FINAL
No Further Response
Action Planned Decision Document
Environmental Restoration Program Site 2

Former Fire Training Area
Nevada Air National Guard
Reno, Nevada

April 2007

ANG/CEVR
Andrews AFB, Maryland

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Reno, Nevada

April 2007

Prepared For:

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DECLARATION OF THE DECISION

Site Name and Location

ERP Site 2, Former Fire Training Area
Nevada Air National Guard Base
Reno, Nevada

Statement of Basis and Purpose

The purpose of this No Further Response Action Planned (NFRAP) Decision Document is to document the Air National Guard's decision for no further action at Environmental Restoration Program (ERP) Site 2, a Former Fire Training Area (FTA), at Nevada Air National Guard Base (NVANG). This decision is based on review of the results of the ERP Preliminary Assessment, Site Investigation (SI), and groundwater monitoring studies conducted at the NVANG. These investigations determined that the site conditions do not pose a threat to human health or the environment.

Description of the Selected Remedy: No Further Action Planned

Based on the current conditions at ERP Site 2, it has been determined that no significant risk or threat to human health or the environment exists. Therefore, no further action under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, is recommended.

Declaration Statement

This NFRAP Decision Document represents the selected action for this site. The NFRAP was developed in accordance with the general guidelines of CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) that also applies to CERCLA response actions. This decision is also in accordance with Nevada Administrative Code (NAC) 445A.226 through 445A.22755.

DECLARATION OF THE DECISION

It has been determined that the selected remedy of no further action is protective of human health and the environment. The selected remedy meets Federal and State requirements that are applicable or relevant and appropriate. The staturatory preference for further treatment is not satisfied because further treatment was not deemed necessary. Residual contaminant levels at the site have been determined to present no significant threat to human life or the environment.

SITE NAME AND LOCATION

ERP Site 2, Former Fire Training Area
Nevada Air National Guard Base
Reno, Nevada

David C. Van Gasbeck, Chief
Environmental Division
Civil Engineer Directorate

19 Sep 06
Date

Jim Najima
Chief, Bureau of Corrective Action
Nevada Division of Environmental Protection

Jan 26 2007
Date

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1,2-DCE	1,2-Dichloroethene
ANG	Air National Guard
ASG	Automated Sciences Group, Inc.
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
ERM	ERM-West, Inc.
ERP	Environmental Restoration Program
°F	Degrees Fahrenheit
FTA	Fire Training Area
ft/d	Feet per day
GC	Gas chromatograph
GSM	Groundwater screening method
MCL	Maximum contaminant level
µg/L	Microgram per liter
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
MTBE	Methyl tertiary butyl ether
NDEP	Nevada Division of Environmental Protection
NVANG	Nevada Air National Guard Base
ORNL/ETS	Oak Ridge National Laboratory/Environmental Technology Section
PA	Preliminary assessment
RCRA	Resource Conservation and Recovery Act
PID	Photoionization detector
RI	Remedial investigation
SI	Site investigation
SVOC	Semivolatile organic compound
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total petroleum hydrocarbons
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound

SECTION 1.0

INTRODUCTION

This decision document describes the site-specific factors and analyses that have led to the selection of No Further Action as the remedy for Site 2, Former Fire Training Area (FTA), at the Nevada Air National Guard Base (NVANG), Reno, Nevada. Documents supporting the decision are identified in Section 10.

The format and organization of this decision document are based on the United States Environmental Protection Agency's (USEPA's) *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, dated July 1989. This decision document includes the pertinent elements of Nevada Division of Environmental Protection's (NDEP's) *Requirements for IRP Decision Documents*, transmitted in a letter dated 30 December 1998. This decision document is organized as follows:

- **Declaration of the Decision.** Functions as the abstract and formal authorizing signature page for the decision document.

- **Section 1.0 - Introduction.** Summarizes the purpose and organization of the decision summary portion of the decision document, identifies the site to which the decision document pertains, and clarifies the relationship of this decision document to previous versions of the decision document.

- **Section 2.0 - Site Name, Location, Description, and History.** Identifies and describes the site, provides location and property ownership information, and summarizes the site history, conditions, and previous investigation activities.

- **Section 3.0 - Community Participation.** Documents community participation activities throughout the decision-making process, references the Community Relations Plan in Appendix A, and describes the location and availability of the Administrative Record.

- **Section 4.0 - Scope and Role of Site.** Discusses Site 2 in relation to other sites at NVANG and identifies when and where monitoring or

remedial activities at other sites influence, or are influenced by monitoring or remedial activities at Site 2.

- **Section 5.0 - Site Characteristics.** Summarizes the regional, facility, and site-specific characteristics and conditions, including the concentrations and distribution of contaminants and their fate and transport.

- **Section 6.0 - Current and Potential Site and Resource Uses.** Discusses the current and potential future uses of the land.

- **Section 7.0 - Summary of Site Risks.** Discusses risks due to contamination present at the site.

- **Section 8.0 - Statutory Authority Finding.** States the conclusion that No Further Action is appropriate for Site 2.

- **Section 9.0 - Documentation of Significant Changes.** Describes the changes made to this decision document on the basis of comments received during the public comment period.

- **Section 10.0 - References.** Lists the sources of information used in preparing this decision document.

- **Appendix A - Responsiveness Summary.** Summarizes responses to public comments.

SECTION 2.0

SITE NAME, LOCATION, DESCRIPTION, AND HISTORY

The Reno Tahoe International Airport complex is located approximately 5 miles southeast of downtown Reno, Nevada (Figure 2-1). The NVANG presently occupies approximately 60 acres of land in the southern portion of the northwest quadrant of the airport complex (Automated Sciences Group, Inc. [ASG], 1989).

In April 1948, the NVANG was established as the 192nd Fighter Squadron. This designation was changed to the 192nd Fighter Bomber Squadron in April 1951. The unit was redesignated as the 192nd Fighter Interceptor Squadron in June 1955 and retained this designation until April 1958, when the unit was renamed the 152nd Fighter Group. In February 1961, the 152nd Fighter Group acquired the designation of the 152nd Reconnaissance Group (ASG, 1989). In 1996, the mission of the NVANG changed and it currently houses the 152nd Airlift Wing.

Initially, the NVANG was equipped with P-51 aircraft and was located at the Stead Army Air Base in Reno, Nevada. In 1953, the NVANG leased 29 acres of land at Hubbard Field (Reno/Tahoe International Airport) from the City of Reno. In 1954, NVANG operations were moved from Stead Army Air Base to their present location. F-86A aircraft were assigned to the NVANG from 1956 until 1961 when the group converted to the RB-57 aircraft. In 1965, the NVANG converted to RF-101 aircraft, which were flown until 1975 when the NVANG converted to RF-4C aircraft (ASG, 1989). Because of its change in mission in 1996, the NVANG now utilizes C-130 aircraft.

2.1 Site Description

Site 2 is a former fire training area (FTA) located east of Building 1 (Figure 2-2). The site is currently under parking area A2 of the aircraft parking apron. The FTA consisted of an unlined, slightly bermed, open earthen area with a depth of 12 to 18 inches. Jet fuel (JP-4), spent solvents, waste oils, and other flammable liquids were the primary materials

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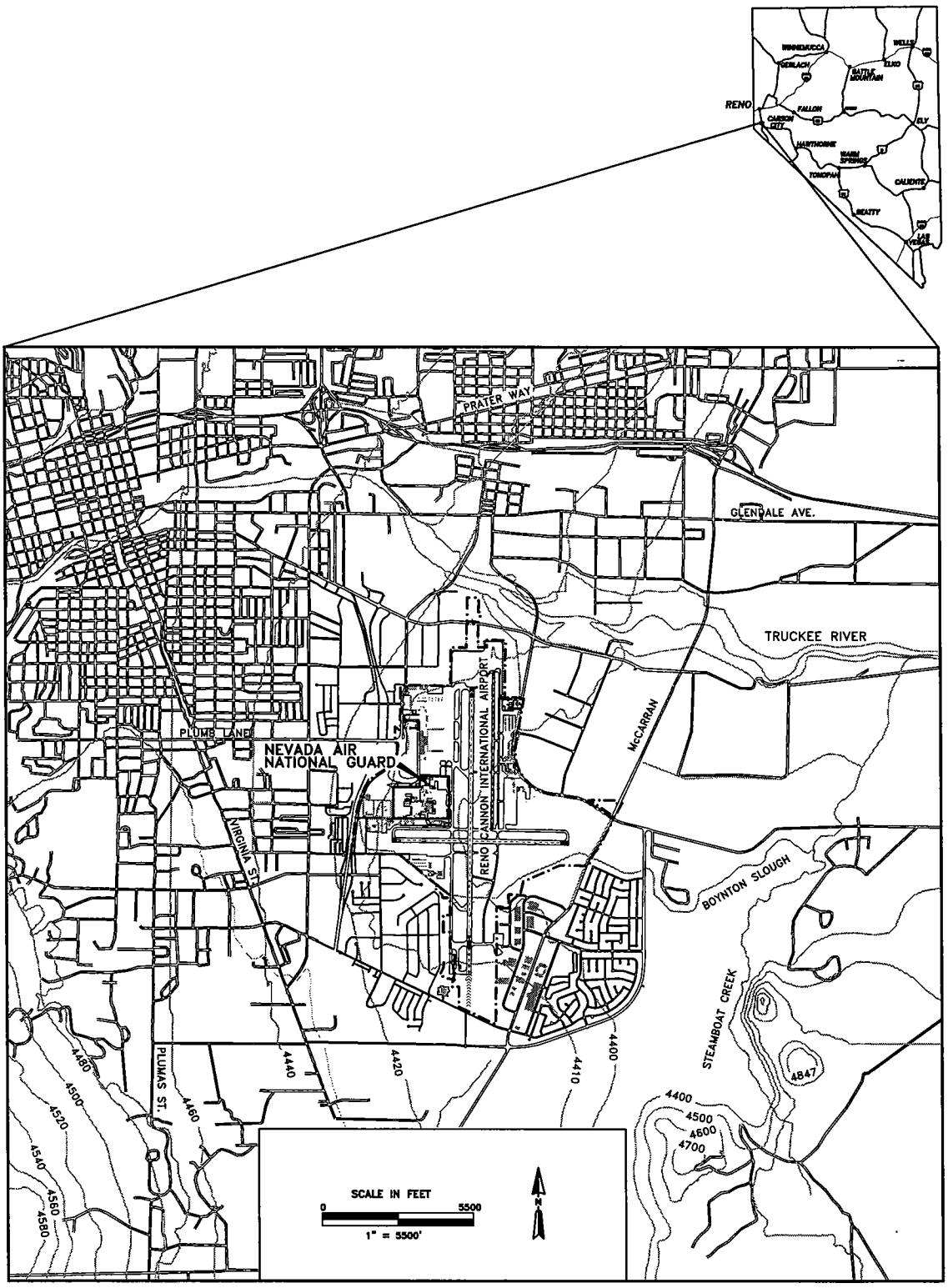
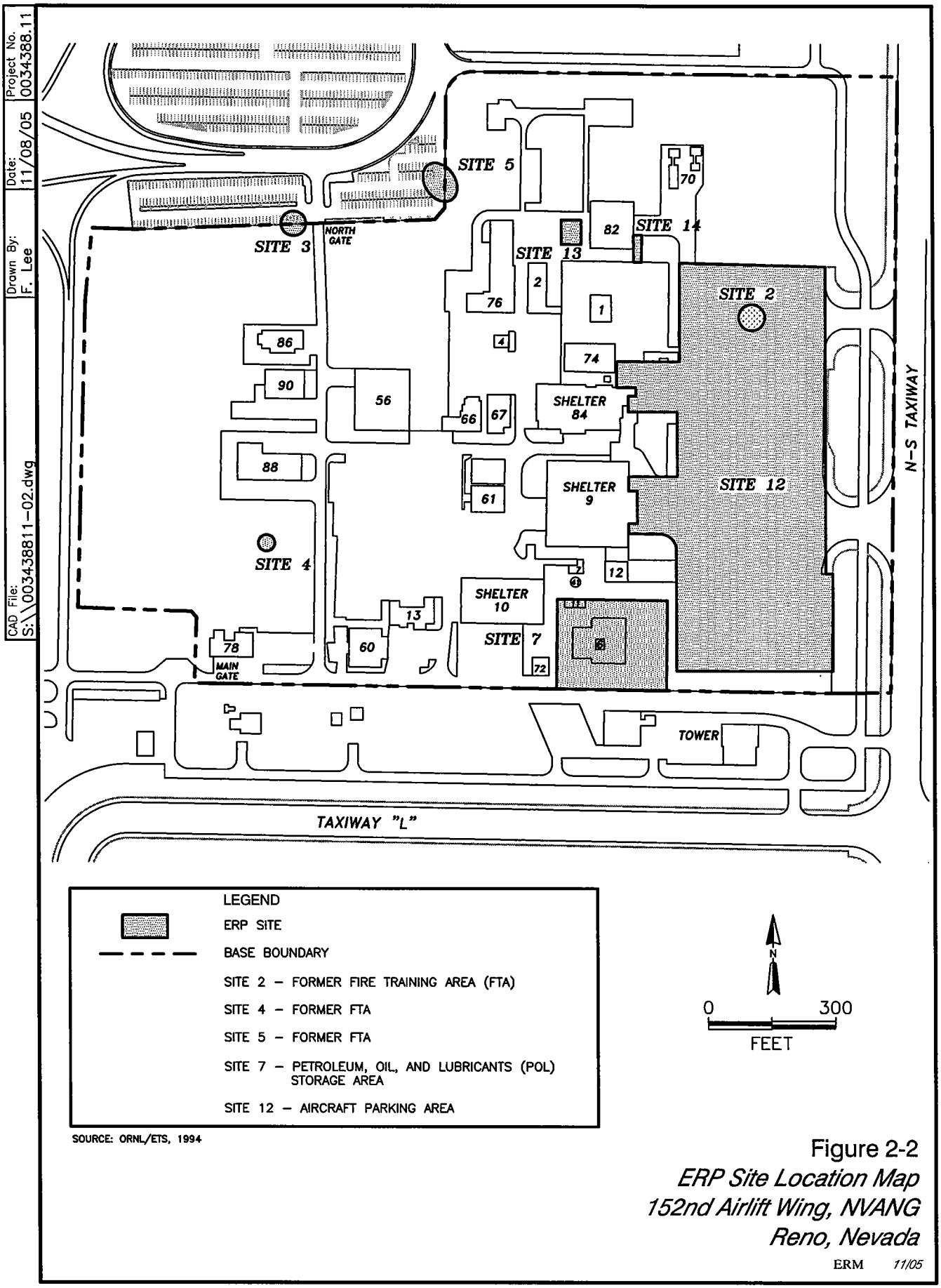
Drawn By: F. Lee
Date: 11/08/05
Project No. 0034388.11



SOURCE: ORNL/ETS, 1994

Figure 2-1
NVANG Location Map
152nd Airlift Wing, NVANG
Reno, Nevada
ERM *11/05*



SOURCE: ORNL/ETS, 1994

Figure 2-2
ERP Site Location Map
152nd Airlift Wing, NVANG
Reno, Nevada
ERM 11/05

burned during the training exercises. In addition, a water base was applied to the FTA prior to each burning exercise. It is estimated that 10 burns per year were conducted at this FTA and up to 150 gallons of flamable liquids were used per burn. Assuming that 70 percent of flamables were destroyed, up to 450 gallons per year may have remained either to evaporate or infiltrate the ground. Based on these estimates, up to 1,800 gallons of flammable liquids may have infiltrated the ground during the 4-year period this FTA was in use (ASG, 1989).

2.2 Site History and Enforcement Activities

The Environmental Restoration Program (ERP) is an environmental program developed by the Department of Defense to identify, assess, characterize, and clean up or control contamination from past hazardous material spills and waste disposal activities at Department of Defense sites, including Air National Guard (ANG) facilities. As part of the voluntary ERP for NVANG, the following investigations/assessment activities were completed:

- The preliminary assessment (PA) was conducted at NVANG in June 1988 (ASG, 1989). This document focused on past and present generation, use, handling, and disposal practices at seven potentially contaminated sites, including Site 2. The PA recommended Site 2 for further ERP investigation.

- A Site Investigation (SI) was completed in 1994, which included sediment/surface water sampling, soil borings, groundwater screening, piezometer and monitoring well installation, and aquifer pumping tests (Oak Ridge National Laboratory/Environmental Technology Section [ORNL/ETS], 1994). During the SI, three soil borings, three piezometers, and three monitoring wells were installed at Site 2. Based on the results of the SI, a no-further-action decision document was recommended for Site 2.

- Groundwater monitoring was conducted at Site 2 between 1992 and 2004. Monitoring and sampling of Site 2 wells were conducted during fourth quarter 1992; first quarter 1993; first and third quarters 1998; second and fourth quarters 1999; second and fourth quarters 2000; third quarter 2001; first and fourth quarters 2002; and second and fourth quarters 2003.

NVANG is not listed on the National Priorities List; therefore, NDEP provides regulatory oversight. There have been no enforcement activities at the site.

SECTION 3.0

COMMUNITY PARTICIPATION

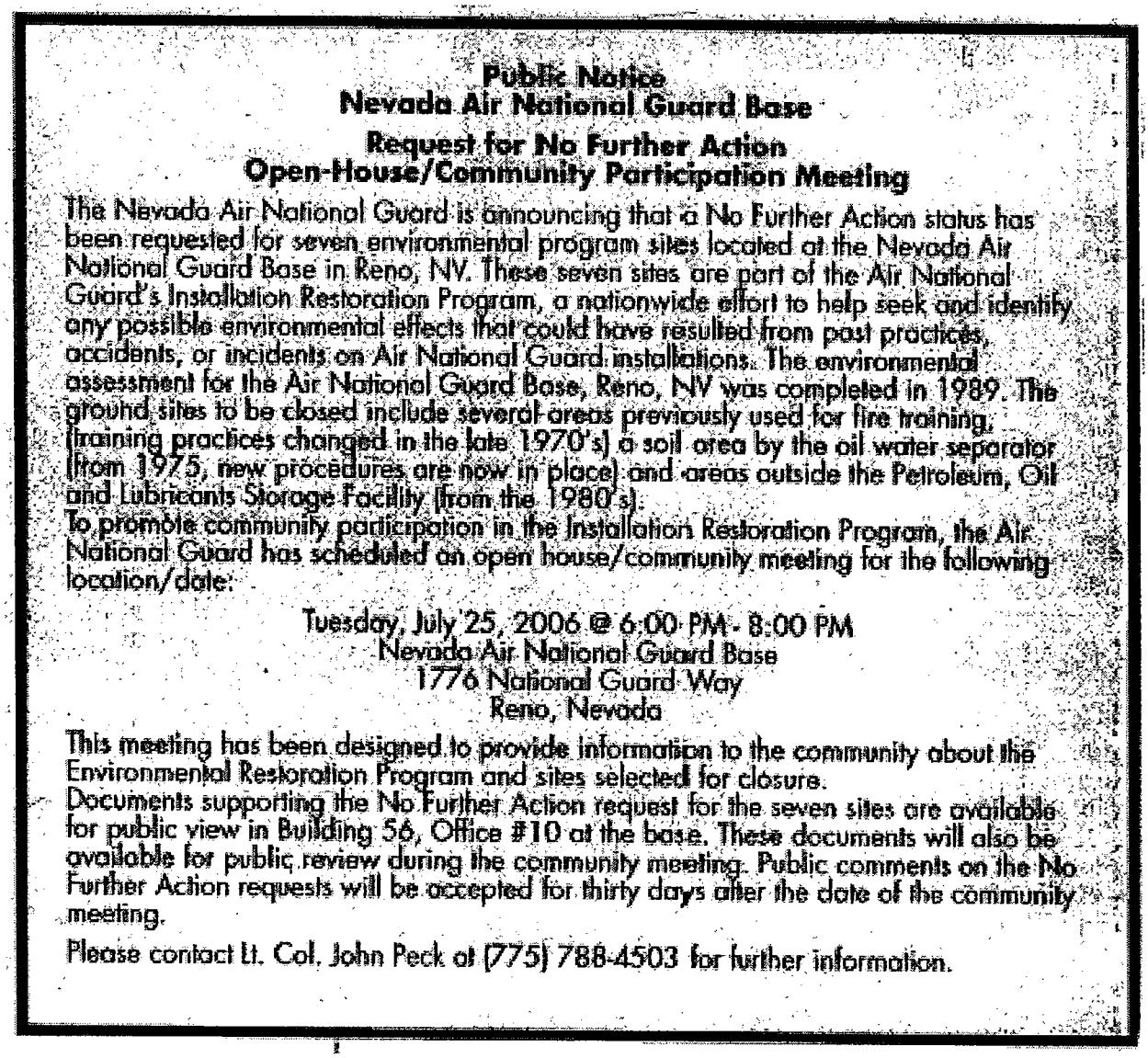
Community participation has been encouraged under a community relations plan drafted pursuant to Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The site-specific community relations plan prepared in October 1995 has been available for public review (along with all site reports) at the Washoe County Library in Reno, Nevada, and at the NVANG during normal business hours.

To meet the informational desires of the community and to allow the Reno, Nevada, area residents to participate in the decision-making process, the ANG held two Restoration Advisory Board meetings in the early stages of the ERP process at the NVANG. Although results from these meetings were positive, the number of interested parties was low and the ERP program at the NVANG was viewed by the community with little concern; therefore, no further meetings were scheduled.

To further inform the community about the Environmental Restoration Program and sites selected for closure, an open-house meeting was held at the NVANG on 25 July 2006. To announce the planned meeting, an advertisement was published in the *Reno Gazette Journal* on 21 and 22 July 2006 (Figures 3-1 and 3-2).

Information provided during the 25 July 2006 meeting included a visual presentation (which gave an historic overview of investigative work performed at Site 2) and printed handouts with similar information. In addition, draft copies of this decision document were available for review during the meeting. This meeting also marked the start of a 30-day public comment period to give interested parties an opportunity to review the documents supporting closure of Site 2.

There was no community attendance at the open-house meeting. Additionally, no community feedback was received during the 30-day comment period.



Public Notice
Nevada Air National Guard Base

Request for No Further Action
Open-House/Community Participation Meeting

The Nevada Air National Guard is announcing that a No Further Action status has been requested for seven environmental program sites located at the Nevada Air National Guard Base in Reno, NV. These seven sites are part of the Air National Guard's Installation Restoration Program, a nationwide effort to help seek and identify any possible environmental effects that could have resulted from past practices, accidents, or incidents on Air National Guard installations. The environmental assessment for the Air National Guard Base, Reno, NV was completed in 1989. The ground sites to be closed include several areas previously used for fire training, (training practices changed in the late 1970's) a soil area by the oil water separator (from 1975, new procedures are now in place) and areas outside the Petroleum, Oil and Lubricants Storage Facility (from the 1980's).

To promote community participation in the Installation Restoration Program, the Air National Guard has scheduled an open house/community meeting for the following location/date:

Tuesday, July 25, 2006 @ 6:00 PM - 8:00 PM
Nevada Air National Guard Base
1776 National Guard Way
Reno, Nevada

This meeting has been designed to provide information to the community about the Environmental Restoration Program and sites selected for closure.

Documents supporting the No Further Action request for the seven sites are available for public view in Building 56, Office #10 at the base. These documents will also be available for public review during the community meeting. Public comments on the No Further Action requests will be accepted for thirty days after the date of the community meeting.

Please contact Lt. Col. John Peck at (775) 788-4503 for further information.

Figure 3-1
Public Meeting Notice
152nd Airlift Wing, NVANG
Reno, Nevada

RENO NEWSPAPERS INC
Publishers of
RENO GAZETTE-JOURNAL
955 Kuenzli St. P.O.Box 22000 RENO, NV 89520 PHONE: (775) 788-6200
Legal Advertising Office (775) 788-6394

- ERM
- 2525 Natomas Park Dr #350
- Sacramento, CA 95833
- David - Betts

Customer Account #	313208
PO# /ID#	0000159257
Ad Cost	$2,425.50

PROOF OF PUBLICATION

STATE OF NEVADA
COUNTY OF WASHOE

ss: Julia Ketcham

Being first duly sworn, deposes and says: That as the legal clerk of the RENO GAZETTE-JOURNAL, a daily newspaper published in Reno, Washoe County, State of Nevada, that the notice:

request for no further action

has published in each regular and entire issue of said newspaper on the following dates to wit:

July 21, 22, 2006

Signed: Julia Ketcham

7-22-06

Tana Ciccotti
Notary Public

TANA CICCOTTI
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 02-75269-2 - Expires May 16, 2010

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Please contact Lt. Col. John Peck at (775) 788-4503 for further information.

Figure 3-2
Proof of Publication
152nd Airlift Wing, NVANG
Reno, Nevada

SECTION 4.0

SCOPE AND ROLE OF SITE

Based on the results of the PA and interviews with NVANG personnel, 14 sites were identified where past waste management and facility operations may have impacted shallow soil and groundwater. The PA recommended further investigation of Sites 2 through 7. Site 12 was investigated during the Rapid Response Site Assessment (PEER Consultants, 1992). Sites 2, 3, 4, 5, 7, 13, and 14 were investigated during the SI (ORNL/ETS, 1994); and Sites 4, 5, 7, and 14 were further investigated during the Remedial Investigation (RI) (ERM, 1996). Figure 2-2 shows the location of Site 2 in relation to other ERP sites. Per agreement between the ANG and NDEP, no further action is appropriate for Sites 2, 3, 4, 5, 12, 13, and 14. Closure requests for these sites will be submitted in separate documents. A remedial action (that includes source removal) is ongoing at Site 7.

As shown in Figure 2-2, Site 2 is located in the eastern portion of the NVANG and is generally cross gradient of Site 7, which is the most heavily impacted portion of NVANG.

The sampling locations used to evaluate Site 2 are as follows:

- Fifteen groundwater screening method (GSM) sampling locations. Groundwater samples were collected from hydraulically driven, hollow steel probes that were advanced to approximately 1 foot below the top of the saturated zone. GSM sample locations at Site 2 are shown in Figure 4-1.

- Three hollow-stem auger soil borings advanced to depths ranging from 5 to 7 feet below ground surface (bgs). Soil samples were collected using a split-barrel sampler from depths ranging from 3 to 7 feet bgs. Soil boring locations are shown in Figure 4-2.

- Three permanent monitoring wells (MW-08, MW-09, and MW-11) were installed for groundwater monitoring and sampling. MW-08 was replaced with MW-08R in July 1999. Monitoring well locations are shown in Figure 4-3.

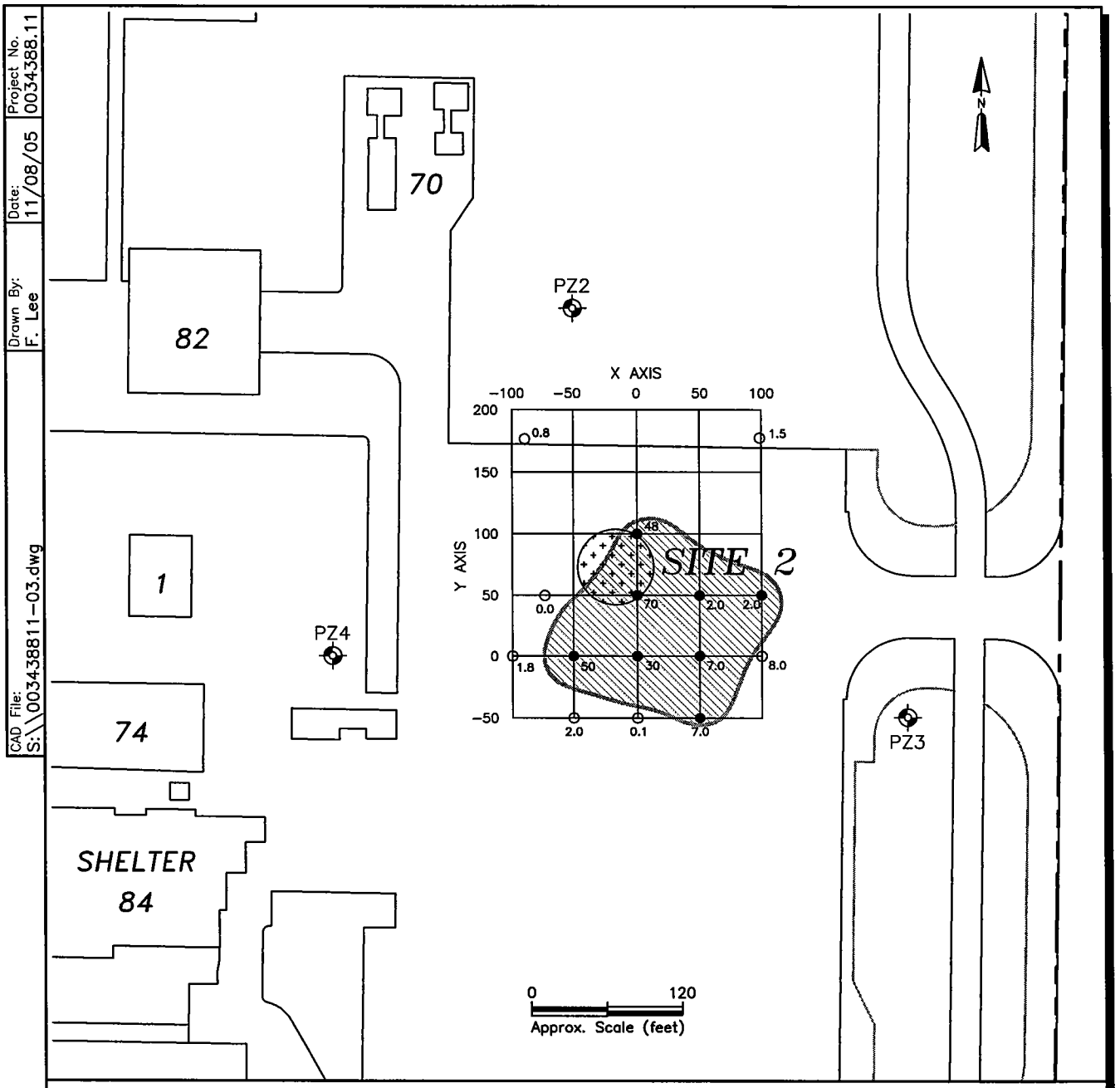

Figure 4-1
Groundwater Screening Survey and Piezometer Locations
Site 2
152nd Airlift Wing, NVANG
Reno, Nevada
ERM 11/05

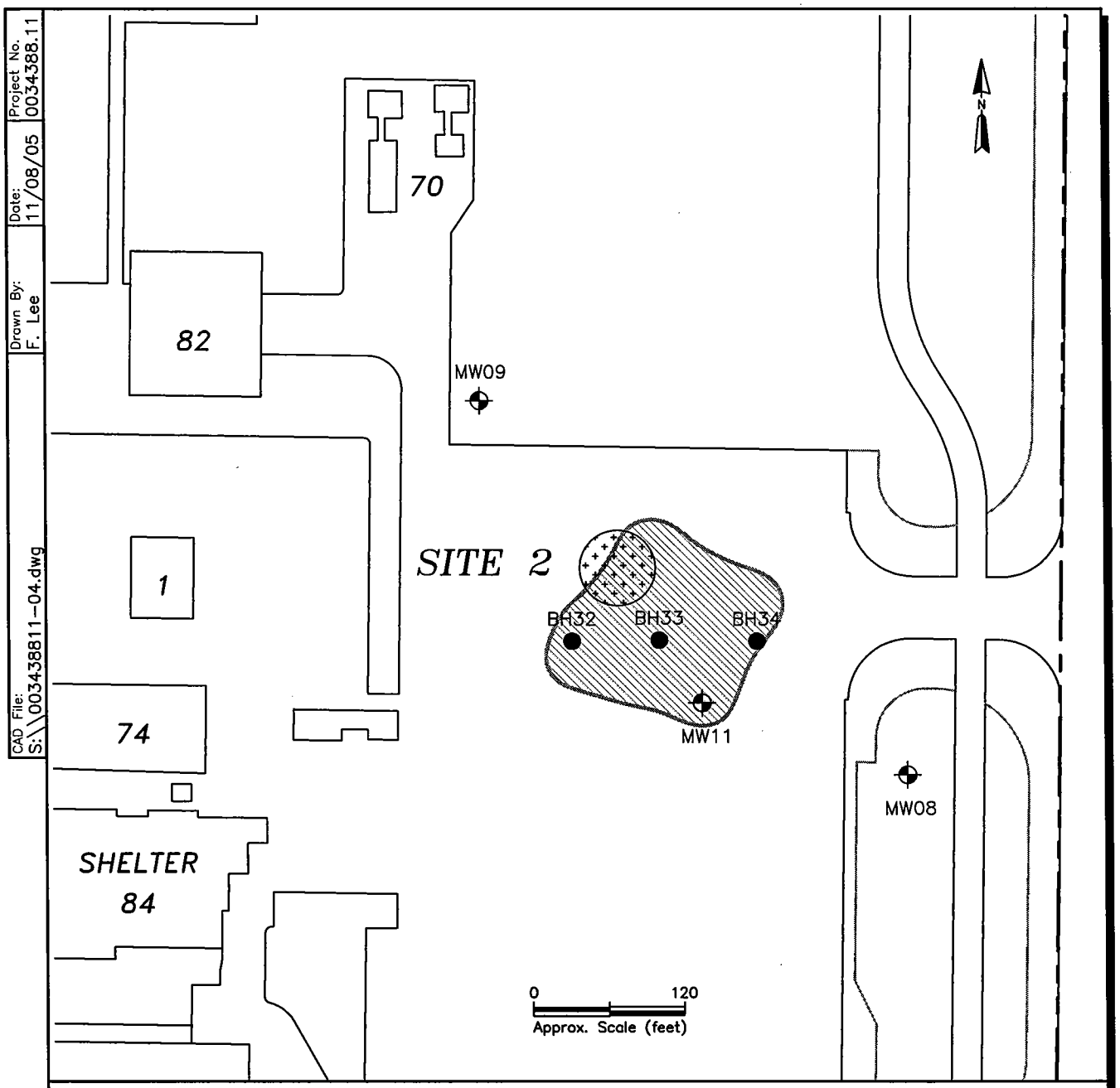

Figure 4-2

Soil Boring and Monitoring Well Locations

Site 2

152nd Airlift Wing, NVANG

Reno, Nevada

ERM 11/05

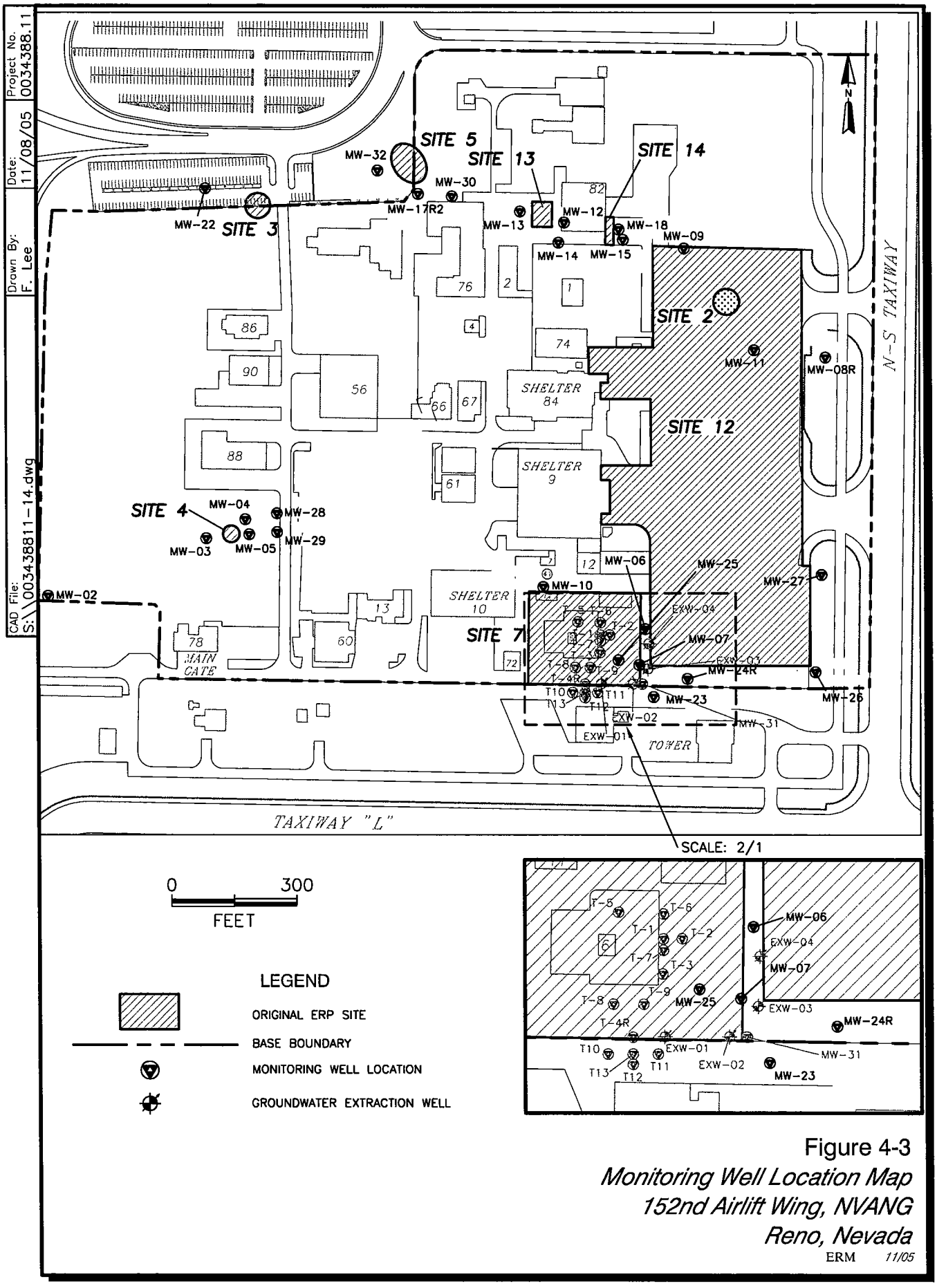

Figure 4-3
Monitoring Well Location Map
152nd Airlift Wing, NVANG
Reno, Nevada
ERM 11/05

Sampling locations used as a basis for the decision for Site 2 are summarized on Table 4-1, along with the gradient relationships to Site 2 and the uses of the data from each location. Table 4-2 provides a chronological summary of quantitative sampling activities at each location.

The GSM locations were initially completed to qualitatively identify areas most likely to contain residual waste. Soil sampling was conducted to confirm the distribution of residual chemicals in soil and quantitatively identify the compounds present. Monitoring wells were installed to determine direction and gradient of groundwater flow and quantitatively identify the compounds dissolved in groundwater.

Table 4-1

Summary of Data From Sampling Locations Used as Basis of Decision for ERP Site 2
152nd Airlift Wing
Nevada Air National Guard
Reno, Nevada

Sampling Location	Data Type	Data Uses
Within Site 2		
Two GSM locations	Qualitative	Qualitative assessment of the extent of dissolved-phase chemicals within the suspected source area
Upgradient or cross-gradient of Site 2		
One GSM location	Qualitative	Qualitative assessment of the lateral extent of dissolved-phase chemicals near the suspected source area
BH32, MW-09, PZ2, PZ4	Quantitative	Quantitative assessment of lateral extent of suspected area of chemicals in soil, based on GSM survey. Determination of direction and magnitude of groundwater flow. Quantitative assessment of dissolved chemical concentrations upgradient of suspected source area.
Downgradient of Site 2		
12 GSM locations	Qualitative	Qualitative assessment of the extent of dissolved-phase chemicals downgradient the suspected source area.
BH33, BH34, MW08/08R, MW-11, PZ3	Quantitative	Quantitative assessment of lateral extent of suspected area of chemicals in soil, based on GSM survey. Determination of direction and magnitude of groundwater flow. Quantitative assessment of dissolved chemical concentrations downgradient of suspected source area.

Key:
BH - Borehole
GSM - Groundwater screening method
MW - Monitoring well
PZ - Piezometer

Table 4-2

Chronological Quantitative Sampling Summary for ERP Site 2
152nd Airlift Wing
Nevada Air National Guard
Reno, Nevada

Sampling Location	Matrix	Sampling Date(s)	Range of Analyses
BH32 through BH34	Soil	12/92	TPH, VOCs, SVOCs
MW-8/MW-08R	Groundwater	12/92, 3/93, 03/98, 08/98, 05/99, 11/99, 05/00, 11/00, 09/01, 03/02, 10/02, 04/03, 10/03	VOCs, SVOCs, metals
MW-09	Groundwater	12/92, 3/93	VOCs, SVOCs, metals
MW-11	Groundwater	12/92, 3/93, 10/02, 04/03, 10/03	VOCs, SVOCs, metals

Key:
BH – Soil boring
MW – Monitoring well
SVOC – Semivolatile organic compound
TPH – Total petroleum hydrocarbons
VOC – Volatile organic compound

SECTION 5.0

SITE CHARACTERISTICS

This section summarizes the characteristics and conditions of the region, the facility, and the site. It describes the physical and ecological setting, climate, surface water patterns, and geology and hydrogeology, as well as the nature and extent of contamination and the fate and transport of chemicals of concern.

5.1 Topography

The average elevation of Truckee Meadows, where the NVANG is located, is 4,400 feet above mean sea level. The area around Truckee Meadows is generally flat with a gentle slope to the west; although topographic relief is substantial in the surrounding mountain ranges (ASG, 1989).

5.2 Climate

The annual mean temperature for Reno, Nevada, is 49.9 degrees Fahrenheit (°F) with a maximum monthly average of 91.3°F occurring in July and a minimum monthly average of 18.9°F occurring in December. The average daily temperature change is 35°F with a maximum daily temperature change of 43.5°F occurring in July and August (ASG, 1989).

National Oceanic and Atmospheric Administration Station No. 26-6779, located at Reno Tahoe International Airport, records an average annual precipitation of 7.49 inches for the Reno, Nevada area. According to the Water Atlas of the United States, Plate 12, the average annual evaporation from open water surfaces is 43 inches (ASG, 1989). Using the method outlined in the Federal Register (47 Federal Regulation 31224, July 1982), the annual net precipitation for the NVANG is -35.51 inches (ASG, 1989). Rainfall intensity based on the 1-year, maximum 24-hour rainfall is calculated to be 1.5 inches (ASG, 1989).

5.3 Geology

5.3.1 Regional Geology

The majority of the information presented in the following subsections was obtained from Cohen and Loeltz (1964), Bingler (1975), and the Preliminary Assessment (ASG, 1989), which contains information derived from the Nevada Bureau of Mines and Geology Report #25 (Bateman and Scheibach, 1975).

Geologic maps of the Reno and Mt. Rose quadrangles show that the northern portion of the NVANG lies on a Quaternary deposit termed "floodplain and lacustrine deposits" consisting of interbedded gray to pale grayish-yellow silt and fine-grained sand with thin lenses of peat. These are fluvial and lacustrine deposits up to 23 feet thick with little or no soil development (Bonham and Rogers, 1983). The southern portion of the airfield is underlain by deposits known as "alluvial bajada deposits" consisting of thin, sheet-like aprons of fine- to medium-grained sand with intercalated muddy, medium-pebble gravel. These deposits result from low gradient streams that have reworked older gravelly outwash and alluvial fan deposits. They are weakly weathered and largely undissected, with little or no soil development (Bonham and Rogers, 1983).

The general geology of the Reno area consists of a north-trending basin known as the Truckee Meadows. This basin is located at the western margin of the Basin and Range physiographic province just east of the Sierra Nevada. Bingler (1975) describes the Truckee Meadows as a structural depression bounded by the Carson Range on the west, the Virginia Range on the east, Steamboat Hills to the south, and the eastern part of the Peavine Mountain block to the north. These marginal blocks consist of Mesozoic metavolcanic and plutonic rocks overlain by a thick sequence of Tertiary volcanic and epiclastic rocks. The Tertiary rocks are predominantly andesite and andesite porphyry flow rock, hypabyssal intrusives, and minor siliceous welded tuff, which are commonly represented by the Kate Peak and Alta Formations.

The foothill and mountain drainages that rim the basin contain large exposures of altered volcanic rock. Along the western margin of the basin and to the north and west along the Truckee River drainage basin, tilted beds of Miocene to upper Pliocene Hunter Creek Sandstone (composed of conglomerate, sandstone, and diatomite) are exposed, marking the start of early basin-sediment accumulation. The continuation of long-established

patterns of basin-sediment accumulation is represented by the extensive Quaternary deposits exposed in the Truckee Meadows.

Bingler (1975) divided the Quaternary deposits into three major categories:

- Main stream gravel deposits of the Truckee River represented by bouldery outwash from glacial activity;
- A long and complex history of alluvial fan deposition along the margins of the Truckee Meadows that extends in time from the Pleistocene into the Holocene; and
- Reworking of older deposits and deposition of fine-grained clastic debris throughout the central part of the Truckee Meadows by low gradient streams during the Holocene and continuing to the present.

Geothermal activity in Truckee Meadows is found in two major areas known as Steamboat Springs and Moana. These activities are likely due to the cooling of an intrusive body at a depth that may be connected to groundwater resources through fault systems near these areas. Geothermal activity has a profound effect on groundwater chemistry by means of hydrothermal alteration of volcanic rocks underlying Truckee Meadows.

5.3.2 Local Geology

The soil descriptions below are based on the PA (ASG, 1989) and were derived from the *Soil Survey of Washoe County, Nevada, South Part* (Baumer, 1983).

The Truckee sandy loam, gravelly substratum covers the northern half of the airport and all of the NVANG property (Baumer 1983, Map Index No. 805). This very deep, somewhat poorly drained soil is on flood plains and is formed in alluvium derived from mixed rock sources. Typically, the surface layer is gray sandy loam about 12 inches thick. The upper 18 inches of the underlying material is gray, stratified sandy loam through silty clay loam. The lower part, to a depth of 60 inches, is a pale-brown, stratified, gravelly sand and very gravelly sandy loam. Depth to the gravelly material ranges from 30 to 40 inches.

The Vamp silt loam, which is strongly saline-alkali, covers the southern half of the airport and adjacent areas (Baumer, 1983, Map Index No. 911). This is a moderately deep, somewhat poorly drained soil found on flood

plains and terraces. The soil is formed in alluvium and is derived from mixed rock sources. Typically, the surface layer is grayish-brown silty loam about 3 inches thick. Below this is a layer of light grayish-brown and pale-brown, stratified, fine sandy loam and loam about 33 inches thick. The next layer is white, strongly cemented hardpan about 6 inches thick, which is underlain to a depth of 60 inches by yellowish-brown and light olive-gray, stratified loam, sandy loam, and loamy sand. Depth to the hardpan ranges from 20 to 40 inches. Permeability of the Vamp soil is moderate. A seasonal high water table is at a depth of 30 to 40 inches in spring and early summer.

Channeling and deposition are common along stream banks in both soil units. The risk of corrosion is high for uncoated steel and concrete structures because both soil units are strongly saline and alkaline-affected. Both soil units are subject to seasonal flooding that has been controlled around the NVANG by deepened drainage ditches.

5.4 Hydrology

The following subsections describe the surface water hydrology and the hydrogeology of the NVANG.

5.4.1 Surface Water Hydrology

Surface water in the vicinity of the NVANG occurs in both open and covered drainage ditches. Irrigation ditches fed by diversion dams on the Truckee River pass by the NVANG just east of the airfield. There are drainage ditches along the north and south sides of the NVANG that conduct water to the east, across the airfield, and into Boynton Slough, which drains into Steamboat Creek (ASG, 1989).

The Truckee Meadows is drained by the Truckee River, which flows from west to east through the Meadows. The NVANG lies 1.5 miles south of the river channel at its closest point. Steamboat Creek, the major tributary to the Truckee River within the Meadows, enters through Pleasant Valley to the south and flows north to the Truckee River. Other streams in this area flow mainly during spring runoff (ASG, 1989).

5.4.2 Hydrogeology

The potentiometric surface at the NVANG can be as shallow as 3 feet below the land surface. The fine-grained nature of the upper sediments

compared with the more permeable lower sediments may result in confined conditions across the NVANG. The proximity of the groundwater surface to the land surface is due to the area's function as a groundwater discharge point for the Truckee Meadows. Much of the NVANG and airport lie on former swampland that was filled in and drained with ditches that receive the current groundwater discharge. Cohen and Loeltz (1964) estimated the total groundwater discharge into the drainage ditches, drains, and sloughs east of the airport to be 6,500 acre-feet per year (acre-feet/year), with an additional 2,200 acre-feet/year discharged to drains immediately north of the airfield. Today, the only remaining swampland, located east of the NVANG, is found south of the confluence of Boynton Slough and Steamboat Creek.

Groundwater in the Truckee Meadows occurs under both artesian and water table conditions in the unconsolidated and partially consolidated younger and older alluvium of the valley fill. Artesian heads in the meadows area are commonly less than 20 feet above the land surface (Cohen and Loeltz, 1964). Depths to groundwater vary considerably due to the interfingering nature of the valley-fill deposits. Several public water supply wells located in the meadows are screened at depths ranging from 274 to more than 800 feet. Commonly, wells located several yards apart will tap water-bearing deposits at different depths. This trend becomes more pronounced in the area of the Truckee River, where channel shifts have left discontinuous and sinuous gravels (ASG, 1989).

Review of Nevada Department of Water Resources drilling records, stored by the United States Geological Survey Water Resources Division in Carson City, Nevada, indicates that there are 90 monitoring wells within a 1-mile radius of the NVANG. None of these wells are considered private supply wells, as they are less than 30 feet deep and constructed as monitoring wells related to environmental site assessments in the airport area. Because shallow groundwater in this area contains high concentrations of naturally occurring inorganic compounds, there are no known private drinking water wells near the NVANG.

Cohen and Loeltz (1964) suggest that 70 percent of the recharge to the groundwater in the Truckee Meadows is from infiltration by crop irrigation practices and 30 percent can be attributed to the infiltration of stream flow and underflow from tributary valleys. Increasing urbanization in the Meadows, however, has decreased the use of crop irrigation, thus decreasing the rate of recharge and consequently lowering water levels. The State engineer's office in Carson City estimates the present annual groundwater recharge to the Truckee Meadows at 20,000 to 25,000 acre-feet.

During the SI, single well pumping tests were performed on six monitoring wells, and recovery tests were performed on two wells. Transmissivity values calculated from the pump test data ranged from 39 to 3,110 square feet per day. Hydraulic conductivities, defined as the product of the screened aquifer thickness and transmissivity, ranged from 4 to 479 feet per day (ft/d). The range of values indicates the lithology of the unconfined saturated zone is very heterogeneous. This conclusion is consistent with data from borehole logs. Using an average hydraulic conductivity value of 500 ft/d, a gradient of 0.001, and effective porosity of 0.20 (fine to coarse sand), the SI report calculated an average linear groundwater velocity of 2.5 ft/d (ORNL/ETS, 1994).

Figure 5-1 shows the potentiometric surface map developed based on the last semiannual monitoring event (third quarter 2003). As indicated, groundwater flow is east or east-southeast. The groundwater gradient in the vicinity of Site 2 was approximately 0.0056 feet per foot during fourth quarter 2003. These results are consistent with groundwater gradient and flow directions observed during previous events (ERM, 2003a).

5.5 Cleanup Levels for Soil and Groundwater

Cleanup levels for impacted soil and groundwater at NVANG (created for the RI/Feasibility Study) were calculated for protection of both human health (assuming direct contact with soil) and groundwater. Direct contact standards were calculated following the methodology established in Subpart S of the Resource Conservation and Recovery Act (RCRA) Corrective Action Rule (USEPA, July 1990). Cleanup levels for protection of groundwater were calculated based on (1) Toxicity Characteristic Leaching Procedure (TCLP) standards; (2) Federal Maximum Contaminant Levels (MCLs); or (3) a drinking water equivalency level using Subpart S methodology. Where available, the numeric TCLP standard (in milligrams per liter [mg/L]) was selected as the groundwater protective cleanup level (in milligrams per kilogram [mg/kg]) without any unit conversion. For compounds with no established TCLP standard, the cleanup levels were calculated by multiplying the MCL (in mg/L) by 100. For compounds with no established TCLP standard or MCL, a drinking water equivalency standard (in mg/L), calculated using

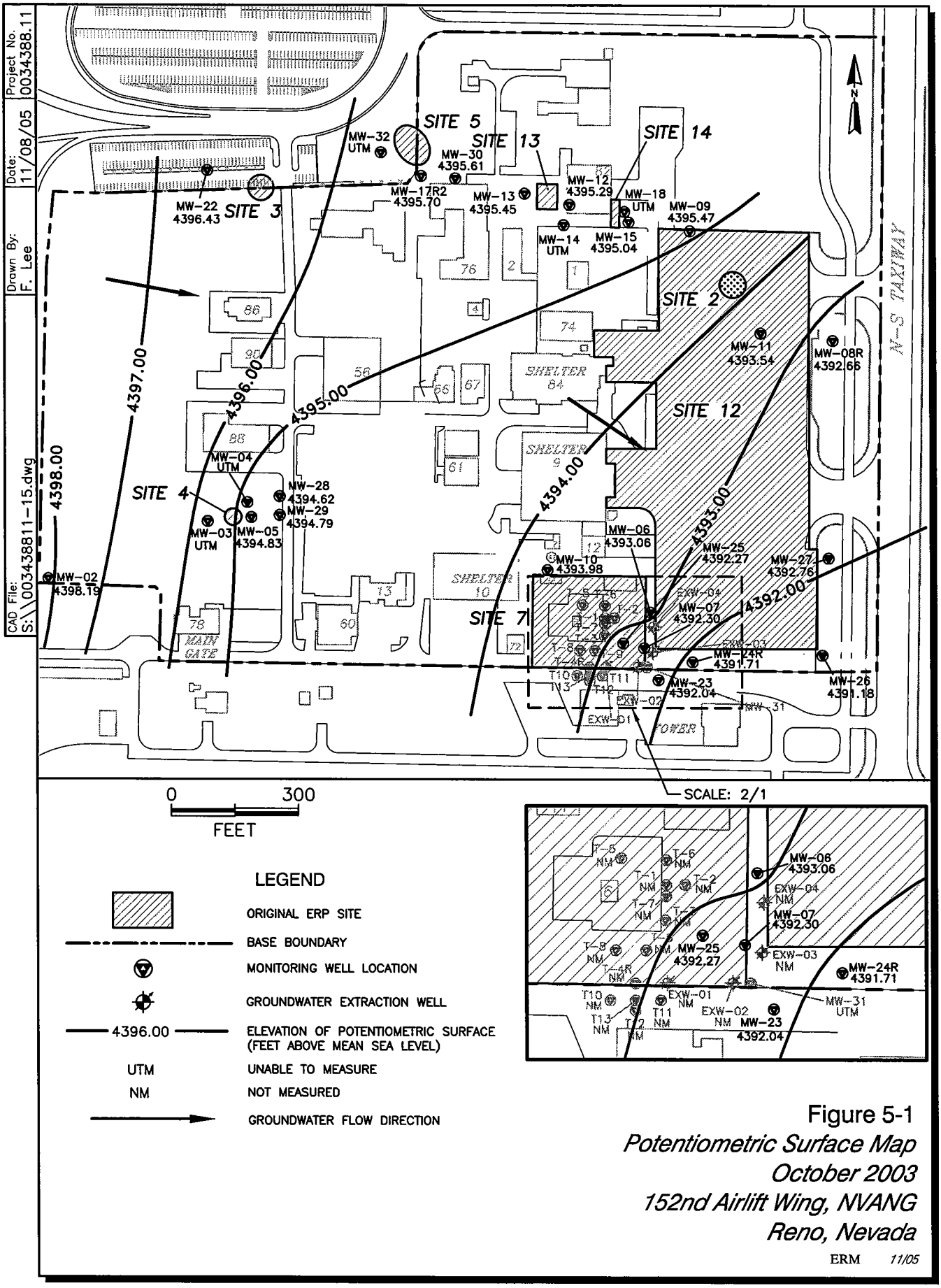

Figure 5-1
Potentiometric Surface Map
October 2003
152nd Airlift Wing, NVANG
Reno, Nevada
ERM 11/05

Subpart S methodology, was multiplied by 100 to derive the soil cleanup level (in mg/kg). Table 5-1 summarizes groundwater protective cleanup levels for Site 2 soils. Groundwater protective cleanup levels are preferred because they are more conservative than the human health cleanup levels for the chemicals of concern.

The SI (ORNL/ETS, 1994) compared detected concentrations of inorganic constituents (metals) to background concentrations to determine whether further action was necessary to address metals in soil. Background concentrations for metals were derived from two sources: (1) the range of detected concentrations in seven soil samples taken from soil borings drilled in areas where it was reasonably certain there was no impact; and (2) crustal abundance average concentrations reported in *Abundance of Chemical Elements in Continental Crust* (Taylor, 1964). The SI concluded that concentrations of metals in ERP Sites soil were within normal background ranges. Based on these results further assessment was deemed unnecessary, and metals were not subsequently evaluated in the RI (ERM, 1996).

Consistent with NDEP guidance, potential cleanup levels identified in the SI and RI for groundwater were based primarily on Federal MCLs. For several compounds with no established MCLs, the RI derived drinking water equivalency levels using the methodology set forth in Subpart S of the proposed RCRA Corrective Action Rule (EPA, 1990). In addition, the SI compared concentrations of inorganic constituents (metals) to concentrations measured in non-impacted background wells and concentration ranges for metals and cations in groundwater determined by Welch and others (1989) for the Carson River Basin.

The cleanup levels identified in the SI and RI were used to determine whether further action was necessary at the site. Although these cleanup levels provided the basis for recommending no further action at Sites 2, 3, and 13 in the SI and long term monitoring for Site 14 in the RI, it should be noted that the SI and RI did not identify groundwater cleanup levels for some compounds. To allow a comprehensive evaluation of all detected constituents, either the current Federal MCL or the current Region 9 PRG has been selected as the cleanup level for these compounds. Table 5-2 summarizes cleanup levels for all constituents detected in Site 2 groundwater. The RI report (ERM, 1996) contains further details on calculation of soil and groundwater cleanup levels.

Table 5-1

Summary of Soil Cleanup Levels
ERP Site 2
152nd Airlift Wing, Nevada Air National Guard
Reno, Nevada

Compound	Human Health Cleanup Level (Based on Subpart S)	Groundwater Protection Cleanup Level	Groundwater Protection Cleanup Level Method
Volatile Organic Compounds (micrograms per kilogram)			
2-Butanone	48,000,000	200,000	TCLP
Chloroform	120,000	6,000	TCLP
1,2-Dichloroethene	*	*	NA
Ethylbenzene	8,000,000	70,000	MCL x 100
Xylenes	160,000,000	1,000,000	MCL x 100
Semivolatile Organic Compounds (micrograms per kilogram)			
Bis(2-ethylhexyl)phthalate	50,000	600	MCL x 100
2-Methylnaphthalene	3,200,000	140,000	Subpart S x 100
Naphthalene	3,200,000	140,000	Subpart S x 100
Total Petroleum Hydrocarbons (milligrams per killogram)			
TPH	4,800	210	Subpart S x 100

Key:
* = None established
MCL = Maximum contaminant level
NA = Not applicable
TCLP = Toxicity characteristic leaching procedure
TPH - Total petroleum hydrocarbons

Table 5-2

Summary of Groundwater Cleanup Levels
ERP Site 2
152nd Airlift Wing, Nevada Air National Guard
Reno, Nevada

Compound	Groundwater Cleanup Level (µg/L)	Source
Volatile Organic Compounds		
Benzene	5	USEPA Region 9 Primary MCL
cis-1,2-Dichloroethene	70	USEPA Region 9 Primary MCL
trans-1,2-Dichloroethene	100	USEPA Region 9 Primary MCL
Methyl tert Butyl Ether	20	NDEP Interim Action Level
Trichloroethene	5	USEPA Region 9 Primary MCL
Toluene	1,000	USEPA Region 9 Primary MCL
Semivolatile Organic Compounds		
Diethyl phthalate	29,000	USEPA Region 9 Tap Water PRG
Di-n-octyl phthalate	700	Subpart S
Pentachlorophenol	1	USEPA Region 9 Primary MCL
2-Methylnaphthalene	1,400	Subpart S
Inorganic Constituents		
Aluminum	200	USEPA Region 9 Secondary MCL
Antimony	6	USEPA Region 9 Primary MCL
Arsenic	10	USEPA Region 9 Primary MCL
Barium	2,000	USEPA Region 9 Primary MCL
Copper	1,300	USEPA Region 9 Primary MCL
Iron	300	USEPA Region 9 Secondary MCL
Manganese	50	USEPA Region 9 Secondary MCL
Vanadium	36	USEPA Region 9 Tap Water PRG
Zinc	5,000	USEPA Region 9 Secondary MCL

Key:
µg/L = Micrograms per liter
MCL = Maximum contaminant level
NDEP = Nevada Division of Environmental Protection
PRG = Preliminary remediation goal
USEPA = United States Environmental Protection Agency

5.6 Nature and Extent of Contamination

This section summarizes results of investigations at Site 2 and discusses in detail contaminants in soil and groundwater. Investigations at the site are summarized in Section 2.

GSM sampling (ORNL/ETS, 1994) indicated the presence of trace levels of several chlorinated and fuel-related compounds in groundwater near the suspected source area. Specific compounds could not be identified because of interference effects. The area of suspected groundwater impact extended approximately 100 feet north and east of the suspected source area. SI soil samples collected within the area of groundwater impact contained detectable total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). The highest concentrations of TPH, VOCs, and SVOCs occurred in BH33, located 50 feet southeast of the suspected source area. SI groundwater samples indicated the presence of low to trace concentrations of VOCs (trichloroethene [TCE]) and 1,2-dichloroethene [1,2-DCE]) and SVOCs (Di-n-octyl phthalate, diethyl phthalate, and pentachlorophenol) primarily in MW-08, located southeast of the suspected source area.

Results from long-term groundwater monitoring indicate low concentrations of VOCs are localized in the vicinity of MW-08/MW-08R. MW-09 was nondetect for all analytes during 1992 and 1993. MW-11, which is located between the suspected FTA-1 source area and MW-08, was nondetect for all analytes between 1992 and 1999, but contained low concentrations of methyl tertiary butyl ether (MTBE) during 2002 and 2003. MW-08/08R also contained low concentrations of MTBE between 2001 and 2003.

5.6.1 Qualitative Data from GSM Sampling

Qualitative data were initially collected to assess the presence or absence of dissolved volatile chemicals in the general vicinity of the Site 2 suspected source area. GSM samples were collected from 1-inch-diameter hollow steel probes, which were driven to approximately 1 foot below the top of the saturated zone. Groundwater samples were placed in 40-milliliter vials, agitated to induce volatilization of dissolved VOCs, and the headspace gas was then analyzed using a field gas chromatograph (GC). Photoionization (PID) readings were also collected from the borehole openings at each location. GC data were recorded as either

positive (detectable VOCs present) or negative (detectable VOCs not present). The GC and PID data were combined to delineate the area of likely groundwater impact. The GC and PID data are summarized on Table 5-3 and the area of impact is shown on Figure 4-1. As shown in Figure 4-1, the area of likely impact extended approximately 100 feet south and east of the suspected source area.

5.6.2 Quantitative Soil Data

Quantitative soil analytical data were collected during the SI to define the nature and extent of chemical impacts in the unsaturated zone.

During the SI, three soil borings (BH32 through BH34) were advanced within the footprint of likely groundwater impact, as defined by the GMS survey. Soil samples were collected for analysis at depths ranging from 3 to 7 feet bgs. Samples were analyzed for VOCs, SVOCs, TPH, and metals. All metals results were within the background ranges reported in the SI. Table 5-4 summarizes results for organic chemicals in soil and Figure 4-2 shows the locations of the borings. As indicated, detectable VOCs, including chloroform; 2-butanone; 1,2-DCE, ethylbenzene, and xylenes were reported in BH32, BH33, and BH34, with the maximum concentration (4,400 micrograms per kilogram 2-butanone) occurring in BH33 at 3 feet bgs.

Bis(2-ethylhexyl)phthalate was detected in all three borings. 2-methylnaphthalene and naphthalene were detected only in BH33. Other SVOCs were non-detect. Detectable TPH was reported in all three borings at concentrations ranging from 0.12 mg/kg (BH33) to 84.69 mg/kg (BH32).

Except for 1,2-DCE, reported concentrations of all analytes were less than the cleanup levels described in Section 5.5. A cleanup level for 1,2-DCE has not been established.

5.6.3 Groundwater Monitoring

Groundwater samples were collected from site-related monitoring wells (Figure 4-3) as part of both the SI (1992 and 1993) and during annual and semiannual monitoring conducted between 1998 and 2003. Table 5-5 summarizes available groundwater analytical results from site-related monitoring wells for the period 1992 to 2003.

Table 5-3

GSM Survey Results
ERP Site 2
152nd Airlift Wing, Nevada Air National Guard
Reno, Nevada

GSM Location	Grid Coordinates (x,y)	PID (ppm)	GC Decision
S201	0,0	30	Positive
S202	0,-50	0.10	Negative
S203	50,0	7.0	Positive
S204	-50,0	50	Positive
S205	0,50	70	Positive
S206	0,0	8.0	Negative
S207	50,50	2.0	Positive
S208	50,-50	7.0	Positive
S209	0,100	48	Positive
S210	-50,-50	2.0	Negative
S211	100,50	2.0	Negative
S212	-75,50	0.0	Negative
S213	-100,0	1.8	Negative
S214	100,175	1.5	Negative
S215	-45,175	0.80	Negative

Key:
GC = Gas chromatograph
GSM = Groundwater screening method
PID = Photoionization detector
ppm = Parts per million

Table 5-4

Organic Chemical Constituents Detected in Soil
Site 2
152nd Airlift Wing, Nevada Air National Guard
Reno, Nevada

Chemical	BH32			BH33			BH34	
	3 ft	5 ft	7 ft	3 ft	5 ft	7 ft	3 ft	5 ft
Volatile Organic Compounds (µg/kg)								
Chloroform	1.0 J	1.0 J	1.0 J	ND	2.0 J	2.0 J	ND	1.0 J
2-Butanone	ND	12 J	-	4,400 J	ND	ND	9.0 J	ND
1,2-Dichloroethene	ND	ND	ND	200 J	8.0 J	48	ND	ND
Ethylbenzene	ND	ND	ND	ND	17	12 J	ND	ND
Xylenes	ND	ND	ND	ND	13	-	ND	ND
Semivolatile Organic Compounds (µg/kg)								
bis(2-Ethylhexyl)phthalate	88 J	55 J	50 J	89 J	42 J	40 J	79 J	120 J
2-Methylnaphthalene	ND	ND	ND	ND	84 J	91 J	ND	ND
Naphthalene	ND	ND	ND	ND	52 J	110 J	ND	ND
PHCs (mg/kg)								
Total Petroleum Hydrocarbons	84.69	1.83	1.17	ND	12.43	0.12	0.17	ND

Notes:

J = Reported value is below the contract required detection limit, but above the instrument detection limit. Values are estimated.

Abbreviations:

µg/kg = Micrograms per kilogram
ft = Feet
mg/kg = Milligrams per kilogram
NA = Not available
ND = Not detected
PHCs = Petroleum hydrocarbons

Table 5-5
Chemical Constituents Detected in Groundwater
Site 2
152nd Airlift Wing, Nevada Air National Guard
Reno, Nevada

Chemical	Background Range	MW-08/08R Dec-92	Mar-93	Mar-98	Aug-98	May-99	Nov-99	May-00	Nov-00	Sep-01	Mar-02	Oct-02	Apr-03	Oct-03	Oct-03 (D)	MW-09 Dec-92	Mar-93	MW-11 Dec-92	Mar-93	May-99	Oct-02	Apr-03	Apr-03 (D)	Oct-03
Volatile Organic Compounds (µg/L)																								
Trichloroethene	NA	**6.0**	2.0 J	ND	ND	ND	ND	ND	ND	1.2	ND	ND	<1.0	<1.0	1.1	ND	ND	ND	ND	ND	ND	<1.0	<1.0	<1.0
1,2-Dichloroethene	NA	ND	18	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	ND	ND	ND	NS	NS	NS	NS
cis-1,2-Dichloroethene	NA	ND	ND	ND	ND	ND	20	ND	12	31	7.5	23	25	34	49	ND	ND	ND	ND	ND	ND	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	NA	ND	ND	ND	ND	ND	ND	ND	ND	1.7	ND	2.6	2.2	2.0	3.2	ND	ND	ND	ND	ND	ND	<1.0	<1.0	<1.0
Benzene	NA	ND	ND	ND	ND	ND	ND	2.2	ND	ND	ND	ND	<0.5	<1.0	<1.0	ND	ND	ND	ND	ND	ND	<0.5	<0.5	<1.0
Toluene	NA	ND	ND	ND	ND	ND	ND	2.0	ND	ND	ND	ND	<0.5	<1.0	<1.0	ND	ND	ND	ND	ND	ND	<0.5	<0.5	<1.0
Methyl-tertiary butyl ethe	NA	NS	NS	NS	NS	ND	ND	ND	5.2	8.1	9.6	3.0	5.4	<1.0	1.1	NS	NS	NS	NS	ND	3.7	3.5	3.3	5.0
Semivolatile Organic Compounds (µg/L)																								
Di-n-octyl phthalate	NA	ND	ND	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0 J	ND	ND	NS	NS	NS	NS
Diethyl phthalate	NA	ND	1.0 J	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS
Pentachlorophenol	NA	ND	**1.0 J**	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**2.0 J**	ND	ND	ND	NS	NS	NS	NS
2-Methylnaphthalene	NA	ND	ND	NS	NS	NS	ND	17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS	NS	NS
Inorganic Analytes (µg/L)																								
Aluminum	305 - 568	**389**	ND	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**366**	ND	**392**	ND	NS	NS	NS	NS	NS
Antimony	ND	ND	ND	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	ND	36.2	NS	NS	NS	NS	NS
Arsenic	84.5 - 152	**43.4 J**	50	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**26.8 J**	**29.5**	**45.2 J**	**49.8**	NS	NS	NS	NS	NS
Barium	17.7 - 39.4	95.5	41.7	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	50.2	23.5	64.2	92.2	NS	NS	NS	NS	NS
Calcium	18,600 - 47,400	61,600	85,400	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	43,200	74,300	66,000	53,500	NS	NS	NS	NS	NS
Copper	6.6 - 11.9	ND	ND	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	ND	ND	11.3	ND	NS	NS	NS	NS	NS
Iron	55.9 - 360	35.9 J	65.5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	ND	21.7	ND	262	NS	NS	NS	NS	NS
Magnesium	40 - 6,880	12,400	17,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	8,300	15,800	21,100	24,700	NS	NS	NS	NS	NS
Manganese	15.6 - 172	**248**	**127**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**111**	**93.6**	**1,350**	**3,030**	NS	NS	NS	NS	NS
Potassium	2,850 - 14,500	12,400	10,600 J	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	8,820	9,130 J	17,200	15,800 J	NS	NS	NS	NS	NS
Sodium	16,500 - 443,000	150,000	157,000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	98,700	132,000	132,000	81,100	NS	NS	NS	NS	NS
Vanadium	12.5 - 15	13.5	11	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	11.9	17.7	6.9	ND	NS	NS	NS	NS	NS
Zinc	3.8 - 4.2	5.3	5.2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.3	ND	4.9	8.7	NS	NS	NS	NS	NS

Notes:
* = No established value
< = Concentration is below the specified method detection limit
(1) = EPA Region 9 Maximum Contaminant Level
(2) = EPA Region 9 Tap Water Preliminary Remediation Goal
Bold = Result exceeds cleanup level.
Shading = Result exceeds background range reported in SI (ORNL/ETS, 1994)
J = Reported value is below the contract required detection limit, but above the instrument detection limit for volatile organic compounds and semivolatile organic compounds.
For inorganics, the reported value is estimated because the associated matrix spike was out of control limits. Values are estimated.
(D) = duplicate sample

Abbreviations:
µg/L = Micrograms per liter
MW = Monitoring well
NA = Not applicable
ND = Not detected
NS = Not sampled

During the SI (1992 to 1993), samples were initially collected from all three wells (MW-08, -09 and -11). MW-09, which was nondetect for all analytes, except for a single detection of pentachlorophenol (2 µg/L), was not monitored after 1993. Both MW-08/08R and MW-11 were sampled regularly during monitoring conducted between 1998 and 2003. All available analytical results are summarized on Table 5-5. Groundwater samples were analyzed for VOCs (USEPA Methods 8010, 8020, 8260), SVOCs (USEPA Method 8270C), and metals.

As indicated on the Table 5-5, low concentrations of cis-1,2-DCE (12 to 49 µg/L) and trans-1,2-DCE (1.7 to 3.2 µg/L) were consistently detected in MW-08/08R between 1992 and 2003. TCE (2.7 to 10 µg/L) was only detected in MW-08/08R four times. 1,2-DCE, benzene, and toluene were detected once in MW-08/08R. MW-09 was nondetect for all VOC analytes during 1992 and 1993 and subsequently was removed from the sampling program. MW-11 contained detectable MTBE between 2002 and 2003, but was nondetect for all other analytes. MTBE was consistently detected in both MW-08/08R and MW-11 between 2000 and 2003, but MW-02, which is located upgradient of all NVANG ERP sites, routinely contained the highest MTBE concentrations of all NVANG monitoring wells. A file search conducted by ERM in 2002 identified a likely source of MTBE upgradient of NVANG (former National Car Rental Facility). Based on these considerations, MTBE detected in Site 2 wells is believed to have originated upgradient of the NVANG.

Diethyl phthalate (1 µg/L in March 1993) and 2-methylnaphthalene (17 µg/L in May 2000) were detected once in MW-08/08R between 1992 and 2003. Pentachlorophenol was detected once in MW-08/08R (1 µg/L in March 1993) and once in MW-09 (2 µg/L in March 1993) during the same period. Other SVOC analytes were not detected.

TCE exceeded the groundwater cleanup level (5 µg/L) in a single sample collected from MW-08 in December 1992 (6 µg/L). 1,2-DCE was detected in one sample collected from MW-08 in March 1993 (18 µg/L). A groundwater cleanup level for 1,2-DCE has not been established. All other reported concentrations were less than the groundwater cleanup levels.

Concentrations of aluminum, arsenic, and manganese in SI groundwater samples exceeded cleanup levels. However, only aluminum and manganese exceeded the range of concentrations in background groundwater samples. Based on comparison to dissolved inorganic concentrations documented by Welch and Others (1989) for the Carson

River Basin, the SI concluded that all detected inorganic analytes were within naturally occurring background ranges (ORNL/ETS, 1994).

5.7 Contaminant Fate and Transport

The RI Report (ERM, 1996) evaluated the fate and transport of JP-4 constituents and TCE present in soil and groundwater beneath the NVANG. The evaluation assessed potential routes of migration, contaminant persistence, and migration of these compounds.

JP-4 constituents, including TPH, benzene, toluene, ethylbenzene, xylenes, and polynuclear aromatic hydrocarbons (which are produced during combustion of JP-4) have been detected in vadose zone soils and groundwater at Site 2. Potential routes of migration for JP-4 constituents include the following:

- Lateral flow of floating nonaqueous-phase liquid on the water table;
- Volatilization of free-phase or adsorbed chemicals into soil gas;
- Transport of dissolved and adsorbed chemicals in surface water runoff;
- Leaching of adsorbed or free-phase chemicals in soil to groundwater;
- Volatilization of dissolved chemicals from groundwater to soil gas;
- Release of chemicals in soil gas to ambient air; and
- Transport of dissolved chemicals via groundwater flow.

TCE has been detected at concentrations greater than the MCL in a groundwater sample collected from MW-08. Potential routes of migration for TCE include the following:

- Volatilization of TCE from groundwater to soil gas and release of TCE in soil gas to ambient air; and
- Movement of dissolved TCE with groundwater flow.

Biodegradation is the primary factor reducing concentrations of fuel hydrocarbons and TCE in the environment. Indigenous bacteria, capable of metabolizing fuel hydrocarbons and chlorinated solvent, are ubiquitous in the environment. However, very high chemical concentrations may be toxic to bacteria and very low concentrations may be insufficient to

support bacterial metabolism. Other primary factors affecting biodegradation of fuel hydrocarbons are availability of oxygen, nutrients, and moisture. Biodegradation of fuel hydrocarbons may occur under aerobic or anaerobic conditions. Biodegradation of TCE primarily occurs under anaerobic conditions. Under methanogenic conditions, degradation of TCE can occur through reductive dechlorination; whereby TCE is broken down into dichloroethene isomers, which are in turn degraded to vinyl chloride and ethane. Volatilization of chemicals to the atmosphere and photo oxidation is also an important process affecting contaminant persistence.

For JP-4 constituents and TCE, both transport and transformation processes are important in determining fate of chemicals in soil and groundwater. Biodegradation of fuel constituents and TCE in soil or groundwater is considered the most important transformation process. Volatilization of VOCs in soil or groundwater to soil gas, migration of VOCs in soil gas to ambient air, leaching of VOCs and other fuel constituents from soil to groundwater, and movement of dissolved chemicals with groundwater flow are considered the most important transport processes.

Evaluation of concentration trends in Site 2 monitoring wells indicates the residual dissolved-phase impact beneath Site 2 is limited to the immediate vicinity of MW-08/08R and concentrations have remained relatively stable since site assessment began in 1992. Except for MTBE, VOCs have never been detected in MW-09 or MW-11. MTBE was regularly reported in both MW-08/08R and MW-11 during sampling, but is believed to originate from an off-site upgradient source (Section 5.6.3). Except for detections of MTBE in MW-08/-08R and a single detection of TCE and 1,2-DCE in MW-08/-08R, all reported organic analyte concentrations are below groundwater cleanup levels (Table 5-2)

Soil analytical data collected in 1992 indicated residual petroleum hydrocarbons, VOCs, and SVOCs were present in soil in the vicinity of the suspected source area, but all concentrations are less than cleanup levels established in the RI.

5.8 Basis for Decision

The ANG has selected No Further Action as the preferred alternative for Site 2 for the following reasons:

- All reported concentrations of organic analytes were less than soil cleanup levels for protection of groundwater and human health.

- The dissolved-phase impacts at Site 2 are limited at single well MW-08/-08R. Except for single detections of TCE and 1,2-DCE in MW-08 in 1992 and 1993, all reported groundwater concentrations are less than cleanup levels for groundwater.

- As indicated in Section 5.6.3, dissolved MTBE detected in MW-08/-08R and MW-11 is believed to originate from an off-site upgradient source and is not related to releases at Site 2.

In summary, No Further Action is recommended for this site because there appears to be no significant ongoing source of contamination and the site does not present a risk to human health or the environment. Additionally, concentrations of organic chemicals dissolved in groundwater are now below applicable cleanup levels.

SECTION 6.0

CURRENT AND POTENTIAL SITE AND RESOURCE USES

NVANG currently serves as the home of the Air National Guard's 152nd Airlift Wing, which services and operates C-130E and C-130H aircraft. The NVANG occupies approximately 60 acres of land in the northwest quadrant of the Reno Tahoe International Airport Complex. The land to the south and west of the NVANG is primarily industrial and residential. The land east and north of the NVANG is occupied by the Reno Tahoe International Airport. Currently, Site 2 is paved and is part of the A2 Aircraft Parking Apron. Because the site is part of the aircraft parking apron, its use is not expected to change in the foreseeable future. Groundwater at the site is not currently used as a drinking water resource. The ANG does not expect to use groundwater at this site for any purpose in the foreseeable future.

SECTION 7.0

SUMMARY OF SITE RISKS

Analytical results from soil samples obtained during the SI indicated that all residual concentrations were less than soil cleanup levels for protection of groundwater and human health. The site is now completely covered by pavement, further minimizing the potential for exposure to any potenital residual impacts in soil nor any downward migration to groundwater.

Dissolved chemicals (excluding MTBE, which likely originated off site) have not exceeded groundwater protection cleanup levels since 1992. Shallow groundwater beneath the site is not used as a potable water source. Based on these considerations, exposure to impacted groundwater is not a complete pathway.

In summary, there is no unacceptable risk to human health and the environment associated with any of the chemicals potentially attributable to releases at Site 2. Therefore, the preferred alternative for Site 2 is No Further Action.

SECTION 8.0

STATUTORY AUTHORITY FINDING

Analytical results from soil samples collected at Site 2 were below soil cleanup levels for protection of human health and groundwater. Concentrations of chemicals in groundwater have been below groundwater cleanup levels since 1992.

Based on these observations and conditions, Site 2 does not pose an unacceptable risk to human health or the environment. Accordingly, no further action is recommended at this site. This action is in accordance with and complies with applicable statutes and regulations.

SECTION 9.0

DOCUMENTATION OF SIGNIFICANT CHANGES

No changes were made to this document following the open house community meeting and subsequent 30-day comment period.

SECTION 10.0

REFERENCES

This document was prepared with the use of information contained in the Administrative Record for Site 2, former FTA, which is available for review at NVANG, Reno, Nevada. The primary documents used as sources of the information contained in this decision document are listed below.

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APPENDIX A

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

Notice of the open house meeting and public comment period was published in the *Reno Gazette Journal* on 21 and 22 July 2006. The public comment period extended from 25 July through 24 August 2006. The public meeting presenting the proposed site closure was held at the Nevada Air National Guard Base in Reno, Nevada, on 25 July 2006. As of 25 August 2006, the ANG had received no public comments on the proposed closure of Site 2.

Based on the low community response to the Restoration Advisory Board meetings, no attendance at the 25 July 2006 open house meeting, and the lack of community feedback during the 30-day comment period, there appears to be little to no community concern regarding the closure of Site 2.