetland hydrology and hydric soils. The presence of hydric soils at these sites is questionable because saturation within the upper 46 cm (18 in) of the soil does not appear to occur. At the majority of the 24 known excavations, the soil supporting the roots of these trees does not appear to be saturated near the soil surface, and it appears that the only time the upper 46 cm (18 in) of soil would be saturated is immediately following a precipitation event. The saturated soil zone appears to be located 1 to 2 m (3 to 6 ft) deep and, therefore, would not meet the criteria needed to be considered hydric soils. If these excavations do not meet the criteria for jurisdictional wetlands they would, however, still be considered waters of the United States by virtue of the fact that they are located on Frenchman Lake (see Section 4.2.27).

Within Yucca Flat, numerous subsidence craters created by historical belowground nuclear tests retain surface water and support hydrophytic vegetation. These craters are another category of man-induced wetlands. These circular depressions (typically about 150 m [500 ft] in diameter and 20 m [70 ft] in depth) also intercept and collect surface runoff after storms, and many of them support hydrophytic vegetation (again, mostly saltcedar trees).

Vegetation within the craters of Yucca Flat and the excavations on Frenchman Lake may be mapped during 1997 as part of the continuing vegetation mapping of the NTS. Further assessments will be made of these areas only when a proposed NTS project may affect them. At that time, the presence of field indicators positive for jurisdictional wetlands would be determined.

4.2.27 Waters of the United States

There are other natural bodies of water on the NTS that are unvegetated but which attract wildlife and are therefore considered important biological resources. These water bodies include Yucca and Frenchman lakes which periodically flood during heavy precipitation and are known to offer seasonal habitat to migratory waterfowl. Although they are not wetlands by definition, they qualify as waters of the United States. Waters of the United States is a broad category of waters under the jurisdiction of the USACE as authorized under the CWA. They include ". . . waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes or natural ponds . . . ."

The exact boundaries of the waters of the United States on both Yucca and Frenchman lakes are yet to be delineated using detailed topographic maps and field observations, although the upper elevation boundary (the "ordinary high water mark") is often approximated by the high water mark created during a 100-year storm of six hours duration. At Yucca Lake, this upper elevation is estimated at 1,196.3 m mean sea level (msl) (3,925 ft msl) with an area of approximately 2,016 ha (4,982 ac) (Raytheon Services Nevada, 1994). This water level is located approximately at the edge of the unvegetated playa. At Frenchman Lake, the 100-year, 6-hour model elevation is estimated at 939 m msl (3,080 ft msl), and no estimate of area has been made (Julianne Miller, Hydrologist [BN], personal communication, March 3, 1997). This water level is also located approximately at the edge of the unvegetated playa.

5.0 DISCUSSION AND SUMMARY OF NTS WETLANDS

5.1 Jurisdictional Wetlands Determination

Sixteen of the 25 NTS study sites surveyed in 1996 and 1997 met the three required criteria (hydrophytic vegetation, wetland hydrology, and hydric soils) to be considered jurisdictional wetlands (Figure 5-1, Table 5-1). Copies of wetland field data sheets used to document site conditions and delineate jurisdictional wetland boundaries at the sites are located in Appendix B. Nine sites lacked one or more of the three field indicators needed to be considered jurisdictional wetlands.

All 16 sites which may be considered jurisdictional wetlands had field indicators of hydrophytic vegetation (Table 5-1), suggesting that the sizes of the jurisdictional wetlands increase slightly with increased seepage and water flow. During years of abundant seepage, wetland vegetation increases in area of coverage, and during years of reduced seepage, the total wetland area is reduced. Four sites have cave pools which contain water throughout most of the year but lack vegetation (Cane, Tippipah, Tub, and Whiterock springs), apparently because of reduced light reaching the caves. These pools that lacked hydrophytic vegetation did not meet the criteria to be considered jurisdictional wetlands but may be considered waters of the United States which still fall under the jurisdiction of the USACE. Yucca Playa Pond is an ephemeral pond, the margins of which support wetland vegetation. However, the pond periodically inundates a large area of about 16,246 m^2 (174,807 ft^2) which appears to support no vegetation. Like the unvegetated cave pools, this area may also be considered waters of the United States.

Twenty-three of the 25 study sites had field indicators of wetland hydrology (Table 5-1). No such field indicators were found at Rainier Spring and Tupapa Seep when these sites were visited (Table 5-1). The source of water at most of the study sites is groundwater discharge from seeps and springs. Surface runoff from precipitation was found at Yucca Playa Pond and at four sites with natural rock catchment basins (tanks). The length of time soils are saturated at these sites which retain surface runoff varies depending on the time of year when precipitation events occur. Winter storms provide water that stays longer in the tanks and pond than water from summer storms. Two sites have tanks (Rock Valley Tank and Yellow Rock Springs), but they also have some water from seepage. Little is known about the persistence of water in all of the known NTS tanks through the year, but it is possible that water in these natural rock depressions, as well as in Yucca Playa Pond, would be considered waters of the United States by the USACE.

Twenty sites were observed to have field indicators for hydric soils (Table 5-1). Field indicators were limited at these sites and were often inferred from site hydrology and past observations of surface water or saturated soils. The five sites lacking field indicators for hydric soils either had no water or no saturated soils at the time the survey was conducted (Pavits Spring, Rainier Spring, Rock Valley Tank, and Tupapa Seep) or were located in bedrock and soils were absent (Tongue Wash Tank). The soils at the remaining 20 sites often lacked field indicators such as mottling and low chroma values (i.e., dark colored soils due to high organic matter content) that are common in wetter climates such as the Great Basin. Desert wetland soils on the NTS are often subject to severe erosion during

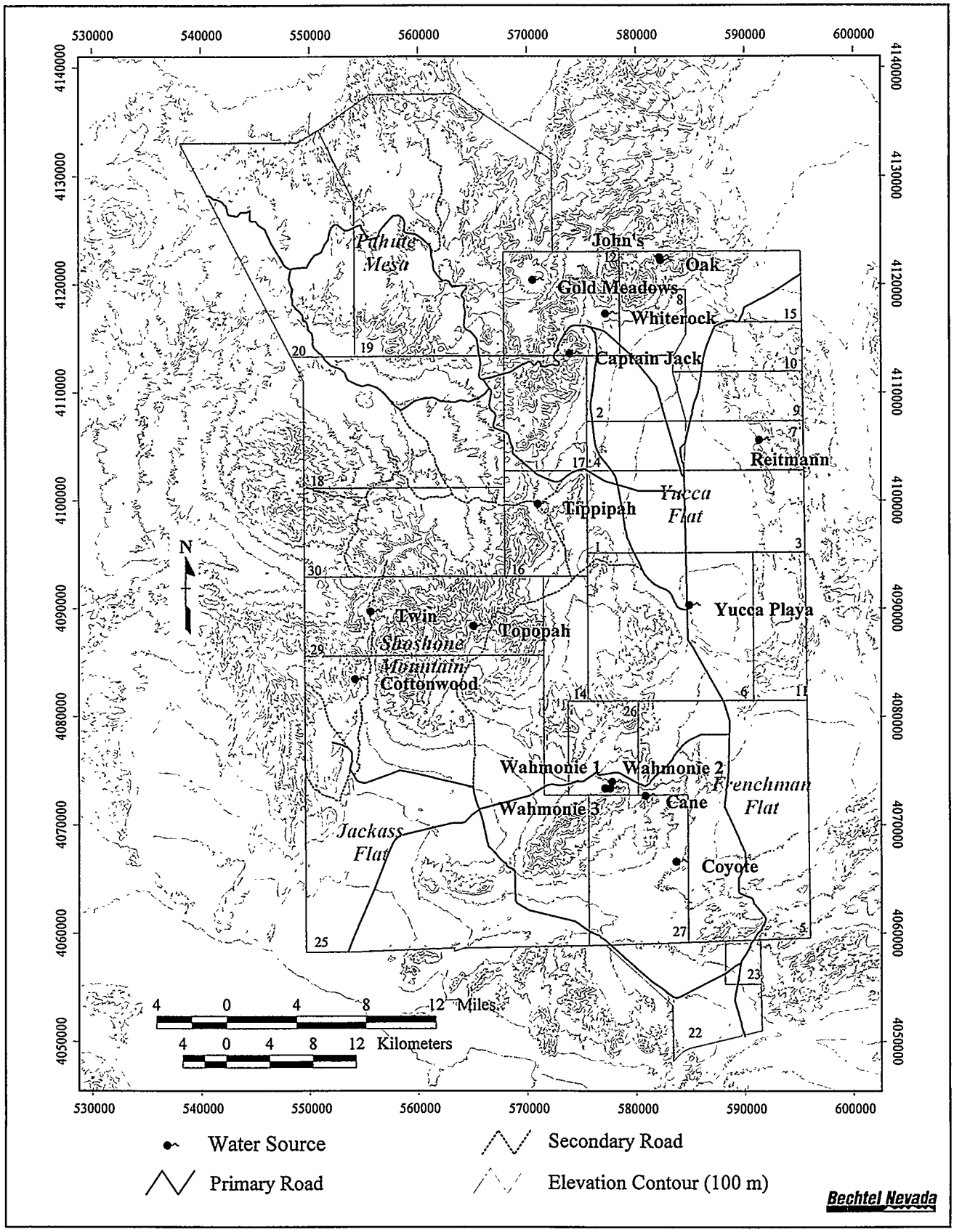

Figure 5-1 **Water sources identified as jurisdictional wetlands at the NTS**

Table 5-1 **Wetland hydrology data and jurisdictional wetland status of natural water sources surveyed June 1996 – February 1997**

Water Source	Area of Wetland Vegetation (m^2)[a]	Area of Surface Water (m^2)[b]	Flow Rate (ℓ/min)[c]	Maximum Depth (cm)[d]	Wetland Indicators			Jurisdictional Status[e]
					Vegetation	Hydrology	Soils	
Ammonia Tanks	0	30	0	100	no	yes	yes	no
Cane Spring	230	4	3.0	200	yes	yes	yes	yes
Captain Jack Spring	30	7	0.9	18	yes	yes	yes	yes
Cottonwood Spring	130	90	1.0	25	yes	yes	yes	yes
Coyote Spring	160	0	0	0	yes	yes	yes	yes
Fortymile Canyon Tanks	0	8	0.2	20	no	yes	yes	no
Gold Meadows Spring	45	0	0	0	yes	yes	yes	yes
John's Spring	50	5	0.4	3	yes	yes	yes	yes
Oak Spring	40	1	0.4	3	yes	yes	yes	yes
Pavits Spring	0	0	0	0	no	yes	no	no
Rainier Spring	0	0	0	0	no	no	no	no
Reitmann Seep	1	1.5	0.2	15	yes	yes	yes	yes
Rock Valley Tank	0	0.1	0.	30	no	yes	no	no
Tippipah Spring	500	190	2.7	38	yes	yes	yes	yes
Tongue Wash Tank	0	4.5	0	25	no	yes	no	no
Topopah Spring	200	8	0.12	25	yes	yes	yes	yes
Tub Spring	0	0.1	0.1	5	no	yes	yes	no
Tupapa Seep	0	0	0	0	no	no	no	no
Twin Spring	27	2	NM	10	yes	yes	yes	yes
Wahmonie Seep 1	250	5	NM	8	yes	yes	yes	yes
Wahmonie Seep 2	150	0.25	0	0	yes	yes	yes	yes
Wahmonie Seep 3	180	0	0	0	yes	yes	yes	yes
Whiterock Spring	1,800	0.1	1.9	3	yes	yes	yes	yes
Yellow rock Spring	0	30	NM	40	yes	yes	yes	yes
Yucca Playa Pond	3,400[f]	22,930	0	150	yes	yes	yes	yes
Total Area (m^2)	**7,193**	**23.316**						

[a]Total surface area over which wetland plans were located. [b]Maximum inundated area recorded at the time of the survey. [c]Maximum flow rate recorded during the year 1996. NM = maximum depth of natural surface water pools. [e]Whether site qualifies as a jurisdictional wetland based on presence of wetland indicators. [f]Area includes that defined by tree canopy cover and an equal area of extended roots.

storm runoff that removes soil from its place of accumulation. The drying of the remaining soil during periods of low precipitation does not permit the accumulation of organic matter (low chroma) or the presence of other characteristics (mottling) common to hydric soils elsewhere. Desert soils do, however, meet the criteria of hydric soils when they are inundated for long (seven days to one month) or very long (greater than 30 days) periods of time during the plant growing season.

5.2 Physical and Chemical Features

5.2.1 Physical Hydrology

Twenty-five sites were visited and characterized between June 1996 and January 1997. Eleven of these wetlands have surface flow of water all year long (Cane Spring, Captain Jack Spring, Cottonwood Spring, John's Spring, Oak Spring, Reitmann Seep, Tippipah Spring, Topopah Spring, Tub Spring, Twin Spring, and Whiterock Spring). The remaining 14 sites are ephemeral; they may dry up at some period of time during the year or during dry years. The sizes of the NTS wetlands are very small compared to the Ash Meadows spring system. With the exception of Tippipah Spring, Whiterock Spring, and Yucca Playa Pond, most of the sites were relatively small in size, less than 300 m^2 (3,228 ft^2) (*Table 5-1*). The NTS wetlands varied in size from less than 1 m^2 (10.8 ft^2) to approximately 3,400 m^2 (37,000 ft^2) based on the area of hydrophytic vegetation. Yucca Playa Pond and Whiterock Spring had the largest area of wetland vegetation at 1,800 m^2 (19,368 ft^2) and 3,400 m^2 (37,000 ft^2), respectively. Inundated areas were also very small (1 m^2 [10.8 ft^2] to about 190 m^2 [2,045 ft^2]) except for the Yucca Playa Pond (22,932 m^2 [246,748 ft^2]), which had more surface water than all the other sites combined. When these sites are inundated, water levels are generally very shallow, ranging from 3 to 200 cm (1.2 to 78.8 in) (*Table 5-1*).

Flow rates of NTS springs measured in 1996 and 1997 were very low, ranging from 0.0 to 3.0 ℓ/min (0.0 to 0.80 gal/min), while the flow rate at Crystal Springs in Ash Meadows is over 9,500 ℓ/min (2,500 gal/min) (DOE, 1988). Flow rates of springs at NTS vary seasonally and are partially dependent on large precipitation events (Ingraham *et al.*, 1991; Lyles *et al.*, 1990). For example, at Cane Spring, surface flow from the cave pool was negligible during June 1996, but was measured at approximately 3 ℓ/min (0.8 gal/min) during November 1996 following a period of local rainfall. A review of historical flow rates of NTS springs suggests that discharge rates measured in 1996 fall within the range of most previously reported discharge rates from 1982 to 1990. This is not the case, however, when current flow rates are compared with those from the 1960s. There is one historical record which suggests that flow rates have decreased markedly over the last 25 years at two of the largest NTS springs. In November 1960, Moore (1961) reported discharge rates at Cane Spring of 7.6 to 11.4 ℓ/min (2 to 3 gal/min) and at Whiterock Spring of 3.8 to 7.6 ℓ/min (1 to 2 gal/min). About 25 years later (1981-1988), measurements ranged from 1.1 to 6.3 ℓ/min (0.29 to 1.66 gal/min) for Cane Springs and 0.5 to 4.6 ℓ/min (0.37 to 1.22 gal/min) for Whiterock Spring (Ingraham *et al.*, 1991; Lyles *et al.*, 1990). Other evidence which suggests declining flow rates at Cane Spring is the area of inundation which has decreased dramatically from 1963 to the present (see *Photos 4-5* and *4-6*). This reduction probably occurred in the late 1960s or early 1970s when a reduction in flow from NTS springs was noted by Giles (1976).

The earliest accounts of flow rates for springs at NTS are reported by Ball (1907) who indicated that discharges at Oak and Whiterock springs were both approximately "1500 to 3000 gallons a day" (4 to 8 ℓ/min). Such rates are well above those reported during 1996; Oak Spring was 0.4 ℓ/min (0.1 gal/min) and Whiterock Spring was 1.9 ℓ/min (0.5 gal/min). Data from Ball (1907) showed rates at Cane Spring (4 ℓ/min [about 1,500 gal/day]) that are more consistent with 1980-1996 measured rates, but are half the 1960 values reported by Moore (1961). Similar long-term trends in spring flow rates are not apparent in the historical data from other NTS springs. For example, discharge at Topopah Spring was slightly lower in 1907 (0.04 to 0.07 ℓ/min [0.01 to 0.02 gal/min]) (Ball, 1907) than that recorded in 1996 (0.14 ℓ/min [0.04 gal/min]) but also less than that recorded in 1960 (0.5 ℓ/min [0.13 gal/min]).

These data suggest that the springs on the NTS do not respond similarly through time. Whiterock Spring appears to have been very consistent since the early 1900s, while Oak Spring has declined steadily. Cane and Topopah springs increased in the 1960s from the early 1900s, but returned to previously recorded rates by the 1980s and 1990s. It is important to note that there are several factors that could account for changes in documented spring discharges over time, including changes in climate, changes in rock matrix structure due to seismic events, and man-made modifications to the seeps and springs themselves. At Cane Spring, for example, excavation of the tunnel may have exposed water-filled rock fractures that resulted in a short-term increase in spring flow rates, which then decreased through time as the fracture was drained. Different hydrogeologic conditions among the developed springs could explain the variety of responses observed at these sites. Also, the historical data may reflect errors in discharge measurements and seasonal variations not taken into account during the measurement of flow rates.

Nine springs at NTS have been altered in some way by humans to improve flow for various purposes such as mining or ranching activities. These alterations usually involved digging adits and installing pipes and tanks to improve flow or storage capacity. Cane, Oak, Tippipah, Topopah, Tub, Twin, and Whiterock springs have all been excavated. Gold Meadows Spring was improved by constructing an earthen berm to increase water storage. Captain Jack Spring had pipes and watering troughs installed to increase water availability. These alterations have had effects on present conditions of soils, vegetation, and surface hydrology. For example, human activities around springs have caused vegetation changes such as plant introductions, selected grazing of some species, and physical disturbance.

Twenty-three of the 25 study sites discussed in this report demonstrate field indicators for wetland hydrology (Table 5-1). The presence of standing water (inundated soils), however, was limited to 21 of the 25 sites.

5.2.2 Chemical Features

Biologically important water quality parameters (water temperature, dissolved oxygen, pH, total dissolved solids, and electrical conductivity) were measured at 11 wetland sites which had surface water exceeding 5 cm (2 in) in depth (Table 5-2). At three sites (Cane, Tippipah, and Whiterock springs), water quality was sampled at two locations within the

Table 5-2 Water quality measurements of natural water sources on the NTS surveyed June 1996 – February 1997

Spring/Seep	Date	Location (microhabitat)	Water Temperature (°C)	Dissolved Oxygen (ppm)	pH	TDS (ppm)	Electrical Conductivity (μS)
Cane	6/19/96	cave pool	19.4*	6.2*	7.7*	190*	—
Cane	9/09/96	cave pool	17.4	6.0	7.1	207	406
Cane	11/13/96	cave pool	15.7	8.4	7.2	209	424
Cane	6/19/96	flow box	28.0*	0.7*	7.3*	248*	—
Cane	0/09/96	flow box	22.2	2.6	7.0	227	453
Cane	11/13/96	flow box	9.2	6.7	7.3	256	525
Captain Jack	6/19/96	spring pool	19.0*	5.5*	7.1*	90*	—
Captain Jack	9/10/96	spring pool	16.8	4.9	7.3	95	193
Cottonwood	1/08/97	spring pool	7.4	3.5	7.1	54	107
Reitmann	6/19/96	spring pool	30.0*	—	9.2*	379*	—
Reitmann	7/24/96	spring pool	28.4	2.1	7.7	346	—
Reitmann	9/10/96	spring pool	31.5	8.1	8.8	336	669
Reitmann	11/22/96	spring pool	12.4	2.7	7.4	287	557
Tippipah	6/18/96	open channel pool	18.6*	1.2	6.8	114	—
Tippipah	9/03/96	open channel pool	18.5	1.0	6.7	135	267
Tippipah	11/15/96	open channel pool	13.7	4.6	7.2	119	243
Tippipah	9/03/96	cave pool	15.3	6.7	7.0	114	227
Tippipah	11/22/96	cave pool	14.3	7.8	7.1	106	212
Topopah	6/20/96	spring pool	14.9*	3.8	7.5	66	—
Topopah	9/09/96	spring pool	20.0	2.7	6.7	69	139
Tub	6/24/96	guzzler can	26.0*	—	7.6	147	—
Tub	9/10/96	guzzler can	26.5	6.0	7.5	146	294
Twin	1/08/97	spring pool	16.8	1.0	7.0	137	271
Wahmonie Seep 1	6/20/96	wash pool	17.8*	1.8	7.5*	259	—
Whiterock	6/18/96	flow box	16.8	8.1*	7.0	124	—
Whiterock	9/03/96	flow box	18.7	6.6	7.2	139	277
Whiterock	9/03/96	west cave pool	15.6	5.8	7.4	142	276
Yucca Playa	1/07/97	pond	1.7	13.6	8.1	162	328

*Values represent single readings. All other values are an average of three readings. "—" indicates no data collected.

wetland to assess potential differences in biological indicators in different microhabitats (Table 5-2). Although the data set is small, two biologically important parameters, water temperature and dissolved oxygen, showed differences between and within microhabitats across season. Temperatures were consistently lower in the cave pools at these three sites, ranging from 3°C to 9°C (5° F to 15° F) less than the temperatures recorded in the open pools at these sites. Among all sites, water temperatures ranged from a low of 1.7° C (35°F) in a January 1997 sample beneath the ice at Yucca Playa Pond, to a high of 31.5° C (88° F) at Reitmann Seep in September 1996. Water temperatures measured at NTS springs are consistent with those from perched groundwater springs which are generally less than 21°C (70° F) (Winograd and Thordarson, 1975). Water in pools at the springs is subject to solar heating and is not geothermally heated as is common in many springs in the Mojave Desert, including Ash Meadows.

For the 11 water sources at which data were collected, the dissolved oxygen values ranged from a low of 1.0 at Tippipah Spring in September 1996 to a high of 13.6 in the Yucca Playa Pond in January 1997. Dissolved oxygen is inversely correlated with water temperature; thus, it shows seasonal fluctuations with higher values in winter and lower values in late summer. Dissolved oxygen readings also were higher in the cave pools versus the surface outflows at Cane, Tippipah, and Whiterock springs. The higher decomposition rates (increased biological oxygen demand) and higher water temperatures in the outside pools contribute to these differences. These water quality parameters are important for aquatic organisms such as the hydrobiid snail at Cane Spring. The snail appears to require water of lower temperature and higher oxygenation for survival. Its absence from the flow box microhabitat was coincident with low flow into the box and the higher temperature/lower oxygen measurements taken in June and September, 1996.

Values for pH were fairly constant for most sites across the sampling dates (Table 5-2). Most sites had slightly basic pH values which is in close agreement with values recorded by Lyles *et al.* (1990). They sampled six springs on the NTS and found means ranging from 7.09 to 7.65. In addition, pH values from selected springs measured by Moore (1961) are similar in most cases to measurements taken in 1996, although readings from Cane and Tippipah springs were more alkaline. These values differ from those obtained by Taylor and Giles (1979) who reported that seven of eight NTS springs monitored had slightly acidic water.

Total dissolved solids and electrical conductivity measured at NTS springs in 1996 (Table 5-2) appear within similar ranges of previously reported values (Moore, 1961; Lyles *et al.*, 1990). Total dissolved solids were fairly constant across season and were generally low (66 to 379 parts per million [ppm]) when compared to irrigation water standards 600 ppm (U.S. Salinity Laboratory, 1954). Topopah Spring had the lowest values, while Reitmann Seep had the highest values. Data collected by others on major cations, anions, and mineral and trace elements in NTS spring water suggest that the water chemistry of NTS springs has not changed greatly over the past 35 years (Moore, 1961; Taylor and Giles, 1979; Romney and Greger, 1994; Lyles *et al.*, 1990; Stetzenbach, 1994).

5.3 Biological Features

5.3.1 Wetland Plants

Eighty-one species of vascular plants have been recorded in or near wetland sites on the NTS (Table 5-3). There are relatively fewer species of plants recorded at all NTS wetland sites compared to other wetlands in southern Nevada such as Ash Meadows, where approximately 327 species of plants have been identified (The Nature Conservancy and FWS, 1996). Most of the species in NTS wetlands are forbs (34 species, 42 percent) followed by grasses/rushes/sedges (29 species, 36 percent), and trees/shrubs (18 species, 22 percent). This is very different from the general flora of the NTS, where forbs make up approximately 74 percent of the total number of species. Grasses, rushes, and sedges make up only 12 percent, while trees/shrubs make up 14 percent (Beatley, 1976).

The total number of plant species recorded at each wetland site during 1996 varied between 0 and 25. Cane, Topopah, Tippipah, and Whiterock springs had the most species recorded (25, 24, 23, and 22 respectively) (Table 5-3). Tongue Wash Tank had no plant species recorded in the observation area. Three sites, Gold Meadows Spring, Rainier Spring, and Rock Valley Tank had only one species. Low species numbers at sites are due primarily to the rocky nature and lack of soil moisture at these sites. In general, the smaller, ephemeral wetlands had fewer species, while the larger more permanent wetlands had more species (Tables 5-1 and 5-3). Thirty-six species of plants occurred at only a single wetland site, while others (e.g., basin wildrye, Louisiana sagewort, Baltic rush, annual rabbitsfoot grass, and seep monkeyflower) had much wider distributions (Table 5-3).

Overall, there are 24 species of plants at NTS wetlands that had 10 percent or greater absolute cover (classified as dominants) (Table 5-3). Half of these dominants (12 species) are grasses, rushes, or sedges. Forbs, which include more species than the other plant groups, have only five species that are dominants, while trees and shrubs comprised seven dominant species. These dominant species are very important in determining if hydrophytic vegetation is present at a site. Seventeen of the 24 dominant species are listed as obligate or facultative wetland species. They typify wetland areas because they generally do not occur outside very wet habitats. Three dominant species (basin wildrye, Sandberg bluegrass, and Louisiana sagewort) found in NTS wetlands are listed as facultative upland species. Species in this category can tolerate moist conditions but are more typically found in drier upland habitats. On the NTS, however, these three species are found primarily in spring areas, washes, and other areas where moisture is abundant and should probably be listed as facultative wetland species for southern Nevada. The brome grasses, foxtail brome and cheatgrass, were dominants at one or more study sites. They are ubiquitous on disturbed sites. Foxtail brome is listed as an upland species, cheatgrass, is not listed on the Region 8 species list, and they and are not indicators of mesic habitats on the NTS. There are two other dominants which were recorded at several study sites:

Table 5-3 List of plants recorded at wetland sites on the NTS

Scientific Name	National plant code	Region 8 indicator status	Ammonia Tanks	Cane Spring	Captain Jack Spring	Cottonwood Spring	Coyote Spring	Fortymile Canyon Tanks	Gold Meadows Spring	John's Srping	Oak Spring	Pavits Spring	Rainier Spring	Reitman Seep	Rock Valley Tank	Tippipah Spring	Tongue Wash Tank	Topopah Spring	Tub Spring	Tupapa Seep	Twin Spring	Wahmonie Seep 1	Wahmonie Seep 2	Wahmonie Seep 3	Whiterock Spring	Yellow Rock Springs	Yucca Playa Pond	Multiple Springs [c]
Trees/Shrubs																												
Atriplex canescens	ATCAC	UPL		X																								X
Atriplex confertifolia	ATCO	NL																		X								
Baccharis emoryii	BAEM	FACW																				D	D	D				
Cercocarpus intricatus	CEIN7	NL																										X
Chrysothamnus sp.	CHRYS9	NL																										X
Chrysothamnus viscidiflorus	CHVI8	NL																										X
Ericameria nauseosa	ERNA10	NL										X				X						D			X			
Populus fremontii	POFR2	FACW*				D																						
Prosopis glandulosa var. *torreyana*	PRGLT	UPL		X[a]																								
Prunus fasciculata	PRFA	NL																										X
Purshia glandulosa	PUGL2	NL																										X
Purshia stansburiana	PUST	NL																										X
Purshia tridentata	PUTR2	NL																										X
Quercus gambelii	QUGA	NL			X																							X
Rhus trilobata	RHTR	NI				X				X	X							X	D		X					D		
Salazaria mexicana	SAME	NL																		X								
Salix exigua	SAEX	FACW									D[b]														D[b]			
Salix gooddingii	SAGO	FACW		D[b]																								X
Symphoricarpos longiflorus	SYLO	NL																										X
Tamarix chinensis	TACH2	FACW																										X
Tamarix ramosissima	TARA	FACW		X[b]																		X					D	
Grasses/Rushes/Sedges																												
Agrostis exarata var. *monolepis*	AGEMX2	FACW																X										
Bromus diandrus	BRDI3	NL		X[a]														X[b]										
Bromus rubens	BRRU2	UPL			X	X		X						X	D	X								D				X
Bromus tectorum	BRTE	NL		X[b]	X											X				D						D		
Carex sp.	CAREX	NL																										X
Carex alma	CAAL7	OBL									X[a]																	
Carex praegracilis	CAPR5	FACW-		X[b]						D						X		X							X			
Dactylis glomerata	DAGL	FACU										X																
Deschampsia danthonioides	DEDA	FACW														X									X[a]			
Distichlis spicata	DISP	FAC+ *		X[a]			D																					
Eleocharis palustris	ELPA3	OBL														X												X
Eleocharis parishii	ELPA4	OBL		X[b]										D		X		X										X
Elymus sp.	ELYMU	NL																										X
Hordeum jubatum	HOJU	FAC+																		D					X[a]			
Hordeum murinum ssp. *glaucum*	HOMUG	NL		X[a]							X[a]							X[a]										X
Juncus balticus	JUBA	FACW	X	D[b]					D							D		D[b]				D			D[b]			X
Juncus longistylis	JULO	FACW+														X												
Juncus saximontanus	JUSA	FACW+																D										
Leymus cinereus	LECI4	FACU	X	D	X		X			X	D		D					X				D			X			
Leymus triticoides	LETR5	FAC+		X[a]							X[a]																	
Poa secunda	POSE	FACU			X[a]						X[a]							D							X[a]			

*From Beatley (1976), [b]Recorded by Beatley and observed during this survey, [c]From Allred *et al.* (1963) D = Dominant species of 10% or greater absolute cover.

Table 5-3 (continued)

Scientific Name	National plant code	Region 8 indicator status	Ammonia Tanks	Cane Spring	Captain Jack Spring	Cottonwood Spring	Coyote Spring	Fortymile Canyon Tanks	Gold Meadows Spring	John's Srping	Oak Spring	Pavits Spring	Rainier Spring	Reitman Seep	Rock Valley Tank	Tippipah Spring	Tongue Wash Tank	Topopah Spring	Tub Spring	Tupapa Seep	Twin Spring	Wahmonie Seep 1	Wahmonie Seep 2	Wahmonie Seep 3	Whiterock Spring	Yellow Rock Springs	Yucca Playa Pond	Multiple Springs[c]
Polypogon interruptus	POIN7	FACW+												D		D		X			X	X			X[b]			X
Polypogon monspeliensis	POMO5	FACW+		X[b]																								X
Polypogon viridis	POVI9	OBL		X[a]							X[a]																	X
Potamogeton pectinatus	POPE6	OBL		X[a]																								
Sporobolus airoides	SPAI	FAC-										X																
Typha domingensis	TYDO	OBL		X[b]												X					D				X		X	X
Typha latifolia	TYLA	OBL																							X[a]			
Unidentified grass		NL																	X									
Forbs																												
Amaranthus albus	AMAL	FACU		X[a]												X[a]									X[a]			X
Artemisia dracunculus	ARDR4	NL				X															X							
Artemisia ludoviciana	ARLU	FACU	D		X	X		X								X		D			X	X	X	D	X			
Berula erecta	BEER	OBL		X[a]																								X
Camissonia megalantha	CAME16	NL		X[a]																								X
Castilleja applegatei ssp. *martinii*	CAAMP	NL														X		X[a]										
Cirsium neomexicanum	CINE	NL				X																						
Cleome lutea	CLLU2	UPL		X[a]																								X
Conyza canadensis	COCA5	FACU																X							X[b]			
Encelia sp.	ENCEL	NL	X																									
Epilobium ciliatum	EPCI	FAC																							X[a]			
Epilobium glaberrimum	EPGL	FACW														X		X										
Erigeron divergens	ERD14	NL																X							X[a]			
Erodium cicutarium	ERCI6	NL														X												
Galium aparine	GAAP2	FACU								X								X[a]										
Heliomeris multiflora var. *nevadensis*	HEMUN	NL														X												
Kochia scoparia	KOSC	FACU					X																					
Lactuca serriola	LASE	FACU														X		X							X[a]			
Linum lewisii	LILE3	NL																							X			
Lotus sp.	LOTUS	NL														X												
Melilotus indicus	MEIN2	FACU																							X			
Mimulus guttatus	MIGU	OBL		X[a]	D	X		X		D	X[a]					X[a]		X				X			X[a]			X
Oenothera cespitosa ssp. *marginata*	OECEM4	NL								X																		
Penstemon rostriflorus	PER010	NL			X																							
Penstemon sp.	PENSTEM	NL								X																		
Pentagrama triangularis	PETR7	NL				X																						
Potentilla biennis	POBI7	FAC			X									X		D		X							X[b]			
Pseudognaphalium stramineum	PSST7	FAC																X										
Rumex crispus	RUCR	FAC		X[a]																								X
Rumex salicifolius	RUSA	FACW*		D	D													D			X				X[b]			X
Sisymbrium altissimum	SIAL2	FACU-																X										
Suaeda moquinii	SUMO	FACW-*																										X
Verbena bracteata	VEBR	FACU		X[a]												X												X
Veronica anagallis-aquatica	VEAN2	OBL		X[b]	D											D		D				D						X
Total Number of Species			4	26	11	8	3	3	1	7	9	3	1	4	1	23	0	24	2	2	6	9	2	3	22	2	2	33

[a]From Beatley (1976), [b]Recorded by Beatley and observed during this survey, [c]From Allred *et al.* (1963). D = Dominant species of 10% or greater absolute cover.

skunkbush sumac, for which the USACE does not have sufficient information about habitat requirements and rubber rabbitbrush, which is not included in the Region 8 species list (Reed, 1996).

Sixteen of the 25 sites characterized on the NTS show field indicators for hydrophytic vegetation.

There are no known plant species on the NTS that are listed as threatened or endangered under the Endangered Species Act. There is, however, one endangered and three threatened plant species that occur in either riparian areas, meadows, seeps, springs, or sinks of Ash Meadows. None of these plants were observed in the wetland habitats of the NTS.

5.3.2 Algae at Wetland Sites

Algae were not studied during 1996, although extensive mats of filamentous algae were noted at Captain Jack, Tippipah, and Cane springs. Filamentous algae at Cane Spring was identified as an important substrate for the hydrobiid snail that exists there. Taylor and Giles (1979) reported that *Vaucheria* sp., *Oedogonium* sp., and *Microthamnion kuetzingianum* formed an extensive algal mat substrate covered with several species of diatoms in the Cane Spring tunnel entrance. The snail was sampled and found only on algal mats at the tunnel entrance.

The primary data available on algae at springs are from Taylor and Giles (1979) and Shields and Drouet (1962). Sixty-four species of algae were identified at eight springs (Appendix B). Most of the species identified were diatoms (Chrysophyta - 33 species). Also represented were green algae (Chlorophyta - 20 species) and blue-green algae (Cyanobacteria - 11 species). Cane Spring had the most species with 27. Only three species of algae were identified from Tippipah Spring cave. Algae from springs on the NTS are little studied to date and the species list developed is certainly underrepresented.

5.3.3 Wildlife Use

Wetlands are important habitats for many species of animals. A total of 138 species of animals have been documented at NTS wetland sites (Appendix D). These species include various classes of animals including mammals, birds, reptiles, and terrestrial insects. The largest group of vertebrates using wetlands are birds (Table 5-4). Throughout the arid west, an extraordinary diversity of bird species depend on wetland habitats (Carothers *et al.*, 1974; Knopf *et al.*, 1988a,b; Dobkin, 1994). Among the 134 species of migratory landbirds that breed regularly in the Great Basin, more than half are associated primarily with riparian habitats (Dobkin, 1996). Destruction or degradation of wetland habitats is widely viewed as the most important factor in the decline of landbird populations in western North America (Bock *et al.*, 1993; Desante and George, 1994; Ohmart, 1994). For this reason, land management agencies are aware of the importance of protecting and restoring riparian habitats for birds and other wildlife (Warner and Hendrix, 1984).

Table 5-4 Number of vertebrate species recorded at each wetland study site on the NTS

Groups	Ammonia Tanks	Cane Spring	Captain Jack Spring	Cottonwood Spring	Coyote Spring	Fortymile Canyon Tanks	Gold Meadows Spring	John's Spring	Oak Spring	Pavits Spring	Rainier Spring	Reitmann Seep	Rock Valley Tank	Tippipah Spring	Tongue Wash Tank	Topopah Spring	Tub Spring	Tupapa Seep	Twin Spring	Wahmonie Seep 1	Wahmonie Seep 2	Wahmonie Seep 3	Whiterock Spring	Yellow Rock Springs	Yucca Playa Pond	Total (unique species)
Mammals	3	11	5	2	2	2	9	2	2	2	0	3	3	6	1	5	5	1	4	2	3	1	4	3	3	15
Upland game birds	1	3	3	0	0	0	3	0	1	1	0	2	0	3	1	3	3	0	1	1	0	0	2	0	1	3
Migratory waterfowl	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6
Raptors	0	6	5	0	0	1	6	0	0	0	0	1	0	3	0	4	0	0	0	0	0	0	3	0	1	11
Passerine birds	0	69	16	0	0	0	25	2	2	0	0	3	0	16	2	7	6	1	0	1	0	0	13	0	0	80
T & E species	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Totals	**4**	**95**	**29**	**2**	**2**	**3**	**43**	**4**	**5**	**3**	**0**	**9**	**4**	**28**	**4**	**19**	**14**	**2**	**5**	**4**	**3**	**1**	**22**	**3**	**7**	**116**

One hundred species of birds have been documented at NTS springs (Table 5-4). Passerine birds comprise the majority of birds recorded (80 species). With the exception of Cane Spring, raptor use appears somewhat higher at higher elevation sites (e.g., Gold Meadows Spring, Captain Jack Spring), although raptor use of wetland habitats has been poorly documented on the NTS. Upland game birds, while few in species number (three: chukar, Gambel's quail, mourning dove), benefit greatly because large numbers of these species depend on food, cover, and water at wetlands for reproduction and survival. Waterfowl use of NTS springs is negligible probably due to the small surface areas of open water. Only Cane Spring and Yucca Playa Pond are natural NTS wetland sites that are known to attract migratory waterfowl.

Mammal use is second in importance in terms of numbers of species, although data deficiencies exist for numerous sites that have been little studied. Fifteen mammal species have been recorded at NTS wetland sites (Table 5-4). It appears from these limited data that not all natural water sources are of equal importance to large mammals. For example, coyotes and mule deer use most of the NTS springs and seeps, while feral horses and pronghorn antelope use a very limited number of these natural water sources (Appendix D). This likely reflects the distribution and movement patterns of these species on the NTS. The use and importance of NTS wetlands to small mammals and bats cannot be assessed without further studies.

Documented use of wetland habitats on the NTS by federally listed endangered or threatened species appears to be negligible. There are only three such wildlife species known to occur on the NTS: the endangered peregrine falcon, and the threatened desert tortoise and bald eagle. Desert tortoise scat has been observed at the Rock Valley Tank (Table 5-4). Peregrine falcons have been sighted at two man-made well reservoirs on the NTS, but not at any natural wetlands (Greger, 1994; Greger, unpublished data). Bald eagles were sighted several times near Rock Valley during February 1977 (Castetter and Hill, 1979).

Cane Spring has the heaviest recorded species use (95 species) of all wetland sites (Table 5-4), due in part to the fact that the area has been more intensively studied and that a pond, which existed at the site when discharge rates were higher, probably attracted more bird species, particularly migratory waterfowl and passerine birds. Gold Meadows Spring, Captain Jack Spring, and Tippipah Spring also support fair numbers of species (44, 29, 26, respectively). There are several study sites that show very low numbers of species (Cottonwood Spring, Coyote Spring, Fortymile Canyon Tanks, Rainier Spring, Tupapa Seep, and Wahmonie Seep 3). All of these sites (except Cottonwood Spring) have only ephemeral water that is unavailable for wildlife use much of the year. These low numbers of species recorded may be a result of very limited study (particularly for Cottonwood Spring) and may underestimate their importance to wildlife.

Many aquatic invertebrate organisms occur in NTS springs despite their small surface area. Observed groups of aquatic organisms in springs include oligochaetes (segmented worms), nematodes (roundworms), copepods, ostracods (seed shrimps), cladocerans (water fleas), chironomids (midge larvae), and hydrobiid gastropods (springsnails); and Yucca Playa Pond is known to support three species of shrimp (fairy, tadpole, and clam shrimp) (Starkweather, 1995). The one species of hydrobiid snail (*Pyrgulopsis* sp.) is now

restricted to a small area of the spring cave pool at Cane Spring. This organism also occurs in four springs located in the northern region of the Spring Mountains some 64 km (40 mi) south of Cane Spring. Relatively little is known about aquatic invertebrates from riparian habitats in the Great Basin (Hersher and Pratt, 1990). They are also poorly known on the NTS.

6.0 MANAGEMENT OF NTS WETLANDS

The management goals and practices described in this section may be incorporated into the NTS resource management plan. During development of this plan, new wetlands-related goals (in addition to those below) may also be established. They will be integrated with those for other NTS resources such as surface and groundwater, biota, geology, and existing infrastructure. The interests of regional land and wildlife managers and stakeholders will be considered and may be incorporated into new goals. For example, DOE/NV's goal for wetlands preservation may be linked with the Nevada Division of Wildlife's goal to maintain viable populations of chukar that are known to use selected NTS springs. The management goals and practices described below are currently implemented on the NTS and ensure compliance with wetlands legislation and DOE policy to manage the NTS under the guiding principles of ecosystem management.

6.1 Protection as Important Biological Resources

Many natural water sources on the NTS provide islands of unique habitat within the Mojave and Great Basin Desert communities of south-central Nevada. Wetlands, by definition, support plants that do not normally grow in unsaturated desert soils, and therefore increase the biodiversity of plant communities on the NTS. Similarly, some NTS wetlands provide rare environments within the region for isolated populations of aquatic organisms. They also attract migratory waterfowl, passerine birds, and game species of wildlife, as documented in this report. For these reasons, and apart from their jurisdictional status under the CWA, the NTS wetlands are regarded as rare habitats which are important biological resources. The management goals for all important biological resources on the NTS include (1) avoiding impacts to the resource whenever possible, and (2) minimizing all unavoidable impacts. Additional goals germane to NTS wetlands specifically include restoring the biological integrity of wetlands if degradation occurs and preserving and enhancing the natural and beneficial values of NTS wetlands. These goals combined meet the intent of CWA, NEPA, Executive Order 11990, and the DOE Land- and Facility-Use Management Policy.

6.2 Continued Monitoring

DOE/NV has conducted periodic surveys of nine NTS natural water sources (Cane, Captain Jack, Gold Meadows, Oak, Tippipah, Topopah, Tub, and Whiterock springs, and Reitmann Seep) since 1989. These surveys have focused on wildlife observations and have served to identify wetland function and values, such as seasonal habitat for migrating water fowl. They are integrated with other ecological monitoring tasks such as surveys to census wild horses and chukar. These surveys will continue, and opportunities will be taken to sample for aquatic organisms and to collect basic water quality data at these sites. Results of continued monitoring of these selected water sources may prove valuable in better understanding the function and value of the NTS wetlands.

6.3 Identification and Evaluation of Other NTS Wetlands

Surveys will continue to be conducted on the NTS to locate other springs, seeps, and playa wetlands. These surveys will be conducted primarily in concert with other ecological monitoring field tasks. The three seeps called Wahmonie Seeps 1, 2, and 3 were discovered in the summer of 1996 during field surveys to map tortoise habitat in the southern one-third of the NTS. Habitat mapping of the northern two-thirds of the NTS is planned for Fiscal Years 1997 and 1998, and it is likely that more wetlands will be found during that effort. To identify all important biological resources on the NTS, biologists will take advantage of all opportunities in the field to visit, describe, sample, and photograph new wetland sites according to the methods described in Section 3.0 of this report. Each new wetland discovered will also be evaluated for its jurisdictional status under the CWA.

6.4 Maintenance of Wetlands Geospatial Database

DOE has developed several tools to manage important biological resources, including wetlands, on the NTS. These tools include the EGIS which contains a wetlands geospatial database containing the point locations of all known NTS wetlands linked to field data on vegetation, hydrology, soils, and wildlife usage. Selected digitized photographs of each wetland site are also linked to the database. This database will be updated annually to incorporate all new data collected at known sites or to add data on newly discovered wetland sites. The wetlands geospatial database will eventually be linked with information about other natural and man-made resources for use during implementation of the NTS comprehensive land- and facility-use management plan. These databases will also be used for the preparation of future project-specific EAs and EISs.

6.5 Inclusion in Project Siting and Permitting Procedures

Siting procedures for proposed NTS projects include an evaluation of impacts on important biological resources, including wetlands. Projects are redesigned or relocated whenever possible to avoid adverse impacts. It is possible that a proposed NTS project may unavoidably impact a jurisdictional wetland and require a permit under Section 404 of the CWA. The types of activities that require a permit would be those that destroy wetland habitat or alter the discharge, flow, or movement of water through a wetland, which may include

- clearing wetlands if it involves excavating, leveling, filling, or using heavy equipment in the wetlands;
- constructing or improving ditches or berms in wetlands, especially if the ditches or berms alter the flow of water through the wetlands;
- destroying vegetation either physically, mechanically, or chemically (e.g., burning, mowing, or herbicides); and
- dewatering seeps or springs by intercepting ground water.

A limited number of activities are exempted from regulation under Section 404. Examples of these activities include

- maintenance of currently serviceable structures such as dikes, dams, bridge abutments, and transportation structures; and
- construction of temporary sediment basins where fill material is not placed into navigable waters.

Much of the site-specific information provided in this report is sufficient to initiate a preapplication consultation with the USACE if an NTS project required a Section 404 permit.

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APPENDIX A

LIST OF SCIENTIFIC AND COMMON PLANT NAMES

Appendix A. List of scientific and common plant names*

SCIENTIFIC NAME	COMMON NAME
Trees/Shrubs	
Ambrosia dumosa	white burrobush
Amelanchier utahensis	Utah serviceberry
Artemisia tridentata	big sagebrush
Atriplex canescens	fourwing saltbush
Atriplex confertifolia	shadscale saltbush
Baccharis emoryi	Emory's baccharis
Cercocarpus intricatus	littleleaf mountain mahogany
Chrysothamnus sp.	rabbitbrush
Chrysothamnus viscidiflorus	green rabbitbrush
Coleogyne ramossisima	blackbrush
Encelia virginensis	Virgin River brittlebush
Ephedra nevadensis	Nevada jointfir
Ephedra viridis	mormon tea
Ericameria cooperi	Cooper's heathgoldenrod
Ericameria nauseosa	rubber rabbitbrush
Ericameria teretifolia	needle leaf rabbitbrush
Eriogonum fasciculatum	eastern Mojave buckwheat
Grayia spinosa	spiny hopsage
Juniperus osteosperma	Utah juniper
Larrea tridentata	creosote+B3bush
Pinus monophyla	singleleaf pinyon
Populus fremontii	Fremont's cottonwood
Prosopis glandulosa var. *torreyana*	western honey mesquite
Prunus fasciculata	desert almond
Purshia glandulosa	desert bitterbrush
Purshia stansburiana	Stansbury cliffrose
Purshia tridentata	antelope bitterbrush
Quercus gambelii	Gambel's oak
Rhus trilobata	skunkbush sumac
Salazaria mexicana	Mexican bladdersage
Salix exigua	sandbar willow
Salix gooddingii	Goodding's willow
Symphoricarpos longiflorus	desert snowberry
Tamarix chinensis	fivestamen tamarisk
Tamarix ramosissima	saltcedar
Yucca brevifolia	Joshua tree
Yucca schidigera	Mojave yucca
Grasses/Rushes/Sedges	
Agrostis exarata var. *monolepis*	monolepis bentgrass
Bromus diandrus	ripgut brome
Bromus rubens	foxtail brome
Bromus tectorum	cheatgrass
Carex sp.	sedge
Carex alma	sturdy sedge
Carex praegracilis	clustered field sedge
Carex alma	sturdy sedge
Carex praegracilis	clustered field sedge
Dactylis glomerata	orchardgrass
Deschampsia danthonioides	annual hairgrass
Distichlis spicata	inland saltgrass
Eleocharis palustris	common spikerush
Eleocharis parishii	Parish's spikerush
Elymus elymoides	bottlebrush squirreltail
Elymus sp.	wildrye
Hordeum jubatum	foxtail barley
Hordeum murinum ssp. *glaucum*	smooth barley
Juncus balticus	baltic rush
Juncus longistylis	longstyle rush
Juncus saximontanus	Rocky Mountain rush
Leymus cinereus	basin wildrye
Leymus triticoides	beardless wildrye
Phragmites australis	common reed
Poa secunda	Sandberg bluegrass
Poa sp.	bluegrass
Polypogon interruptus	ditch polypogon
Polypogon monspeliensis	annual rabbitsfoot grass
Polypogon viridis	beardless rabbitsfoot grass
Potamogeton pectinatus	sago pondweed
Sporobolus airoides	alkali sacaton
Typha domingensis	southern cattail
Typha latifolia	broadleaf cattail
Forbs	
Amaranthus albus	prostrate pigweed
Artemisia dracunculus	wormwood
Artemisia ludoviciana	Louisiana sagewort
Berula erecta	cutleaf waterparsnip
Camissonia megalantha	largeflower suncup
Camissonia sp.	suncup
Castilleja applegatei ssp. *martinii*	Martin's wavyleaf Indian paintbrush

* Species nomenclature is according to NRCS, 1996a

Appendix A. List of scientific and common plant names*

SCIENTIFIC NAME	COMMON NAME
Forbs (Cont.)	
Cirsium neomexicanum	New Mexico thistle
Cleome lutea	yellow spiderflower
Conyza canadensis	Canadian horseweed
Encelia sp.	brittlebush
Epilobium ciliatum	hairy willowherb
Epilobium glaberrimum	smooth willowweed
Erigeron divergens	spreading fleabane
Erodium cicutarium	redstem stork's bill
Galium aparine	stickywilly
Halogeton glomerata	halogeton
Heliomeris multiflora var. *nevadensis*	Nevada goldeneye
Kochia scoparia	common kochia
Lactuca serriola	prickly lettuce
Linum lewisii	prairie flax
Linum sp.	flax
Lotus sp.	trefoil
Melilotus indicus	annual yellow sweetclover
Mimulus guttatus	seep monkeyflower
Oenothera cespitosa ssp. *marginata*	tufted eveningprimrose
Penstemon rostriflorus	Bridge penstemon
Penstemon sp.	penstemon
Pentagrama triangularis	western goldfern
Potentilla biennis	biennial cinquefoil
Pseudognaphalium stramineum	straw falsecudweed
Rumex crispus	curly dock
Rumex salicifolius	willow dock
Salsola paulsensii	prickly Russian thistle
Sisymbrium altissimum	tall tumblemustard
Suaeda moquinii	Mojave seablite
Verbena bracteata	bigbract verbena
Veronica anagallis-aquatica	water speedwell

*Species nomenclature is according to NRCS, 1996a

APPENDIX B

DATA SHEETS FOR ROUTINE JURISDICTIONAL WETLAND DETERMINATION

Routine Jurisdictional Wetland Determination

Name: PDG, DJH Wetland Unit: Wash pool
Location: Ammonia Tanks UTM Coordinates Easting: 5-62-850 Northing: 41-10-240
Date: 1-7-97

Hydrology

Type: Seep _____ Spring _____ Pond _____ Detention basin _____ Stream _____ Natural Tanks X
Source: Natural X Man-enhanced _____ Man-made _____ Ephemeral X Permanent _____ Temporary _____
Date of construction/Period of flow: On 1-7-97 there was no water flow out of the tanks.
Disturbance type (if any) and date: None: A nearby rock shelter indicates human historical use
Inundated: Yes X No ___ Depth of standing water >50cm ; Saturated: Yes X No ___ Depth to saturation 0
Other field indicators: _____
Atypical situation: Yes _____ No X ; **Wetland hydrology: Yes X No _____**
Basis: Surface water exists at the observation point.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Artemisia ludoviciana*	FACU	**30**
2.	*Encelia* sp.	UNKN	2
3.	*Juncus balticus*	FACW	8
4.	*Leymus cinereus*	FACU	5
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: _____
Percentage of species that are OBL, FACW, and/or FAC: 0 %; **Hydrophytic vegetation: Yes _____ No X**
Basis: Lack of dominance of hydrophytic species at the observation point.

Hydric Soils

Field indicators: Hydric soils exist at the observation point due to presence of saturated soils for longer than 7 days duration.

Hydric Soils: Yes X No _____

Jurisdictional Wetland Determination : Wetland _____ Nonwetland X

Notes:
[a] Wetland indicator status for plants in region 8. FACW = facultative wetland species. FACU = Facultative upland species. UNKN = Unknown wetland status of this species.

Routine Jurisdictional Wetland Determination

Name: PDG, DJH, JAA Wetland Unit: Drainage channel below cave pool
Location: Cane Spring UTM Coordinates Easting: 5-80-775 Northing: 40-72-730
Date: 6-19-96

Hydrology

Type: Seep ____ Spring X Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced X Man-made ____ Ephemeral ____ Permanent X Temporary ____
Date of construction/Period of flow: Unknown date of construction. PVC pipe directs water from cave to a flow guage box.
Disturbance type (if any) and date: Channels dug out leading to a dry pond. An old road forms a berm-Cave adit pool dug out.
Inundated: Yes ____ No X Depth of standing water 0 ; Saturated: Yes X No ____ Depth to saturation 12"-18"
Other field indicators: Hydrobiid snails, *Pyrgulopsis sp* restricted to cave pool living on filamentous algae present near opening of the cave pool
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes ____ No X**
Basis: At the observation point, the outflow channel is dry at the surface, but is saturated at 1ft depth. No surface outflow from the cave pool occurs on this date. Flow rate measured at the cave pool in November 22,1996 was about 3 liters/min.

Vegetation

List 3 dominant species,% cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

Species	*Indicator Status*[a]	*% Cover*
Trees		
1. none		
2.		
3.		
4.		
Shrubs		
1. *Atriplex canescens*	UPL	**15**
2.		
3.		
4.		
5.		
Herbs		
1. *Leymus cinereus*	FACU	**40**
2. *Rumex salicifolius*	FACW*	**15**
3.		
4.		
5.		
6.		
7.		
8.		
9.		

Percentage of species that are OBL, FACW, and/or FAC: 33 %; **Hydrophytic vegetation: Yes ____ No X**
Basis: Observation point was dry during the survey - other areas nearby have hydrophytic vegetation.

Hydric Soils

Field indicators: Hydric soils-undisturbed: Soils have mottling at depths of about 5-6 ft. under the surface, shown on a cut away bank. Overall depths of soils approximately 6-8 ft.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination: Wetland ____ Nonwetland X

Notes:

Meadow above cave pool has *Juncus balticus and leymus cinereus* (7m x 10m =70 m^2 area); *Typha domingensis, Tamarix ramossisima, Salix goodingii, Polypogon monospeliensis* are other species in the area. Cattails occur under large willows. *Tamarix sp* occurs on the old pond berm (i.e. dirt road). [a] Wetland indicator status for plants in region 8. UPL = Upland plant species. FACW* = tentative assignment as a facultative wetland plant species based on limited information available. FACU = Facultative upland plant species.

Routine Jurisdictional Wetland Determination

Name: PDG Wetland Unit: Seep under the willow trees
Location: Cane Spring UTM Coordinates Easting: 5-80-775 Northing: 40-72-730
Date: 9-9-96

Hydrology

Type: Seep ____ Spring X Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced X Man-made ____ Ephemeral ____ Permanent X Temporary ____
Date of construction/Period of flow: Unknown period of flow
Disturbance type (if any) and date: Channel dug out by man leeds to a dry pond
Inundated: Yes X No ____ Depth of standing water 2-3 cm; Saturated: Yes X No ____ Depth to saturation 0
Other field indicators: Water flow is present under willow \ fenced area
Atypical situation: Yes ____ No X ____; **Wetland hydrology:** Yes X No ____
Basis: Surface water exists at the observation point.

Vegetation

List 3 dominant species, % cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	*Salix goodingii*	FACW	**90**
2.			
3.			
4.			
5.			
Shrubs			
1.			
2.			
3.			
4.			
5.			
Herbs			
1.	*Juncus balticus*	FACW	**30**
2.	*Leymus cinereus*	FACU	**40**
3.	*Typha domingensis*	OBL	**15**
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Percentage of species that are OBL, FACW, and/or FAC: 75 %; **Hydrophytic vegetation:** Yes X No ____
Basis: The observation point has a dominance of hydrophytic vegetation. Total wetland area estimated to be about 230m^2.

Hydric Soils

Field indicators Soil mottling, dark organic soils (low chroma), and soil saturation for greater than 7 days duration are present indicating hydric soils exist at the observation points.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes :

Drainage area appears excavated by man, i.e. man made channel. *Polypogon monospeliensis* occurs in the spring area.
Hydrobid snails are absent from east channnel (where they occurred in 1988) but are now present only in the cave pool.
[a] Wetland indicator status for plants in region 8. FACU = Facultative upland species. FACW = Facultative wetland species OBL = Obligate wetland species.

Routine Jurisdictional Wetland Determination

Name: PDG, DJH, JAA Wetland Unit: Drainage channel below pool
Location: Captain Jack Spring UTM Coordinates Easting: 5-73-834 Northing: 41-13-668
Date: 6-19-96

Hydrology

Type: Seep ____ Spring X Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral ____ Permanent X Temporary ____
Date of construction/Period of flow: In 1977, pipes were installed which lead to watering tanks. Pipes no longer exist. A metal tank (now dry) was bolted to rocks adjacent to the wash channel. A flood damaged tank exists in the wash.
Disturbance type and date: Heavy feral horse use has apparently impacted upland vegetation near the spring entrance.
Inundated: Yes X No ____ Depth of standing water 20cm ; Saturated: Yes X No ____ Depth to saturation 0
Other field indicators: The spring consists of a small pool (24" x 30") and about 8" deep below some rock ledges with a surface ouflow varies from 20-50cm wide by 2 cm deep. Surface flow out of the pool is < 1L/min on 6-19-96.
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No ____**
Basis: Surface water exists at the observation point.

Vegetation

List 3 dominant species, % Cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Mimulus guttatus*	OBL	**10**
2.	*Potentilla biennis*	FAC	**5**
3.	*Rumex salicifolius*	FACW*	**50**
4.	*Veronica anagallis-aquatica*	OBL	**10**
5.			
6.			
7.			
8.			
9.			

Other field indicators:
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No ____**
Basis: The observation point has a dominance of hydrophytic vegetation. Total wetland area is about $30m^2$.

Hydric Soils
Field indicators: Hydric soils exist based on the presence of saturated soils for 7 or more days duration.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:
Drainage from the spring pool continues for ≈ (30m length by 1m width) = $30m^2$ surface area of saturated soils. Soils are very rocky, but with moderate accumulation of fines in the lower end of drainage. [a] Wetland indicator status for plants in region 8. * Indicates a tentative assignment to the facultative wetland category based on limited information for this species in region 8. FACW = Facultative wetland species. FAC = Facultative wetland species. OBL = Obligate wetland species.

Routine Jurisdictional Wetland Determination

Name: PDG, WKO Wetland Unit: Drainage channel
Location: Cottonwood Spring (west of Fortymile Canyon) UTM Coordinates Easting 5-54-045 Northing: 40-83-726
Date: 12-19-96

Hydrology

Type: Seep ____ Spring X Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral ____ Permanent X Temporary ____
Date of construction/Period of flow: Period of flow unknown
Disturbance type (if any) and date: Old metal pipes exist in wash about 200m from the spring site.
Inundated: Yes X No ___ Depth of standing water 1-25cm; Saturated: Yes X No ___ Depth to saturation 0
Other field indicators: Driftwood occurs in wash adjacent to Cottonwood trees. Water occurs in three areas: the spring pool and seep area below it and two surface channels in a rocky wash. Flow rate of 1/Lpm was measured in the stream channel 70m below the spring pool on December 19, 1996.
Atypical situation: Yes ____ No X; **Wetland hydrology: Yes X No ____**
Basis: Surface water exists at the observation point. Water flows for about 200m down the wash.

Vegetation

List 3 dominant species,% cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

Species	*Indicator Status*[a]	*% Cover*
Trees		
1. *Populus fremontii*	FACW*	**20**
2.		
3.		
4.		
5.		
Shrubs		
1. *Rhus trilobata*	NI	**10**
2.		
3.		
4.		
5.		
Herbs		
1. *Bromus rubens*	UPL	2
2. *Mimulus guttatus*	OBL	**20**
3. *Pentagramma triangularis* (fern)	NL	2
4.		
5.		
6.		
7.		
8.		
9.		

Percentage of species that are OBL, FACW, and/or FAC: 66 %; **Hydrophytic vegetation: Yes X No ____**
Basis: Observation point has a dominance of hydrophytic vegetation. Wetland area was estimated at about 130m^2.

Hydric Soils

Field indicators: Hydric soils exist based on the presence of hydrophytic plants and saturated soils for greater than 7 days duration. No soil pits were dug at this site.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:

[a] Wetland indicator status for plants in region 8. OBL = Obligate wetland species. NI = Insufficient information to determine wetland status in region 8. FACW * = Tentative assignment to the facultative wetland category based on limited information for this species in region 8. NL = Not listed in the National List of Plants that occur in Wetlands for Region 8. UPL = Upland plant species

Routine Jurisdictional Wetland Determination

Name: PDG, WKO Wetland Unit: Wash slope
Location: Coyote Spring UTM Coordinates Easting: 5-83-561 Northing: 40-66-755
Date: 9-4-96

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: N/A
Disturbance type (if any) and date: None
Inundated: Yes X No ____ Depth of standing water 0 ; Saturated: Yes X No ____ Depth to saturation 0
Other field indicators: Dark colored, wet surface soil found at two locations in the wash.
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No ____**
Basis: Surface water occurs at two locations at the spring area.

Vegetation

List 3 dominant species, % cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status* [a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Distichlis spicata*	FAC+*	**60**
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: Dark soil
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No ____**
Basis: The observation point has hydrophytic vegetation. Area of wetland was estimated to be about 200m^2.

Hydric Soils:
Field indicators: Hydric soils exist based on the presence of saturated soils for a period of 7 days or greater duration.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:
Kochia scoparius (FACU), a facultative upland species occurs nearby. *Leymus cinereus* (FACU) occurs in a rocky wash 100m upstream from the observation point. [a] Wetland indicator status for plants in region 8. OBL = Obligate wetland species. FAC+* = Tentative assignment to the facultative wetland category based on limited information available for this species in region 8.

Routine Jurisdictional Wetland Determination

Name: PDG Wetland Unit: Ephemeral Pond
Location: Gold Meadows Spring UTM Coordinates Easting: 5-70-450 Northing: 41-20-440
Date: 7-22-96

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced X Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: There is no surface outflow from the pond.
Disturbance type (if any) and date: Southwest side of the pond has a man-made berm. This was possibly constructed by man to deepen the pond for livestock use. Date of excavation is unknown.
Inundated: Yes ____ No X Depth of standing water 0 ; Saturated: Yes X No ____ Depth to saturation 0
Other field indicators: Dark organic matter, damp mud present - water mark on rocks
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No ____**
Basis: Water marks exist on large rocks at the observation point. Water was present earlier in the year. Survey was conducted during a very dry year.

Vegetation

List 3 dominant species, % cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Juncus balticus*	FACW	**15**
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

Oher field indicators:
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No ____**
Basis: A dominance of hydrophytic plants occurs at the observation point. Wetland area estimated at about 45m^2.

Hydric Soils:

Field indicators Hydric soils exist based on presence of saturated soils for a period of 7 or greater days in duration.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:
Sagebrush, *Artemesia tridentata* is the major upland species in the area. Basin wild rye *Leymus cinereus* occurs on the edges of the dryed pond. Horse, deer and antelope use of the spring is significant. [a] Wetland indicator status for plants in region 8. FACW = Facultative wetland species.

Routine Jurisdictional Wetland Determination

Name: WKO Wetland Unit: Third Tank downslope from seep
Location: Fortymile Canyon Tanks UTM Coordinates Easting: 5-57-500 Northing: 40-85-000
Date: 2-12-97

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Natural tanks X
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: Unknown / Winter
Disturbance type (if any) and date: None
Inundated: Yes ____ No X Depth of standing water ____; Saturated: Yes X No ____ Depth to saturation 5cm
Other field indicators: Water is confined to bedrock pools, Few soil fines in the area.
Atypical situation: Yes ____ No X; **Wetland hydrology:** Yes X No ____
Basis: Saturated soils are present at the observation point. Natural water flow exists.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Artemisia ludoviciana*	FACU	5
2.	*Bromus rubens*	UPL	5
3.	*Mimulus guttatus*	OBL	1
4.			
5.			
6.			
7.			
8.			
9.			

Other field indicators: ____
Percentage of species that are OBL, FACW, and/or FAC: 33 %; **Hydrophytic vegetation:** Yes ____ No X
Basis: Hydrophytic plants are absent from the observation point.

Hydric Soils

Field indicators: Hydric soils exist at the observation point. Saturated soils exist for over 7 days duration.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland ____ **Nonwetland** X

Notes:
Several Tanks at the site: 2 pools 3m by 1m x .25m, 2 pools 1m x 1m x .1m, 3 others smaller occur in a narrow rocky wash bottom. Flow rate was 6 ounces/min or 0.18 l/min. Pools contained good growth of algae. Deer and coyote scat were observed in the surrounding wash. 3 golden eagles were observed overhead in flight. Upland species: PUSA, EPVI, ERTE, RHTR, CHVI, EPNE, ARTR. [a] Wetland indicator status for plants in region 8. FACU = Facultative upland species. UPL = Upland species. OBL = Obligate wetland species.

Routine Jurisdictional Wetland Determination

Name: PDG, DJH, Wetland Unit: Ledge pool
Location: John's Spring UTM Coordinates Easting: 5-82-100 Northing: 41-22-490
Date: 12-18-96

Hydrology

Type: Seep ____ Spring X Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral ____ Permanent X Temporary ____
Date of construction/Period of flow: None
Disturbance type (if any) and date: None
Inundated: Yes X No ____ Depth of standing water 2-5cm ; Saturated: Yes X No ____ Depth to saturation 0
Other field indicators: ____
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No ____**
Basis: Surface water exists at the observation point.

Vegetation

List 3 dominant species,% cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	*Rhus trilobata*	NI	**20***
2.			
3.			
4.			
5.			
Herbs			
1.	*Carex praegracilis*	FACW-	**20**
2.	*Gallium aparine*	FACU	Tr
3.	*Leymus cinereus*	FACU	**60***
4.	*Mimulus guttatus*	OBL	**80**
5.	*Penstemon* sp.	UNKN	Tr.
6.	*Oenothera cespitosa* ssp. *marginata*	NL	Tr.
7.			
8.			
9.			

Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No ____**
Basis: The observation point has a dominance of hydrophytic vegetation. Size of wetland area estimated at about $50m^2$.

Hydric Soils

Field indicators: Hydric soils exist based on the presence of saturated soils for 7 days or greater duration.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:

[a] Wetland indicator status for region 8. **R.. trilobata* and *L. cinereus* occur in the transition zone between the jurisdictional wetland and the upland habitat. OBL = Obligate wetland species. FACW- = Facultative wetland species. FACU = Facultative upland plant species. NI = Insufficient information to determine wetland status for this species in region 8. NL= not listed in National List of Plants that occur in Wetlands for Region 8. UNKN = Unknown wetland status.

Routine Jurisdictional Wetland Determination

Name: PDG Wetland Unit: Spring outflow
Location: Oak Spring UTM Coordinates Easting: 5-82-300 Northing: 41-22-400
Date: 11-4-96

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced X Man-made ____ Ephemeral ____ Permanent X Temporary ____
Date of construction/Period of flow: Unknown period of flow, however flow was reported at 1500-3000 gallons in 1907 by S.H.Ball during a geological survey of southwestern Nevada.
Disturbance type (if any) and date: During 1975, a new galvanized tank was installed with a plastic pipe. This renovation replaced the old pipe and tank. No water was present in the metal tanks on 11-4-96. Flow rate measured on December 18, 1996 was about 0.4 l/min. Inundated:Yes X No___ Depth of standing water 2-3cm ; Saturated: Yes X No___
Depth to saturation 0
Other field indicators: Rocky soil - some local excavation of soil (leveling of an area) by man.
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No____**
Basis: Surface water exists at the observation point. Size of the wetland area was estimated at about $40m^2$.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.			
2.			
3.			
4.			
5.			
Shrubs			
1.	*Rhus trilobata*	NI	5*
2.	*Salix exigua*	FACW	**100**
3.			
4.			
5.			
Herbs			
1.	*Leymus cinereus*	FACU	**30***
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: ____
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No____**
Basis: A dominance of hydrophytic vegetation occurs at the observation point.

Hydric Soils

Field indicators: Hydric soils exist based on the presence saturated soils for 7 or greater days duration .

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:
* *Leymus cinereus* and *Rhus trilobata* are present on the edge of the delineated wetland and comprised about 30 % cover of this area: [a] Wetland indicator status for plants in region 8. FACW = Facultative wetland species. NI = Insufficient information to determine wetlands status of this species in region 8. FACU = Facultative upland species.

Routine Jurisdictional Wetland Determination

Name: PDG,WKO Wetland Unit: Dry wash pool
Location: Pavits Spring UTM Coordinates Easting: 5-81-793 Northing: 40-68-350
Date: 9-4-96

Hydrology

Type: Seep____ Spring __X__ Pond _____ Detention basin _____ Stream _____ Mechanically contained _____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: Winter -spring and fall during wet years
Disturbance type (if any) and date: None
Inundated: Yes ___ No X Depth of standing water 0 ; Saturated: Yes ___ No X Depth to saturation not determined
Other field indicators: Old water marks and remnants of spring pool with mesic grasses.
Atypical situation: Yes _____ No __X___; **Wetland hydrology: Yes X No_____**
Basis: Field indicators (old pool) for hydrology were present at the observation site.

Vegetation

List 3 dominant species (% cover in bold) in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	*Ericameria nauseosa*	NL	**40**
2.			
3.			
4.			
5.			
Herbs			
1.	*Dactylus glomerata*	FACU	**10**
2.	*Sporobolus airoides*	FAC-	**10**
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: Mesic grasses including *Poa sp.* and *Camissonia sp.*
Percentage of species that are OBL, FACW, and/or FAC: 33 %; **Hydrophytic vegetation: Yes _____ No X**
Basis: A dominance of hydrophytic vegetation is not present at the observation site.

Hydic soils:
Field indicators: None - no inundation (saturated soils) during surveys in September 1996.

Hydric soils: Yes_____ No ___X___

Jurisdictional Wetland Determination : Wetland _____ Nonwetland __X____

Notes:
Wetlands survey was performed during a very dry year. [a] Wetland indicator status for plants in region 8. FAC- = Facultative wetland species. FACU = Facultative upland species. NL = Not listed on the National List of Plants that occur in Wetlands for Region 8.

Routine Jurisdictional Wetland Determination

Name: PDG DJH Wetland Unit: Wash bottom
Location: Rainier Spring Site UTM Coordinates Easting: 5-71-463 Northing: 41-16-050
Date: 12-18-96

Hydrology

Type: Seep ___ Spring X Pond ___ Detention basin ___ Stream ___ Mechanically contained ___
Source: Natural X Man-enhanced X Man-made ___ Ephemeral X Permanent ___ Temporary ___
Date of construction/Period of flow: Dry on 12-18-96, Flow was known from records in 1957.
Disturbance type (if any) and date: Some old metal pipes found in wash. A pipe was inserted between some rocks in the wash bottom to diect flow to several water tanks (2 - 55 gallon drums, formed into guzzlers) and a larger tank (8ft by 2ft by 2 ft) was overturned below in the wash.
Inundated: Yes ___ No X Depth of standing water 0 ; Saturated: Yes ___ No X Depth to saturation Unknown
Other field indicators: ___
Atypical situation: Yes ___ No X ; **Wetland hydrology: Yes ___ No X**
Basis: Water is absent from the observation point. A dirt road leading to B Tunnel occurs about 10-20 meters from the spring site and may have been a factor in affecting surface runoff and infiltration of the area before the spring dryed up.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Leymus cinereus*	FACU	**30**
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

Other field indicators: ___
Percentage of species that are OBL, FACW, and/or FAC: 0 %; **Hydrophytic vegetation: Yes ___ No X**
Basis: Lack of dominance of hydrophytic vegetation at the observation point.

Hydric Soils
Field indicators: Hydric soils are absent because saturated soils are not present for 7 days or greater duration.

Hydric Soils: Yes ___ No X

Jurisdictional Wetland Determination : Wetland ___ Nonwetland X

Notes: Records from Moore (1961), (USGS report TEI-781) indicated water (flow) was present on several dates in the fall of 1957, but the spring was dry in October 1960. [a] Wetland indicator status for plants in region 8. FACU = Facultative upland species.

Routine Jurisdictional Wetland Determination

Name: PDG, JAA, DJH Wetland Unit: Spring pool
Location: Reitmann Seep UTM Coordinates Easting: 5-91-318 Northing: 41-05-577
Date: 6-19-96

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced X Man-made ____ Ephemeral ____ Permanent X Temporary ____
Date of construction/Period of flow: Unknown date for water tank emplacement. A 50 gallon drum cut in half was installed in the ground and is normally full of water. Sediment from runoff periodically fills the drum.
Disturbance type (if any) and date: Spring pool often fills with sediment from runoff and was dug out on 6-19-96.
Inundated: Yes X No ___ Depth of standing water 6-15 cm; Saturated: Yes X No ___ Depth to saturation 0
Other field indicators: Water flows into a metal drum from a pipe installed in the ground below the spring pool.
Atypical situation: Yes ____ No X; **Wetland hydrology:** Yes X No ____
Basis: Surface water is present at the observation point.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Bromus rubens*	UPL	**10**
2.	*Eleocharis parishii*	OBL	**25**
3.	*Polypogon monspeliensis*	FACW+	**20**
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators:
Percentage of species that are OBL, FACW, and/or FAC: 66 %; **Hydrophytic vegetation:** Yes X No ____
Basis: A dominance of hydrophytic vegetation was present at the observation point. Wetland area = $1 m^2$.

Hydric Soils
Field indicators: Black soils with moderate amounts of organic matter are present: Hydric soils exist based on the presence of saturated soils for greater than 7 days duration. Soil pits were not dug at this site.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:

Black mucky soil occurs around the spring area. A channel appears dug out for about 10m long by 2m wide below the spring pool. Berms formed from this apparent disturbance have salt crust and some organic matter. The surface area of spring pool is about 1 m^2. [a] Wetland indicator status for plants in region 8. OBL = Obligate wetland species. FACW+ is a Facultative wetland species. UPL = Upland plant species.

Routine Jurisdictional Wetland Determination

Name: PDG, DJH Wetland Unit: Solution crevice in limestone outcrop
Location: Rock Valley Tank UTM Coordinates Easting: 5-68-070 Northing: 40-61-000
Date: 1-7-97

Hydrology

Type: Seep ____ Spring ____ Pond ____ Detention basin ____ Stream ____ Natural Tank X
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral ____ Permanent X Temporary ____
Date of construction/Period of flow: Unknown
Disturbance type (if any) and date: None
Inundated: Yes X No ____ Depth of standing water 25-30cm ; Saturated: Yes X No ____ Depth to saturation 0
Other field indicators: ____
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No ____**
Basis: Surface water exists at the observation point but is confined to an opening (20 by 40 cm) in rock. Water exists in a solution cavern of unknown dimensions.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Bromus rubens*	UPL	20
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

Other field indicators: ____
Percentage of species that are OBL, FACW, and/or FAC: 0 %; **Hydrophytic vegetation: Yes ____ No X**
Basis: Hydrophytic vegetation is absent from the observation site.

Hydric Soils

Field indicators: Hydric soils appear to be absent because surface water is confined to a limestone rock opening. An area of dark mesic soil accumulation (5m by 10m) occurs below the limestone outcrop. Soil depths in this area appear shallow although soil pits were not dug in this area.

Hydric Soils: Yes ____ No X

Jurisdictional Wetland Determination : Wetland ____ Nonwetland X

Notes:
Heavy coyote use of the water source is indicated by numerous scats in the area. [a] Wetland indicator status for plants in region 8. UPL = Upland plant species.

Routine Jurisdictional Wetland Determination

Name: PDG, JAA Wetland Unit: Wash channel
Location: Wahmonie Seep 1 UTM Coordinates Easting: 5-77-631 Northing: 40-74-133
Date: 6-20-96

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: None/Unknown period of flow
Disturbance type (if any) and date: None
Inundated: Yes X No ____ Depth of standing water 5-7 cm; Saturated: Yes X No ____ Depth to saturation 0
Other field indicators: Surface flow was present down the wash but was not measured.
Atypical situation: Yes ____ No X; **Wetland hydrology:** Yes X No ____
Basis: Surface water exists at the observation point.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	*Baccharis emoryi*	FACW	**40**
2.	*Ericameria nauseosa*	NL	**10**
3.			
4.			
5.			
Herbs			
1.	*Artemisia ludoviciana*	FACU	1
2.	*Juncus balticus*	FACW	**30**
3.	*Leymus cinereus*	FACU	**15**
4.	*Mimulus guttatus*	OBL	1
5.	*Polypogon monspeliensis*	FACW+	2
6.	*Veronica anagallis-aquatica*	OBL	**10**
7.	Moss	NL	1
8.			
9.			
10.			

Other field indicators:
Percentage of species that are OBL, FACW, and/or FAC: 60 %; **Hydrophytic vegetation:** Yes X No ____
Basis: A dominance of hydrophytic vegetation occurs at the observation point. Area of wetland estimated at about 250m^2.

Hydric Soils:
Field indicators: Hydric soils exist at the observation point based on the presence of saturated soils for 7 days or greater duration.

Hydric soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:
Tamarix ramosissima exists lower down in the wash from the wetland area. Later in the year *Mimulus sp.* will be 5% cover. *Veronica sp.* and *Mimulus sp.* are immature at this time (primarily basal leaves are present). Length of wetland area = 15 ft (5m) x 120 ft (40m) = 200m^2. Surface water occurs in the upper 15 ft (5m) of wash. One surface pool was very small (≈1 ft. wide x 2-3 ft. long). [a] Wetland indicator status for plants in region 8. NL = not listed in the National List of Plants that occur in Wetlands for Region 8. OBL = Obligate wetland species. FACW, FACW+ are both facultative wetland species. FACU = Facultative upland species.

Routine Jurisdictional Wetland Determination

Name: PDG, JAA Wetland Unit: Wash channel
Location: Wahmonie Seep 2 UTM Coordinates Easting: 5-77-597 Northing: 40-73-418
Date: 6-20-96

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: None/Unknown availability of water
Disturbance type (if any) and date: None
Inundated: Yes ___ No X Depth of standing water 0 ; Saturated: Yes X No ___ Depth to saturation 12 inches
Other field indicators: Surface water was present at this seep on June 6, 1996 but not on June 20, 1996.
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No ____**
Basis: Surface water was present at the site during 1996.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	*Baccharis emoryi*	FACW	85
2.			
3.			
4.			
5.			
Herbs			
1.	*Artemisia ludoviciana*	FACU	2
2.	*Moss*		1
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: ____
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No ____**
Basis: A dominance of hydrophytic plants occurs at the observation point. Wetland area was estimated to be about 150m^2.

Hydric soils
Field indicators: Hydric soils exist based on the presence of saturated soils for a period of 7 days or greater duration.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:

Soils are very rocky. Wetland dimensions are approximately 30m x 5 m. Damp soil exists under plants in wash. [a] Wetland indicator status for plants in region 8. FACW = Facultative wetland species. FACU = Facultative upland species.

Routine Jurisdictional Wetland Determination

Name: JAA, PDG Wetland Unit: Seep channel
Location: Wahmonie Seep 3 UTM Coordinates Easting: 5-77-044 Northing: 40-73-438
Date: 6-20-96

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: None/Unknown seasonal availability of water
Disturbance type (if any) and date: None
Inundated: Yes __ No X Depth of standing water 0 ; Saturated: Yes X No ___ Depth to saturation undetermined
Other field indicators: Water marks on rocks in wash. Surface water was present on June 6, 1996 but not on June 20,1996
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No ____**
Basis: Field indicators for surface water were recorded at the observation point.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	*Baccharis emoryi*	FACW	**60**
2.			
3.			
4.			
5.			
Herbs			
1.	*Artemisia ludoviciana*	FACU	**10**
2.	*Bromus rubens*	UPL	**30**
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators:
Percentage of species that are OBL, FACW, and/or FAC: 33 %; **Hydrophytic vegetation: Yes X No ____**
Basis: A dominance of hydrophytic vegetation occurs at the observation site. Area of wetland estimated to be about 180m^2.

Hydric Soils:
Field indicators: Hydric soils exist based on the presence of saturated soils for 7 days or greater duration during 1996.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:

Soils are very thin next to bedrock in the wash bottom. Salt encrusted water marks along the wash occur for 50-60m distance. (Water marks show a 3 meter width). *Artemesia ludoviciana* 10 % cover, and *Bromus rubens* 30% cover, occur on the edges of the wash. [a] = Wetland indicator status for plants in region 8. FACW = Facultative wetland species. FACU = Facultative upland species. UPL = Upland plant species.

Routine Jurisdictional Wetland Determination

Name: DJH, JAA, PDG Wetland Unit: 1 - Upper stretch of the spring channel
Location: Tippipah Spring UTM Coordinates Easting: 5-70-810 Northing: 40-99-723
Date: 6-18-96

Hydrology

Type: Seep ____ Spring _X_ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural _X_ Man-enhanced _X_ Man-made ____ Ephemeral ____ Permanent _X_ Temporary ____
Date of construction/Period of flow: During wet years, flow extends further down the wash, at least 300-500m in length.
Disturbance type (if any) and date: Possible man-enhanced deepening of spring channel - Tunnel excavated by man forms an underground pool that collects water before it flows out into a surface channel. The surface channel is narrow and also appears excavated through rocks with side berms of soil placed adjacent to the channel.
Inundated: Yes _X_ No___ Depth of standing water 15-20cm ; Saturated: Yes _X_ No___ Depth to saturation _0_
Other field indicators: Spring is associated with old homestead and ranch - old corral - livestock used the area.
Atypical situation: Yes ____ No _X_; **Wetland hydrology: Yes _X_ No____**
Basis: Surface water exists at the observation point.

Vegetation *List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)*

Species	*Indicator Status*[a]	*% Cover*
Trees		
1. none		
2.		
3.		
4.		
5.		
Shrubs		
1. none		
2.		
3.		
4.		
5.		
Herbs		
1. *Carex praegracilis*	FACW-	2
2. *Eleocharis palustrus*	OBL	Tr.
3. *Heliomeris multiflora var. nevadensis*	NL	Tr.
4. *Juncus balticus*	FACW	49
5. *Polypogon monspeliensis*	FACW+	Tr.
6. *Veronica anagallis-aquatica*	OBL	49
7.		
8.		

Other field indicators:
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes _X_ No____**
Basis: A dominance of hydrophytic vegetation occurs at the observation point.

Hydric Soils
Field indicators: Hydric soils are present based on presence of saturated soils for 7 days or greater duration.

Hydric Soils: Yes _X_ No ____

Jurisdictional Wetland Determination : Wetland _X_ Nonwetland ____

Notes:

Adjacent to the wetland area is some *Ericameria nauseosa* and the blackbrush community, *Coleogyne ramosissima*, with sagebrush *Artemisia tridentata* further out into the uplands. *Typha domingensis* also occurs in the area. [a] =Wetland indicator status for plants in region 8. OBL = Obligate wetland species. FACW, FACW+, and FACW- are all facultative wetland species. NL = Not listed on the National List of Plants that occur in Wetlands for Region 8. Tr. = Trace amounts (<1% absolute cover).

Routine Jurisdictional Wetland Determination

Name: DJH, PDG, JAA Wetland Unit: 2- Middle stretch of the spring channel
Location: Tippipah Spring UTM Coordinates Easting: 5-70-810 Northing: 40-99-723
Date: 6-18-96

Hydrology

Type: Seep ____ Spring _X_ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural _X_ Man-enhanced ____ Man-made ____ Ephemeral ____ Permanent _X_ Temporary ____
Date of construction/Period of flow: None/ unknown
Disturbance type (if any) and date: None
Inundated: Yes _X_ No ___ Depth of standing water 10-15cm ; Saturated: Yes _X_ No ___ Depth to saturation _0_
Other field indicators: ____
Atypical situation: Yes ____ No _X_ ; **Wetland hydrology: Yes _X_ No ____**
Basis: Surface water occurs at the observation point. Flow rate measured about 80m downstream from the spring source on November 15, 1996 was about 2.7 L/per min.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
Herbs			
1.	*Bromus rubens*	UPL	Tr.
2.	*Bromus tectorum*	NL	2
3.	*Castilleja sp.*	UNKN	Tr.
4.	*Deschampsia danthonioides*	FACW	Tr.
5.	*Eleocharis parishii*	OBL	Tr.
6.	*Epilobium glaberrimum*	FACW	2
7.	*Heliomeris multiflora var nevadensis*	NL	2
8.	*Juncus balticus*	FACW	**40**
9.	*Juncus longistylis*	FACW+	Tr.
10.	*Lactuca serriola*	FACU	2
11.	*Polypogon monspeliensis*	FACW+	**30**
12.	*Verbena bracteata*	FACU	2
13.	*Veronica anagallis-aquatica*	OBL	**20**

Other field indicators: ____
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes _X_ No ____**
Basis: A dominance of hydrophytic vegetation exists at the observation point.

Hydric Soils
Field indicators: Hydric soils exist based on the presence of saturated soils for 7 days or greater duration.

Hydric Soils: Yes _X_ No ____

Jurisdictional Wetland Determination : Wetland _X_ Nonwetland ____

Notes:
Obsidian flakes found at the spring suggest Native American use. Tr = Trace amounts (<1 % cover) . [a] = Wetland indicator status for plants in region 8. OBL = Obligate wetland species. FACW, FACW+ are both facultative wetland species. FACU = Facultative upland species. NL = not listed in National List of Plants that occur in Wetlands for Region 8. UPL = Upland species. UNKN = Unknown status in region 8.

Routine Jurisdictional Wetland Determination

Name: DJH, PDG JAA Wetland Unit: 3 - Lower stretch of the spring channel
Location: Tippipah Spring UTM Coordinates Easting: 5-70-810 Northing: 40-99-723
Date: 6-18-96

Hydrology

Type: Seep ____ Spring X Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: None / Period of flow is dependent on amount of annual rainfall.
Disturbance type (if any) and date: Old livestock corral exits within 100m of the sream channel.
Inundated:Yes X No____ Depth of standing water 5-10cm ; Saturated: Yes X No____ Depth to saturation 0
Other field indicators: ____
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No____**
Basis: Surface water exists at the observation point.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Bromus tectorum*	NL	Tr.
2.	*Erodium cicutarium*	NL	Tr.
3.	*Heliomeris multiflora var nevadensis*	NL	2
4.	*Juncus balticus*	FACW	**40**
5.	*Lactuca serriola*	FACU	2
6.	*Polypogon monspeliensis*	FACW+	**10**
7.	*Potentilla biennis*	FAC	**20**
8.	*Verbena bracteata*	FACU	1
9.	*Veronica anagallis-aquatica*	OBL	**25**
10.			

Other field indicators: ____
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No____**
Basis: A dominance of hydrophytic plants occurs at the observation point. Size of wetland was estimated at about 500m^2.

Hydric Soils

Field indicators: Hydric soils exist based on the presence of saturated soils for a period of 7 days or greater duration.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:

Artemisia tridentata, Ericameria nauseosa encroaching on edge of wetland. A large water tank exists near lower end of the spring channel. On 6-18-96, water flowed 170 m down the wash to the old water tank. [a] = Wetlands indicator status for plants in region 8. Tr = Trace amounts (<1% cover). OBL = Obligate wetland species. FAC, FACW, FACW+ are all types of facultative wetland species. FACU = Facultative upland species. NL = not listed in National List of Plants that occur in Wetlands for Region 8.

Routine Jurisdictional Wetland Determination

Name: PDG, AA Wetland Unit: Rock water tank in cave
Location: Tongue Wash Tank UTM Coordinates Easting: 5-71-360 Northing: 41-13-050
Date: 9-10-96

Hydrology

Type: Seep _____ Spring _____ Pond _____ Detention basin _____ Stream _____ Natural tank X
Source: Natural X Man-enhanced _____ Man-made _____ Ephemeral _____ Permanent X Temporary _____
Date of construction/Period of flow: It is unknown if water flows out of the tank during any time.
Disturbance type (if any) and date: None Inundated: Yes X No ___
Depth of standing water 20-25cm ; Saturated: Yes X No ___ Depth to saturation 0
Other field indicators: A dark water mark on the rocks indicate a previous water level that is higher than the present water level.
Atypical situation: Yes _____ No X ; **Wetland hydrology: Yes X No _____**
Basis: Surface water exists at the observation point.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	none		
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: Some grasses and annuals exist in a small unsaturated area (2-3 m^2) below the cave opening where water may seep out or overflow the tank during very wet years.
Percentage of species that are OBL, FACW, and/or FAC: 0 %; **Hydrophytic vegetation: Yes _____ No X**

Basis: Hydrophytic vegetation is absent at the observation point.

Hydric Soils

Field indicators: Hydric soils appear to be absent at the observation point because water is confined to a bedrock pool. No soil pits were dug at this site.

Hydric Soils: Yes _____ No X

Jurisdictional Wetland Determination: Wetland _____ Nonwetland X

Notes:
The water tank measures about 1-2m wide by 3-4m long and occurs in a small natural cave in tuff rock formation. Numerous petroglyphs at the site indicate use by Native Americans. Large numbers of birds were observed entering the cave drinking on 9-10-96. [a] = Wetlands indicator status for plants in region 8.

Routine Jurisdictional Wetland Determination

Name: PDG, JAA Wetland Unit: Cave Pool
Location: Topopah Spring UTM Coordinates Easting: 5-65-024 Northing: 40-88-369
Date: 6-20-96

Hydrology

Type: Seep ___ Spring X Pond ___ Detention basin ___ Stream ___ Mechanically contained ___
Source: Natural X Man-enhanced X Man-made ___ Ephemeral ___ Permanent X Temporary ___
Date of construction/Period of flow: Unknown
Disturbance type (if any) and date: Pipe was installed in the ground below the cave pool and has flow. Fire burned the area around the spring - date unknown: Cave pool was dug out to increase access to water. Dates of disturbance unknown.
Inundated: Yes X No ___ Depth of standing water 15-20cm; Saturated: Yes X No ___ Depth to saturation 0
Other field indicators: ___
Atypical situation: Yes ___ No X; **Wetland hydrology: Yes X No ___**
Basis: Surface water exists at the observation point. Total area of wetland (all habitats combined) estimated at about 200m^2. Flow rate measured from an existing pipe was estimated at 0.140 L/min on September 9 1996.

Vegetation

List 3 dominant species, ppercent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Artemisia ludoviciana*	FACU	5
2.	*Bromus diandrus*	NL	1
3.	*Epilobium glaberrimum*	FACW	5
4.	*Mimulus guttatus*	OBL	**10**
5.	*Polypogon monspeliensis*	FACW+	1
6.	*Potentilla biennis*	FAC	2
7.	*Rumex salicifolius*	FACW*	**15**
8.	*Sisymbrium altissimum*	FACU-	1
9.	*Veronica anagallis-aquatica*	OBL	**20**
10.	*Pseudognaphalium stramineum*	FAC	5

Other field indicators: ___
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No ___**
Basis: Hydrophytic vegetation is present at the observation point.

Hydric Soils

Field indicators: Hydric soils exist based on the presence of saturated soils for a period of 7 days or greater duration.

Hydric Soils: Yes X No ___

Jurisdictional Wetland Determination : Wetland X Nonwetland ___

Notes:

A pipe was installed into the ground which forms a second shallow pool with vegetation 10 meters downslope from the cave pool. [a] = Wetland indicator status for plants in region 8. OBL = Obligate wetland species. FAC, FACW, FACW+ are all types of facultative wetland species. FACU, FACU- are both Facultative upland species. * = a tentative assignment to this category based on limited information for this species. NL = not listed in the National List of Plants that occur in Wetlands for Region 8.

Routine Jurisdictional Wetland Determination

Name: PDG, JAA Wetland Unit: 2 - Meadow/hillside wetland
Location: Topopah Spring UTM Coordinates Easting: 5-65-024 Northing: 40-88-369
Date: 6-20-96

Hydrology

Type: Seep ____ Spring _X_ Pond _____ Detention basin _____ Stream _____ Mechanically contained _____
Source: Natural _X_ Man-enhanced _X_ Man-made ____ Ephemeral ____ Permanent _X_ Temporary _____
Date of construction/Period of flow: Unknown
Disturbance type (if any) and date: 6x6 ft pit dug on hillside-pipe installed by man to direct flow to tanks, presently not functional Inundated:Yes _X_ No__ Depth of standing water 2-5 cm ; Saturated: Yes _X_ No__ Depth to saturation _0_
Other field indicators: Pit dug out at the top of the hillside meadow (Dimensons of pit = 6x6 ft.)
Atypical situation: Yes _____ No _X_; **Wetland hydrology: Yes _X_ No_____**
Basis: Surface water is present at the observation point. Water was flowing (not measured) down the slope of the meadow.

Vegetation

3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
Shrubs			
1.	none		
2.			
3.			
Herbs			
1.	*Agrostis exarata var monolepis*	FACW	5
2.	*Artemisia ludoviciana*	FACU	**10**
3.	*Bromus diandrus*	NL	2
4.	*Carex praegracilis*	FACW-	5
5.	*Castilleja sp.*	UNKN	2
6.	*Conyza canadensis*	FACU	2
7.	*Eleocharis parishii*	OBL	5
8.	*Epilobium glaberrimum*	FACW	2
9.	*Erigeron divergens*	NL	5
10.	*Juncus balticus*	FACW	**27**
11.	*Juncus saximontanus*	FACW+	**10**
12.	*Lactuca serriola*	FACU	Tr.
13.	*Mimulus guttatus*	OBL	2
14.	*Poa secunda*	FACU	**20**
15.	*Polypogon monspeliensis*	FACW+	5
16.	*Potentilla biennis*	FAC	2
17.	*Pseudognaphalium stramineum*	FAC	2

Other field indicators:
Percentage of species that are OBL, FACW, and/or FAC: >50 %; **Hydrophytic vegetation: Yes _X_ No_____**
Basis: Frequency method was employed at this site: Total percent cover of wetland species summed (63%) exceeds total cover by non-wetland plant species (41%). A dominance of hydrophytic species exists at the observation point.

Hydric Soils:
Field indicators: Hydric soils exist based on the presence of surface hydrology and hydrophytic vegetation.

Hydric Soils: Yes _X_ No _____

Jurisdictional Wetland Determination : Wetland _X_ Nonwetland _____

Notes:.
An area of surface inundation near the bottom of the slope was about 6 ft. long by 3 ft. wide. Another inundated spot near top of the slope was 8 ft. wide x 3 ft. long. Saturated soils are about 20 m long by 3-4 m wide. Soils were dark grey, with little organic matter and no mottling was detected. Wetland vegetation on the sloped meadow is about 20x 6m in dimensions.
[a] = Wetlands plant indicator status for region 8. OBL = Obligate wetland species, FAC, FACW, FACW+ - are all types of facultative wetland species.FACU = Facultative upland plants. NL = not listed in the National List of Plants that occur in Wetlands for Region 8.

Routine Jurisdictional Wetland Determination

Name: WKO Wetland Unit: Wash
Location: Tupapa Seep UTM Coordinates Easting: 5-82-242 Northing: 40-66-431
Date: 11-7-96

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: Unknown period of flow.
Disturbance type (if any) and date: None
Inundated: Yes ____ No X Depth of standing water 0 ; Saturated: Yes ____ No X Depth to saturation Unknown
Other field indicators: ____
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes ____ No X**
Basis: No field indicators of surface hydrology were detected but the survey was performed in a very dry year.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	*Atriplex confertefolia*	NL	2
2.	*Salazaria mexicana*	NL	2
3.	*Ericameria nauseosa*	NL	2
4.			
5.			
Herbs			
1.	*Hordeum jubatum*	FAC+	60
2.	*Bromus tectorum*	NL	20
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: ____
Percentage of species that are OBL, FACW, and/or FAC: 50 %; **Hydrophytic vegetation: Yes ____ No X**
Basis: Only a weak indication of dominance of hydrophytic vegetation was shown at the observation point.

Hydric Soils
Field indicators: No indicators of hydric soils were detected at the observation point.

Hydric Soils: Yes ____ No X

Jurisdictional Wetland Determination : Wetland ____ Nonwetland X

Notes:
Large unidentified composite - toothed leaves 4-5 ft. high. Animal use - coyote scats - raven flew over on survey date.
[a] Wetland indicator status for plants in region 8. FAC+ = Facultative wetland species. NL= not listed in National List of Plants that occur in Wetlands for Region 8.

Routine Jurisdictional Wetland Determination

Name: PDG Wetland Unit: Pipe outflow pool
Location: Tub Spring UTM Coordinates Easting: 5-84-913 Northing: 41-21-790
Date: 6-24-96

Hydrology

Type: Seep___ Spring _X___ Pond _____ Detention basin _____ Stream _____ Mechanically contained _____
Source: Natural ___ Man-enhanced _X___ Man-made _X__ Ephemeral ___ Permanent _X__ Temporary _____
Date of construction/Period of flow: A tunnel was dug into hillside to increase access to water. Date of excavation unknown. Metal pipes were installed to direct water to a metal tank 60m downslope in the wash. Maintenance of a clogged pipe was performed in 1975 to increase flow. The metal pipe was observed disconnected in 1988 and the tank was dry at this time.
Disturbance type (if any) and date: Water drips f rom a broken pipe that comes from the tunnel pool to a gallon tin can which was emplaced into the ground after 1992. Water overflows the can and wets a small area on the ground. A flow rate of 0.06 L/min was measured from an existing pipe on September 10,1996.
Inundated:Yes X No___ Depth of standing water 8" in can ; Saturated: Yes _X_ No___ Depth to saturationUnknown
Other field indicators: Depth of water on soil was approximately 1 inch (2-3cm) covering about 1m^2 surface area.
Atypical situation: Yes _____ No __X__; **Wetland hydrology: Yes __X___ No____**
Basis: Tunnel that was excavated by man has water about 1ft deep, and a pipe carries water about 60m down a dry wash to a shallow surface pool.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	*Rhus trilobata*	NI	**10**
2.			
3.			
4.			
5.			
Herbs			
1.	unidentified grass		2
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: Tunnel excavation may have altered water availability at the original spring site impacting any hydrophytic vegetation present. A rockslide occurred in 1975 that may have impacted original spring site.
Percentage of species that are OBL, FACW, and/or FAC: 0 %; **Hydrophytic vegetation: Yes _____ No__X__**
Basis: No hydrophytic vegetation was present at the observation point.

Hydric Soils:
Field indicators: Hydric soils are present in the cave based on presence of saturated soils for greater than 7 days duration.

Hydric Soils: Yes__X____ No _____

Jurisdictional Wetland Determination : Wetland _____ Nonwetland __X____

Notes: [a] Wetland indicator status for plants in region 8. NI = Insufficient information to determine wetland status in region 8.

Routine Jurisdictional Wetland Determination

Name: WKO Wetland Unit: Wash
Location: Tupapa Seep UTM Coordinates Easting: 5-82-242 Northing: 40-66-431
Date: 11-7-96

Hydrology

Type: Seep X Spring ____ Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral X Permanent ____ Temporary ____
Date of construction/Period of flow: Unknown period of flow.
Disturbance type (if any) and date: None
Inundated: Yes ____ No X Depth of standing water 0 ; Saturated: Yes ____ No X Depth to saturation Unknown
Other field indicators: ____
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes ____ No X**
Basis: No field indicators of surface hydrology were detected but the survey was performed in a very dry year.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	*Atriplex confertefolia*	NL	2
2.	*Salazaria mexicana*	NL	2
3.	*Ericameria nauseosa*	NL	2
4.			
5.			
Herbs			
1.	*Hordeum jubatum*	FAC+	60
2.	*Bromus tectorum*	NL	20
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: ____
Percentage of species that are OBL, FACW, and/or FAC: 50 %; **Hydrophytic vegetation: Yes ____ No X**
Basis: Only a weak indication of dominance of hydrophytic vegetation was shown at the observation point.

Hydric Soils
Field indicators: No indicators of hydric soils were detected at the observation point.

Hydric Soils: Yes ____ No X

Jurisdictional Wetland Determination : Wetland ____ Nonwetland X

Notes:
Large unidentified composite - toothed leaves 4-5 ft. high. Animal use - coyote scats - raven flew over on survey date.
[a] Wetland indicator status for plants in region 8. FAC+ = Facultative wetland species. NL= not listed in national list of plants that occur in wetlands for region 8.

Routine Jurisdictional Wetland Determination

Name: PDG, WKO, Wetland Unit: Wash slope
Location: Twin Springs UTM Coordinates Easting: 5-55-484 Northing: 40-89-984
Date: 12-19-96

Hydrology

Type: Seep ____ Spring X Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral ____ Permanent X Temporary ____
Date of construction/Period of flow: Unknown
Disturbance type (if any) and date: Tunnel was dug into hillside 15-18m by man. A cave-in has occurred. No water visible in cave, but soils are saturated. Tailings excavated from cave form a terrace on hillsidewith stone structure/foundation on it.
Inundated:Yes X No ____ Depth of standing water 10 cm; Saturated: Yes X No ____ Depth to saturation 0
Other field indicators: Outside pool of water exists below a rock ledge.
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No ____**
Basis: Surface water occurs at the observation point.

Vegetation

List 3 dominant species,% cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

Species	*Indicator Status*[a]	*% Cover*
Trees		
1. none		
2.		
3.		
4.		
5.		
Shrubs		
1.		
2.		
3.		
4.		
5.		
Herbs		
1. *Polypogon monspeliensis*	FACW+	Tr.
2. *Rumex salicifolius*	FACW*	5
3. *Typha domingensis*	OBL	**90**
4.		
5.		
6.		
7.		
8.		
9.		

Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No ____**
Basis: The observation point has a dominance of hydrophytic vegetation. Size of the wetland estimated at about 27m^2.

Hydric Soils

Field indicators: Hydric soils exist based on the presence of saturated soils for a period of 7 or more days duration.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:

Artemesia dracunculus (NL), *A ludoviciana* (Facu), and *Rhus trilobata* (NI), occur on the edges of the wetland habitat. *R. trilobata* occupied about 50 % of the wetland edge area. [a] Wetland indicator status for plants in region 8. OBL = Obligate wetland species. FACW+ = a facultative wetland species. FACW* refers to a tentative assignment of this species to a facultative wetland category based on limited information in region 8. Tr = trace amounts (< 1 % cover).

Routine Jurisdictional Wetland Determination

Name: PDG, DJH, JAA Wetland Unit: 1 - Upper stretch of spring channel
Location: Whiterock Spring UTM Coordinates Easting: 5-77-015 Northing: 41-17-396
Date: 6-18-96

Hydrology

Type: Seep ___ Spring _X_ Pond _____ Detention basin _____ Stream _____ Mechanically contained _____
Source: Natural _X_ Man-enhanced _X_ Man-made _____ Ephemeral ___ Permanent X Temporary _____
Date of construction/Period of flow: Flow gauge box has water directed to it through PVC pipes from two tunnels (adits) excavated by man. Unknown date of tunnel excavations.
Disturbance type (if any) and date: A cement retaining wall (3-4 "high) was constructed at the entrance to the east cave with a pipe for drainage to the outside. Date of construction unknown. Inundated:Yes X No___
Depth of standing water 8-10cm in Caves ; Saturated: Yes X No____ Depth to saturation 18 inches
Other field indicators: A broken pipe from the east cave allows water to form a small shallow (1" deep) pool outside the cave entrance. Flow rate from both caves combined was estimated to be about 1.9 L/min on September 3, 1996.
Atypical situation: Yes _____ No _X_; **Wetland hydrology: Yes X No_____**
Basis: Surface water occurs at the observation point. Gravelly soils allow quick drainage of spring flow to subsurface levels of the soil stratum.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
Shrubs			
1.	*Salix exigua*	FACW	**80**
2.			
3.			
4.			
Herbs			
1.	*Potentilla biennis*	FAC	Tr.
2.	*Rumex salicifolius*	FACW*	5
3.			
4.			
5.			
6.			
7.			
8.			

Other field indicators: _____
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No_____**
Basis: A dominance of hydrophytic vegetation occurs at the observation point.

Hydric Soils
Field indicators: Hydric soils exist based on the presence of saturated soils for 7 days or longer duration at the observation point.

Hydric Soils: Yes X No _____

Jurisdictional Wetland Determination : Wetland X Nonwetland _____

Notes:

Salix exigua stand measures about 70m by 20-30 m across. *Artemisia ludoviciana* and *Ericameria nauseosa* are encroaching on the edge of the delineated area. Limited surface water; Salix shrubs ≈ 10 ft. high (3m) - *Rhus trilobata* is possibly spread by birds. Willow trees provide considerable cover for birds and wildlife. [a] Wetland indicator status for plants in region 8. FACW= Facultative wetland species. FAC = Facultative wetland species. * refers to a tentative assignment to a category based on limited information in region 8. Tr = Trace amounts (<1% cover).

Routine Jurisdictional Wetland Determination

Name: PDG, DJH, JAA Wetland Unit: 2 - Lower stretch of spring channel
Location: Whiterock Spring UTM Coordinates Easting: 5-77-015 Northing: 41-17-396
Date: 6-18-96

Hydrology

Type: Seep ____ Spring X Pond ____ Detention basin ____ Stream ____ Mechanically contained ____
Source: Natural X Man-enhanced ____ Man-made ____ Ephemeral ___ Permanent X Temporary ____
Date of construction/Period of flow: Unknown
Disturbance type (if any) and date: Old remnants of livestock corral present in lower section of the wash - Broken down
Inundated: Yes __ No X Depth of standing water 0 ; Saturated: Yes ____ No X Depth to saturation unknown
Other field indicators: Dried algae in stream channel/pools - rocky soil - very few fines.
Atypical situation: Yes ____ No X ; **Wetland hydrology: Yes X No ____**
Basis: Evidence of surface hydrology exists at the observation point.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	none		
2.			
3.			
4.			
5.			
Shrubs			
1.	none		
2.			
3.			
4.			
5.			
Herbs			
1.	*Artemisia ludoviciana*	FACU	2
2.	*Juncus balticus*	FACW	94
3.	*Linum lewisii*	NL	1
4.	*Potentilla biennis*	FAC	1
5.	*Rumex salicifolius*	FACW*	Tr.
6.	*Sporobolus airoides.*	FAC-	2
7.			
8.			
9.			
10.			

Other field indicators:
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No ____**
Basis: A dominance of hydrophytic vegetation occurs at the observation point. Total area of wetland (upper and lower stretches of the habitat combined) was estimated to be about 1800m^2.

Hydric Soils:
Field Indicators: Hydric soils exist based on the presence of saturated soils for greater than 7 days at the observation point.

Hydric Soils: Yes X No ____

Jurisdictional Wetland Determination : Wetland X Nonwetland ____

Notes:
Ericameria nauseosa is encroaching on the edge of the wash. Surface area of *Juncus balticus* measures about 70m by 3m. Pools in lower section of the wash have dried algae on rocks. This site was wet, inundated in the lower reaches earlier this year.
[a] Wetland indicator status for plants in region 8. FAC, FACW, are both facultative wetland species. FACU =Facultative upland species. * refers to a tentative assignment of a species to a category based on limited information in region 8. Tr = Trace amounts (< 1% cover). NL= not listed in National List of Plants that occur in Wetlands for Region 8.

Routine Jurisdictional Wetland Determination

Name: Yellow Rock Springs Wetland Unit: Rocky Wash
Location: PDG,WKO UTM Coordinates Easting: 555-979 Northing: 4-091-944
Date: 12-19-96

Hydrology

Type: Seep ___ Spring X Pond _____ Detention basin _____ Stream _____ Mechanically contained _____
Source: Natural X Man-enhanced _____ Man-made _____ Ephemeral X Permanent ___ Temporary _____
Date of construction/Period of flow: None / Unknown season of flow
Disturbance type (if any) and date: None Inundated: Yes X No ____
Depth of standing water 2-30cm ; Saturated: Yes X No ____ Depth to saturation 0
Other field indicators: Water seeps out of the tuff in several locations. Three separate channels have water flow.
Atypical situation: Yes _____ No X ; **Wetland hydrology: Yes X No _____**
Basis: Pools of water were frozen over at time of survey. Flow was present, but was not measured.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.			
2.			
3.			
4.			
5.			
Shrubs			
1.	*Rhus trilobata*	NI	60
2.			
3.			
4.			
5.			
Herbs			
1.	*Bromus tectorum*	NL	10
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: _____
Percentage of species that are OBL, FACW, and/or FAC: 0 %; **Hydrophytic vegetation: Yes _____ No X**
Basis: Hydrophytic vegetation was absent from the observation point.

Hydric Soils

Field indicators: Hydric soils appear to exist based on the presence of saturated soils for a period of 7 days or greater duration.

Hydric Soils: Yes X No _____

Jurisdictional Wetland Determination : Wetland _____ Nonwetland X

Notes:
Water flows in three washes for about 40-60m length. Inundated pools exist with some shallow gravelly soils. [a] Wetlands indicator status for plants in region 8. NL = not listed in the National List of Plants that occur in Wetlands for Region 8. NI = insufficient information to classify plants acording to wetlands status.

Routine Jurisdictional Wetland Determination

Name: PDG, DJH Wetland Unit: Playa Pond
Location: Yucca Playa Pond UTM Coordinates Easting: 584-805 Northing: 40-90-584
Date: 1-7-97

Hydrology

Type: Seep ___ Spring ___ Pond X Detention basin ___ Stream ___ Mechanically contained ___
Source: Natural X Man-enhanced ___ Man-made ___ Ephemeral X Permanent ___ Temporary ___
Date of construction/Period of flow: None\ unknown
Disturbance type (if any) and date: None Inundated: Yes X No ___
Depth of standing water >100cm ; Saturated: Yes X No ___ Depth to saturation surface
Other field indicators: ___
Atypical situation: Yes ___ No X ; **Wetland hydrology: Yes X No ___**
Basis: Surface water is present at the observation point.

Vegetation

List 3 dominant species, percent cover in bold, in each vegetation layer (5 if only 1 or 2 layers are present)

	Species	*Indicator Status*[a]	*% Cover*
Trees			
1.	*Tamarix ramosissima*	FACW	5
2.			
3.			
4.			
5.			
Shrubs			
1.			
2.			
3.			
4.			
5.			
Herbs			
1.	*Typha domingensis*	OBL	Tr.
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Other field indicators: About 50 *Tamarix* trees exist at the water source.
Percentage of species that are OBL, FACW, and/or FAC: 100 %; **Hydrophytic vegetation: Yes X No ___**
Basis: A dominance of hydrophytic plants occurs at the observation point. The wetland area was estimated to be about 3400m^2, including the area of plants and an equal area of rooting zone.

Hydric Soils

Field indicators: Hydric soils exist based on the presence of saturated soils for a period of 7 days or greater duration.

Hydric Soils: Yes X No ___

Jurisdictional Wetland Determination : Wetland X Nonwetland ___

Notes:
Soils at the observation site have high silt content. The pond was frozen over at the time of the survey. [a] Wetland indicator status for plants in region 8. Tr. = trace amounts (<1% absolute cover). FACW = Faculative wetland species. OBL = Obligate wetland species.

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APPENDIX C

LIST OF ALGAE AND ALGAE-LIKE SPECIES IDENTIFIED FROM SPRINGS ON THE NEVADA TEST SITE

Appendix C. List of algae and algae-like species identified from springs on the NTS.

Scientific Name	Cane Spring	Captain Jack Spring	Reitmann Seep	Oak Spring	Tippipah Spring	Topopah Spring	Tub Spring	Whiterock Spring
Chrysophyta (Golden Algae, Diatoms)								
Achnanthes exigua				X		X		X
Achnanthes lanceolata	X	X		X	X	X	X	X
Achnanthes minutissima	X							
Achnanthes saxonica		X		X				X
Amphora submontana								X
Asterionella formosa			X					
Denticula elegans								X
Epithemia adnata var. *proboscidea*					X			
Epithemia sorex							X	
Fragilaria sp.				X		X		
Fragilaria construens								X
Gomphonema parvulum	X	X		X	X	X		X
Hantzschia sp.								X
Melosira granulata			X					
Meridian circulare		X						
Navicula cryptocephala		X						
Navicula cuspidata var. *ambigua*	X							
Navicula laevissima				X				
Navicula minima	X			X		X		
Navicula rhynchocephala var. *amphiceras*							X	
Nitzschia sp.	X	X	X	X		X		X
Nitzschia amphibia								X
Nitzschia gracilis				X				
Nitzschia linearis	X			X				X
Nitzschia palea	X			X				
Nitzschia tryblionella								X
Pinnularia sp.								X
Pinnularia abaujensis var. *subundulata*						X		
Pinnularia viridis var. *minor*	X							
Stauroneis anceps		X						
Stephanodiscus niagarae			X					
Surirella ovalis	X					X		X
Vaucheria sp.	X							

Sources: Shields and Drouet, 1962; Taylor and Giles, 1979

Appendix C. List of algae and algae-like species identified from springs on the NTS.

Scientific Name	Cane Spring	Captain Jack Spring	Reitmann Seep	Oak Spring	Tippipah Spring	Topopah Spring	Tub Spring	Whiterock Spring
Chlorophyta (Green Algae)								
Ankistrodesmus falcatus			X					
Bulbochaete sp.	X							
Chara sp.	X							
Chlamydomonas sp.								X
Chlorella vulgaris		X	X					
Closterium turgidum						X		
Cosmarium sp.		X					X	
Franceia droescheri	X							
Haematococcus lacustris				X				
Microthamnion kuetzingianum	X			X				
Oedogonium sp.	X	X						X
Oocystis borgei				X				
Oocystis crassa	X							
Pandorina morum	X							
Protoderma viride				X				
Scenedesmus acutus				X				
Scenedesmus bijuga	X							
Spirogyra juergensii		X						
Stigeoclonium sp.	X	X		X			X	
Ulothrix sp.				X				
Cyanobacteria (formerly known as blue-green algae)								
Amphithrix janthina	X							
Calothix sp.		X		X				
Lyngbya sp.								X
Nodularia sphaerocarps	X							
Nostoc enthophytum	X							
Oscillatoria brevis	X							
Oscillatoria sp.		X	X			X		
Phormidium autumnale	X							
Phormidium sp.								X
Phormidium tenue	X						X	
Plectonema boryanum	X							
Total Number of Species	**27**	**14**	**7**	**19**	**3**	**10**	**6**	**19**

Sources: Shields and Drouet, 1962; Taylor and Giles, 1979

APPENDIX D

LIST OF ANIMALS DOCUMENTED TO OCCUR AT NTS WETLANDS AND THEIR SEASON OF USE

Appendix D. List of animals documented to occur at NTS wetlands.
The season in which animals were observed are shown: F=fall, Sp=spring, S=summer, W=winter, Y=year round, X=time of year unspecified

Common Name	Scientific Name	Ammonia Tanks	Cane Spring	Captain Jack Spring	Cottonwood Spring	Coyote Spring	Forty-mile Canyon Tanks	Gold Meadows Spring	John's Spring	Oak Spring	Pavits Spring	Rainier Spring	Reitmann Seep	Rock Valley Tank	Tippipah Spring	Tongue Wash Tank	Topopah Spring	Tub Spring	Tupapa Seep	Twin Spring	Wahmonie Seep 1	Wahmonie Seep 2	Wahmonie Seep 3	Whiterock Spring	Yellow Rock Springs	Yucca Playa Pond	Total Sites
Mammals																											
Antelope ground squirrel	*Ammospermophilus leucurus*		X					Sp					S		S			S									5
Black-tailed jack rabbit	*Lepus californicus*	X	X	S				S		S				X	S									S		X	9
Bobcat	*Lynx rufus*		X			W								X	F			X				S					6
Burro	*Equus asinus*																			X							1
Cactus mouse	*Peromyscus eremicus*		X																								1
Cliff chipmunk	*Eutamias dorsalis*							S																			1
Cow	*Bos taurus*		S														S										2
Coyote	*Canis latrans*	X	Y	S	Y	W	X	X	X		Sp F		S F Sp	X	S F Sp	X	S	F	X	X	S F			Y	X	X	21
Desert cottontail	*Sylvilagus audobonii*		X												S F			F				S		S W Sp			5
Feral horse	*Equus caballas*		X	Y				Y																			3
Long-eared myotis	*Myotis evotis*							S																			1
Mountain lion	*Felis concolor*			S Sp				S F									S Sp										3
Mule deer	*Odocoileus hemionus*	X	Y	Y	FW		X	Y	X	S F Sp	F W Sp		S F Sp		Y		Y	Y		X	F	S	S	Y	X	X	20
Townsend's big-eared bat	*Corynorhinus townsendii*							S																			1
Pallid bat	*Antrozous pallidus*							S																			1
Pronghorn antelope	*Antilocapra americana*							S																			1
Rock squirrel	*Spermophilus variegatus*							S																			1
Southern pocket gopher	*Thomomys umbrinus*		X														X										2
Western pipistrelle (bat)	*Pipistrellus hesperus*							S																			1
Birds																											
American goldfinch	*Carduelis tristis*		X					S																			2
American kestrel	*Falco sparverius*		Sp														F										2
American pipit	*Anthus rubescens*		X																								1
American redstart	*Setophaga ruticilla*		Sp																								1
American robin	*Turdus migratorius*		Sp					S Sp																			2
Ash-throated flycatcher	*Mylarchus cinerascens*		Sp																								1
Barn swallow	*Hirundo rustica*		X																								1
Bewick's wren	*Thryomanes bewickii*		W																								1
Black phoebe	*Sayornis nigricans*		X																								1
Black-headed grosbeak	*Pheucticus melanocephalus*		Sp					S									X							Sp			4
Black-throated gray warbler	*Dendroica nigrescens*		Sp																								1
Black-throated sparrow	*Amphispiza bilineata*		S Sp	S Sp											S Sp			S			S			S			6
Blue grosbeak	*Guiraca caerula*		X																								1
Blue-gray gnatcatcher	*Polioptila caerulea*		Sp	Sp																							2

Sources: Allred et al., 1963; Hayward et al., 1963; Jorgensen and Haywood, 1965; Castetter, 1979; Romney and Greger, 1992; Greger and Romney, 1994a,b; BN, 1996; and Bechtel Nevada unpublished field records, 1974-1997.

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Brewer's blackbird	*Euphagus cyanocephalus*		X																								1
Brewer's sparrow	*Spizella breweri*							S							S			S						X			4
Broad-tailed hummingbird	*Selasphorus platycercus*		X																								1
Brown-headed cowbird	*Molothrus ater*		X					S Sp							S		S										4
Bushtit	*Psaltriparus minimus*			S																							1
Cassin's finch	*Carpodacus cassinii*							S																			1
Cassin's kingbird	*Tyrannus vociferans*		X					S																			2
Cedar waxwing	*Bombycilla cedrorum*		Sp												X									Sp			3
Chipping sparrow	*Spizella passerina*		Sp					S																			2
Chukar	*Alectoris chukar*	X	W	S F Sp				X							S F	X	Y	S F		X						X	10
Common raven	*Corvus corax*		S F Sp	Y				S F		Sp					S F Sp	S	W Sp		F					S Sp			9
Common snipe	*Gallinago gallinago*		X																								1
Common yellowthroat	*Geothylpis trichas*		X																					X			2
Cooper's hawk	*Accipiter cooperii*		X	F				X									W							F			5
Costa's hummingbird	*Calypte costae*		Sp												X												2
Dark-eyed junco	*Junco hyemalis*		X	F W					X				F														3
European starling	*Sturnus vulgaris*		S F																								1
Gambel's quail	*Callipepla gambelii*		S F Sp	S F Sp				X			F		F		S F		S	F			S			S F Sp			10
Golden eagle	*Aquila chrysaetos*		Sp	S			W								Sp												3
Gray catbird	*Dumetella carolinensis*		X																								1
Great blue heron	*Ardea herodias*																									X	1
Great egret	*Casmerodius albus*		X																								1
Great-horned owl	*Bubo virginianus*																									X	1
Greater roadrunner	*Geococcyx californianus*		Sp																								1
Green-tailed towhee	*Piplio chlorurus*		Sp					S																			2
Green-winged teal	*Anas crecca*		X																							X	1
Hermit thrush	*Catharus guttatus*		Sp																								1
House finch	*Carpodacus mexicanus*		Y					S					S W Sp		S W Sp		F	S						S			7
Indigo bunting	*Passerina cyanea*							S																			1
Lark sparrow	*Chondestes grammacus*		X					S																			2
Lazuli bunting	*Passerina amoena*		S Sp					S																			2
Le Conte's thrasher	*Toxostoma lecontei*		Sp																								1
Lesser goldfinch	*Carduelis psaltria*		F					S																			2
Lesser yellowlegs	*Tringa flavipes*		X																								1
Lewis' woodpecker	*Melanerpes lewis*		X																								1
Lincoln's sparrow	*Melospiza lincolnii*		X																								1

Sources: Allred et al., 1963; Hayward et al., 1963; Jorgensen and Haywood, 1965; Castetter, 1979; Romney and Greger, 1992; Greger and Romney, 1994a,b; BN, 1996; and Bechtel Nevada unpublished field records, 1974-1997.

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Loggerhead shrike	*Lanius ludovicianus*		F W Sp												X												2
Long-eared owl	*Asio otus*		Y																					S W			2
MacGillivray's warbler	*Oporornis tolmiei*		Sp												X												2
Mountain bluebird	*Sialia currucoides*							S Sp																			1
Mourning doves	*Zenaida macroura*		S Sp	S Sp				S Sp		S			S Sp		S Sp		F	S						S Sp			9
Northern rough-winged swallow	*Stelgidopteryx ruficollis*		X																								1
Northern flicker	*Colaptes auratus*		W F					Sp F																			2
Northern goshawk	*Accipiter gentilis*							S																			1
Northern harrier	*Circus cyaneus*							S					X				W										3
Northern mockingbird	*Mimus polyglottos*		Sp	F				S							S		S	S						X			7
Northern oriole	*Icterus galbula*		Sp																								1
Olive-sided flycatcher	*Contopus borealis*		Sp																								1
Orange-crowned warbler	*Vermivora celata*		Sp																								1
Phainopepla	*Phainopepla nitens*		Sp	X																							2
Pine siskin	*Carduelis pinus*		X	F																							2
Pinyon jay	*Gymnorhinus cyanocephala*		X	S W F				S								X	Sp F										5
Prairie falcon	*Falco mexicanus*		Sp																								1
Red-naped sapsucker	*Sphyrapicus varius*		F																								1
Red-necked phalarope	*Phalaropus lobatus*		X																								1
Red-tailed hawk	*Buteo jamaicensis*		W	S Sp				S F							S F		X							X			6
Red-winged blackbird	*Agelaius phoeniceus*		X																								1
Rock wren	*Salpinctes obsoletus*		X	S Sp				S							S												4
Rose-breasted grosbeak	*Pheucticus ludovicianus*			Sp				X																			2
Ruby-crowned kinglet	*Regulus calendula*		F Sp	F																							2
Rufous-sided towhee	*Piplio erythrophthalmus*		X																								1
Sage sparrow	*Amphispiza belli*		W										W		F												3
Say's phoebe	*Sayornis saya*		S												S			S						S			4
Scott's oriole	*Icterus parisorum*		X	S																							2
Scrub jay	*Aphelocoma coerulescens*			F					X	X					S F		F	S									6
Sharp-shinned hawk	*Accipiter striatus*		Sp	W				S																			3
Song sparrow	*Melospiza melodia*		X																								1
Swainson's thrush	*Catharus ustulatus*		Sp												X												2
Townsend's warbler	*Dendroica townsendi*		X																								1
Tree swallow	*Tachycineta bicolor*		X																								1
Turkey vulture	*Cathartes aura*			S Sp				S Sp							S Sp									S			4
Vesper sparrow	*Pooecetes gramineus*		X					S																			2
Violet-green swallow	*Tachycineta thalassina*							S																			1
Warbling vireo	*Vireo gilvus*		Sp																								1

Sources: Allred et al., 1963; Hayward et al., 1963; Jorgensen and Haywood, 1965; Castetter, 1979; Romney and Greger, 1992; Greger and Romney, 1994a,b; BN, 1996; and Bechtel Nevada unpublished field records, 1974-1997.

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Western bluebird	*Sialia mexicana*							S																			1
Western meadowlark	*Sturnella neglecta*		X																								1
Western pipestrelle	*Pipistrellus hesperus*		X																								1
Western tanager	*Piranga ludoviciana*		Sp																					Sp			2
Western wood-pewee	*Contopus sordidulus*		X																								1
White-crowned sparrow	*Zonotrichia leucophrys*		F W Sp	F											F												3
White-throated swift	*Aeronautes saxatalis*			S																							1
Wilson's warbler	*Wilsonia pusilla*		Sp					S																Sp			3
Wood duck	*Aix sponsa*		X																								1
Yellow warbler	*Dendroica petechia*		Sp																					X			2
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*		X																								1
Yellow-rumped warbler	*Dendroica coronata*		Sp																								1
Reptiles																											
Desert horned lizard	*Phrynosoma platyrhinos*		X																								1
Desert spiny lizard	*Sceloporus magister*		X																								1
Desert tortoise	*Gopherus agassizii*													X													1
Long-nosed snake	*Rhinocheilus lecontei*		X																								1
Side-blotched lizard	*Uta stansburiana*		X																								1
Sidewinder	*Crotalus cerastes*		X																								1
Western fence lizard	*Sceloporus occidentalis*			X																							1
Western whiptail	*Cnemidophorus tigris*		X																								1
Zebra-tailed lizard	*Callisaurus draconoides*		X																								1
Invertebrates																											
Ant	*Neivamyrmex minor*		X																								1
Black-horned tree cricket	*Oecanthus nigricornis*		X																								1
California tree cricket	*Oecanthus californicus*		X																								1
Desert long-horned grasshopper	*Tamaocerus koebelei*		X																								1
Field cricket	*Acheta assimilis*		X																								1
Ground mantid	*Litaneutria minor*		X																								1
long-horned grasshopper	*Capnobotes fuliginosus*		X																								1
Mantid	*Stagmomantis californicus*		X																								1
Pallid-winged grasshopper	*Trimerotropis pallidipennis*		X																								1
Scarab beetle	*Paracotalpa granicollis*		X																								1
short-horned grasshopper	*Aeoloplides minor*		X																								1
short-horned grasshopper	*Aeoloplides tenuipennis*		X																								1
short-horned grasshopper	*Amphitornus coloradus*		X																								1
short-horned grasshopper	*Eremiacris pallida*		X																								1

Sources: Allred et al., 1963; Hayward et al., 1963; Jorgensen and Haywood, 1965; Castetter, 1979; Romney and Greger, 1992; Greger and Romney, 1994a,b; BN, 1996; and Bechtel Nevada unpublished field records, 1974-1997.

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short-horned grasshopper	*Melanoplus complanatipes*		X																								1
short-horned grasshopper	*Poecilotettix sanguineus*		X																								1
short-horned grasshopper	*Trimerotropis inconspicua*		X																								1
Springsnail	*Pyrgulopsis sp.*		X																								1
Walking stick	*Pseudosermyle straminea*		X																								1
Total Number of Species		4	121	30	2	2	3	43	4	5	3	0	9	4	28	4	19	14	2	5	4	3	1	22	3	7	

Sources: Allred et al., 1963; Hayward et al., 1963; Jorgensen and Haywood, 1965; Castetter, 1979; Romney and Greger, 1992; Greger and Romney, 1994a,b; BN, 1996; and Bechtel Nevada unpublished field records, 1974-1997.

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