

**FINAL  
No Further Response  
Action Planned Decision Document  
Environmental Restoration Program Site 4**

**Former Fire Training Area  
Nevada Air National Guard  
Reno, Nevada**

April 2007



**ANG/CEVR  
Andrews AFB, Maryland**

**FINAL  
No Further Response  
Action Planned Decision Document  
Environmental Restoration Program Site 4**

**Former Fire Training Area  
Nevada Air National Guard  
Reno, Nevada**

**April 2007**

**Prepared For:**

**Air National Guard  
3500 Fetchet Avenue  
Building R-47  
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**Prepared By:**



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Sacramento, California 95833**

**DECLARATION OF THE DECISION**

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**Site Name and Location**

ERP Site 4, 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 Site 4, 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), Remedial Investigation (RI), 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 4, 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.

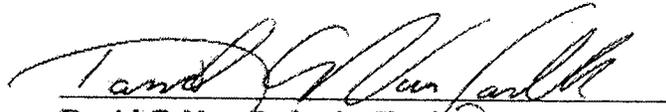
DECLARATION OF THE DECISION

Page 2 of 2

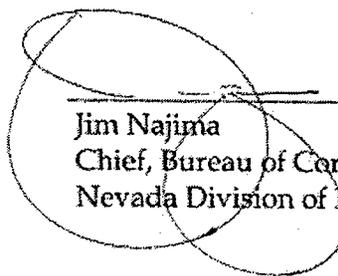
It has been determined that the selected remedy of no further action is protective of human health and the environment. The selected remedy meets Federal and State requirements that are applicable or relevant and appropriate. The statutory preference for further treatment is not satisfied because further 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.

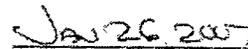
SITE NAME AND LOCATION

ERP Site 4, Former Fire Training Area  
Nevada Air National Guard Base  
Reno, Nevada

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

  
\_\_\_\_\_  
Date

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

  
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Date 

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## LIST OF ACRONYMS/ABBREVIATIONS

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ANG	Air National Guard
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
ERP	Environmental Restoration Program
°F	Degrees Fahrenheit
FR	Federal Regulations
FS	Feasibility Study
FTA	Fire Training Area
ft/d	Feet per day
GC	Gas chromatograph
GSM	Groundwater screening method
MCL	Maximum contaminant level
µg/kg	Micrograms per kilogram
µg/L	Microgram per liter
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
NDEP	Nevada Division of Environmental Protection
NVANG	Nevada Air National Guard Base
PA	Preliminary assessment
PID	Photoionization detector
RCRA	Resource Conservation and Recovery Act
RI	Remedial investigation
SI	Site investigation
SVOC	Semivolatile organic compound
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total petroleum hydrocarbons
VOC	Volatile organic compound
USEPA	United States Environmental Protection Agency

## SECTION 1.0

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**INTRODUCTION**

This decision document describes the site-specific factors and analyses that led to the selection of No Further Action as the remedy for Site 4, 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 U.S. 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 December 30, 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 4 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 4;

- **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 4;
- **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; and
- **Appendix A - Responsiveness Summary.** Summarizes responses to public comments.

## SECTION 2.0

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## *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. [AGS], 1989).

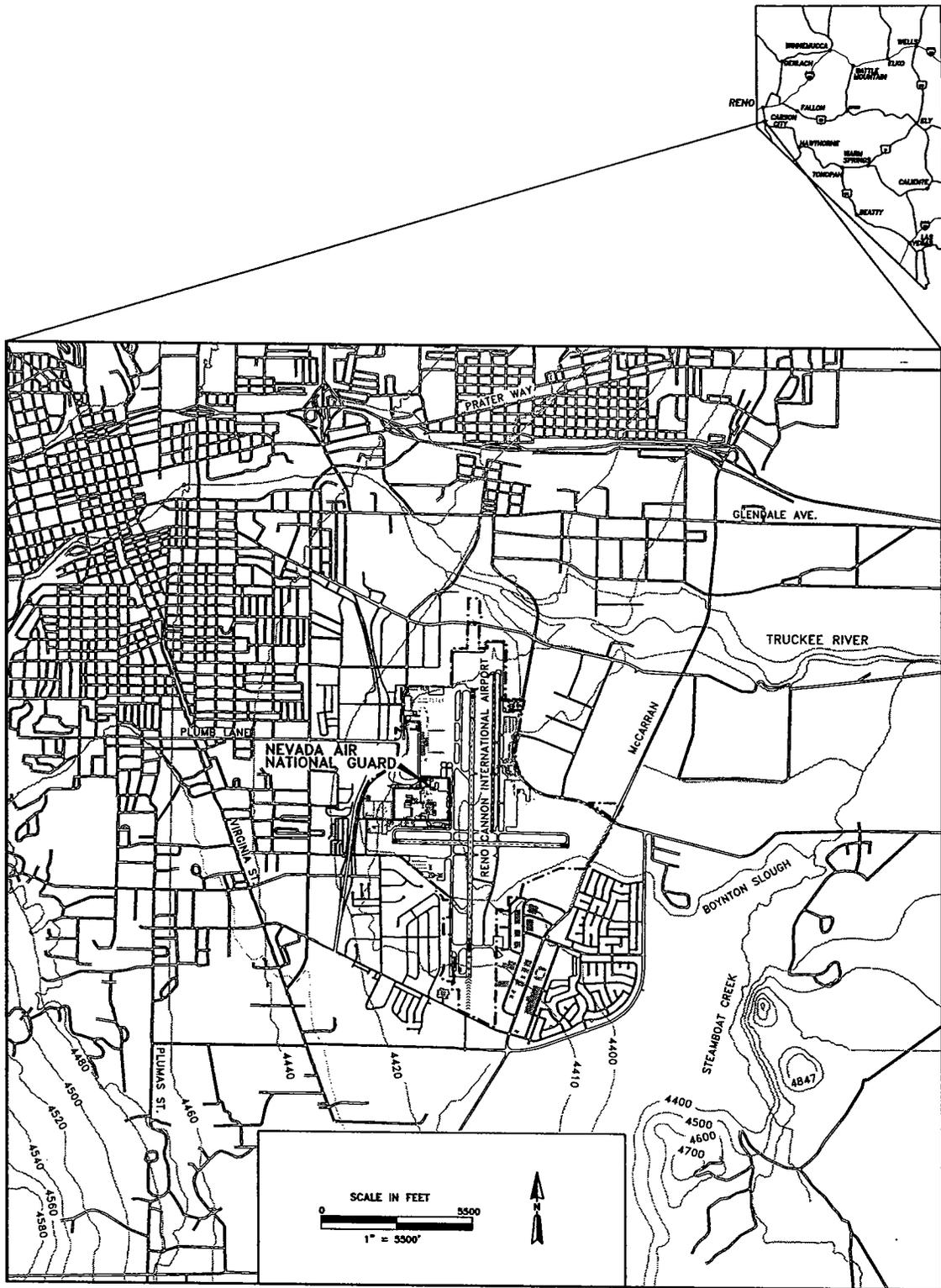
In April 1948, the NVANG was established as the 192nd Fighter Squadron. This designation was changed to the 192nd Fighter Bomber Squadron in April 1951. The unit was redesignated as the 192nd Fighter Interceptor Squadron in June 1955 and retained this designation until April 1958, when the unit was renamed 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. NVANG operations were moved from Stead Army Air Base to their present location in 1954. 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**

IRP Site 4 is a former FTA located on land leased by the NVANG south of Building 88 and is currently covered by a paved roadway and landscaping (Figure 2-2). The FTA consisted of an unlined, slightly bermed, open earthen area used to burn jet fuel (JP-4), spent solvents,

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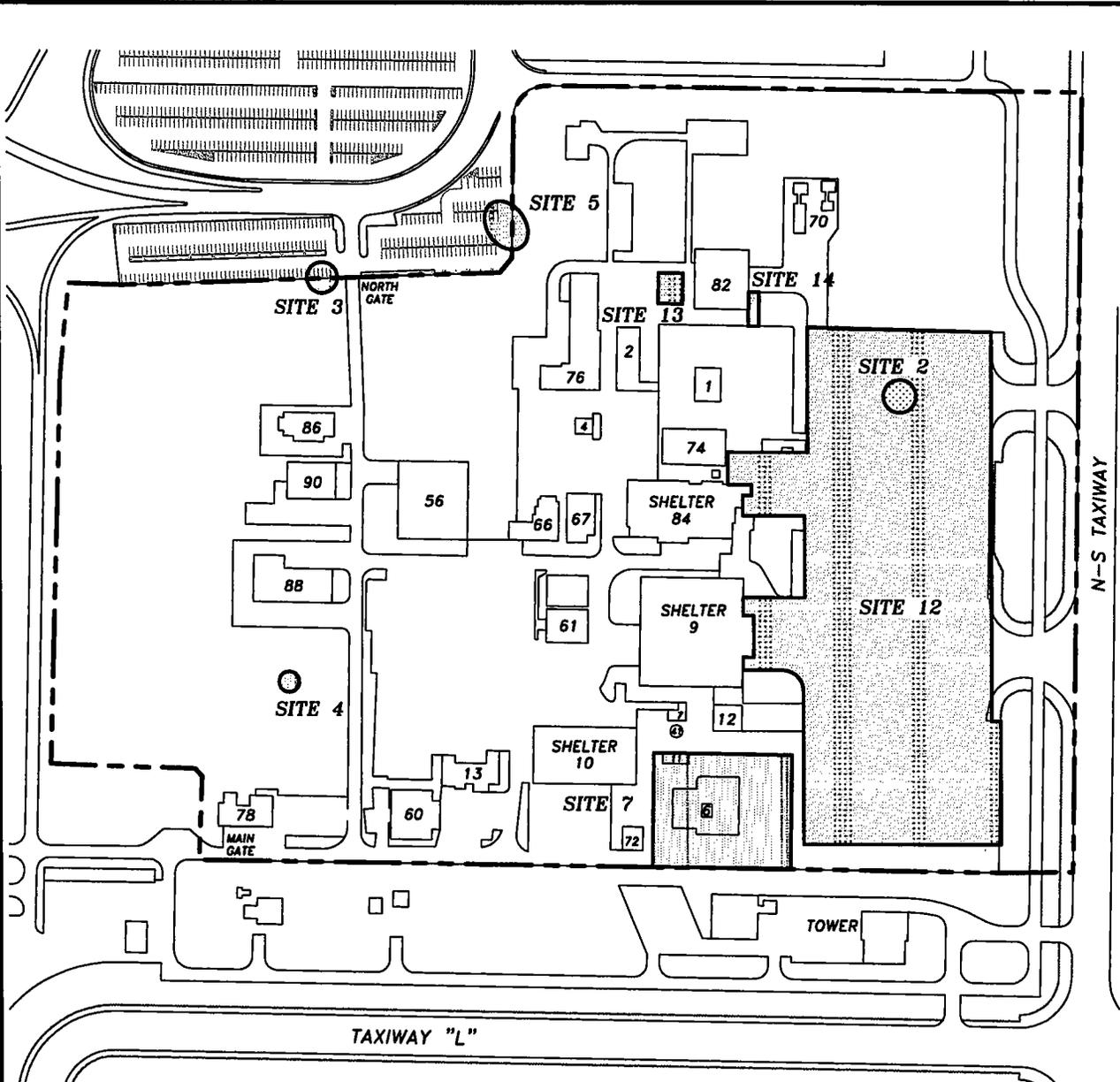


SOURCE: ORNL/ETS, 1994

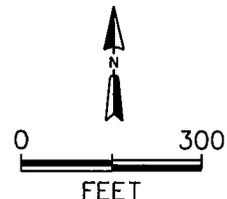
Figure 2-1  
NVANG Location Map  
152nd Airlift Wing, NVANG  
Reno, Nevada

ERM 11/05

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 Date: 04/01/05  
 Project No. 0021693.32



LEGEND	
	ERP SITE
	BASE BOUNDARY
	SITE 2 - FORMER FIRE TRAINING AREA (FTA)
	SITE 4 - FORMER FTA
	SITE 5 - FORMER FTA
	SITE 7 - PETROLEUM, OIL, AND LUBRICANTS (POL) STORAGE AREA
	SITE 12 - AIRCRAFT PARKING AREA



SOURCE: ORNL/ETS, 1994

Figure 2-2  
 ERP Site Location Map  
 152nd Airlift Wing, NVANG  
 Reno, Nevada

ERM 04/05

waste oils, and other flammables during fire training exercises. Burn training exercises were conducted one to two times per year over a 3-year period beginning in 1970. During training exercises, a water base was applied to the FTA prior to each burn. An estimated 150 gallons of flammable liquids were used per burn. It is estimated that 900 gallons of flammable liquids might have been used during the 4-year period the site was used as an FTA. Assuming 70 percent of the liquids were consumed, up to 270 gallons of liquids could have infiltrated the ground (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 (AGS, 1989). This document focused on past and present generation, use, handling, and disposal practices at seven potentially contaminated sites, including Site 4. The PA recommended Site 4 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, five soil borings, three piezometers, and three monitoring wells were installed at Site 4. Based on the results of the SI, a remedial investigation/feasibility study (RI/FS) was recommended for Site 4.
- An RI was completed in 1996, which included installation of soil borings and monitoring wells. During the RI, seven soil borings and two additional monitoring wells were installed at Site 4. Based on the declining presence of total petroleum hydrocarbons (TPH) and chlorinated volatile organic compounds (VOCs) in soil and groundwater, the RI report recommended long term monitoring be performed at the Site 4.

- Groundwater monitoring was conducted at Site 4 between 1992 and 2004. Monitoring and sampling of Site 4 wells were conducted during fourth quarter 1992; first quarter 1993; second, third, and fourth quarters 1995; first and third quarters 1997; first and third quarters 1998; second and fourth quarters 1999; second and fourth quarters 2000; third quarter 2001; first and fourth quarters 2003; and third quarter 2004. Monitoring results indicate consistent decreasing concentration trends in Site 4 wells.

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

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**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 was 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 Air National Guard (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 4) 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 4.

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  
152<sup>nd</sup> 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 - Betta*

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

STATE OF NEVADA  
 COUNTY OF WASHOE

ss: Julia Ketcham

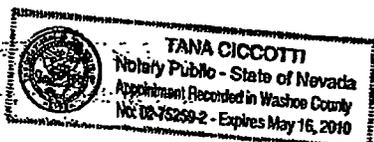
Being first duly sworn, deposes and says:  
 That as the legal clerk of the RENO  
 GAZETTE-JOURNAL, a daily newspaper  
 published in Reno, Washoe County,  
 State of Nevada, that the notice:  
request for no further action

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



**PROOF OF PUBLICATION**

**Public Notice**  
**Nevada Air National Guard Base**  
**Request for No Further Action**  
**Open-House/Community Participation Meeting**

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

Figure 3-2  
 Proof of Publication  
 152<sup>nd</sup> Airlift Wing, NVANG  
 Reno, Nevada

## SECTION 4.0

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**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, 3, 4, 5, 7, 12, 13, and 14. 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 RI (ERM, 1996). [Figure 2-2](#) shows the location of Site 4 in relation to other ERP sites. Per agreement between the ANG and NDEP, no further action is appropriate for Sites 2, 3, 5, 12, 13, and 14. Closure requests for these sites will be submitted under separate documents. A remedial action (that includes source removal) is planned for Site 7.

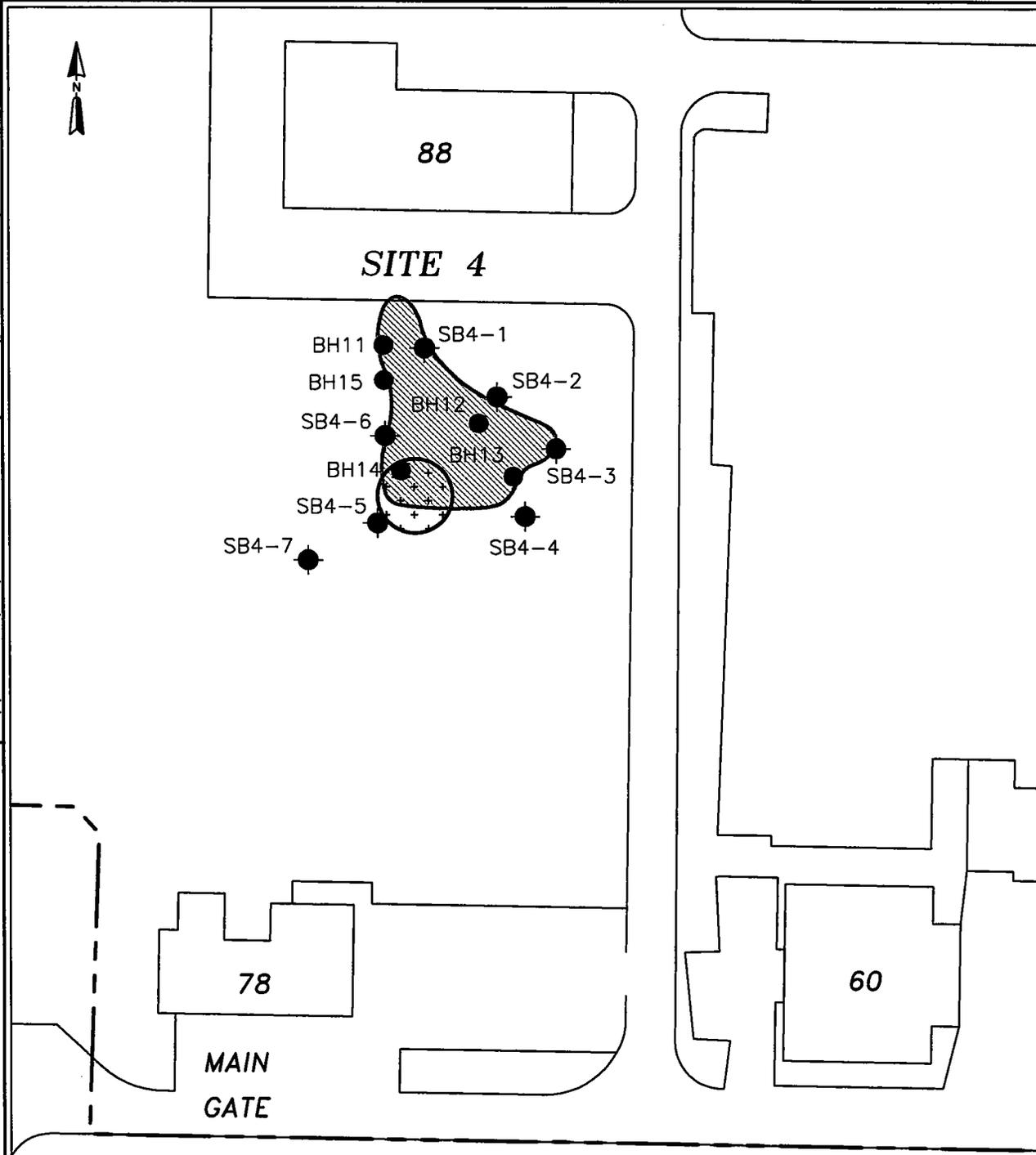
As shown on [Figure 2-2](#), Site 4 is located in the southwestern portion of the NVANG and generally upgradient of Site 7, which is approximately 700 feet east of Site 4. The nearest monitoring well associated with Site 7 is MW-10, which is approximately 650 feet east and downgradient of MW-29 at Site 4. Site 7, which is the most heavily impacted portion of NVANG, is consistently downgradient of Site 4, it did not contribute to dissolved concentrations detected in Site 4 monitoring wells. Sites 2, 3, 5, 12, and 13 are approximately 1,000 to 1,300 feet to the north or northeast and are generally cross gradient of Site 4.

The sampling locations used to evaluate Site 4 are as follows:

- Twenty-one 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 4 are shown on [Figure 4-1](#).
- Twelve hollow-stem auger soil borings advanced to depths ranging from 5.5 to 11.5 feet below ground surface (bgs). Soil samples were collected using a split-barrel sampler from depths ranging from 2 feet to 11.5 feet bgs. Soil boring locations are shown on [Figure 4-2](#).



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LEGEND

-  Original ERP Site
-  Suspected Area of Contamination From GSM Survey
-  SB4-1 Soil Boring - Remedial Investigation
-  BH11 Soil Boring - Site Investigation
-  Base Boundary



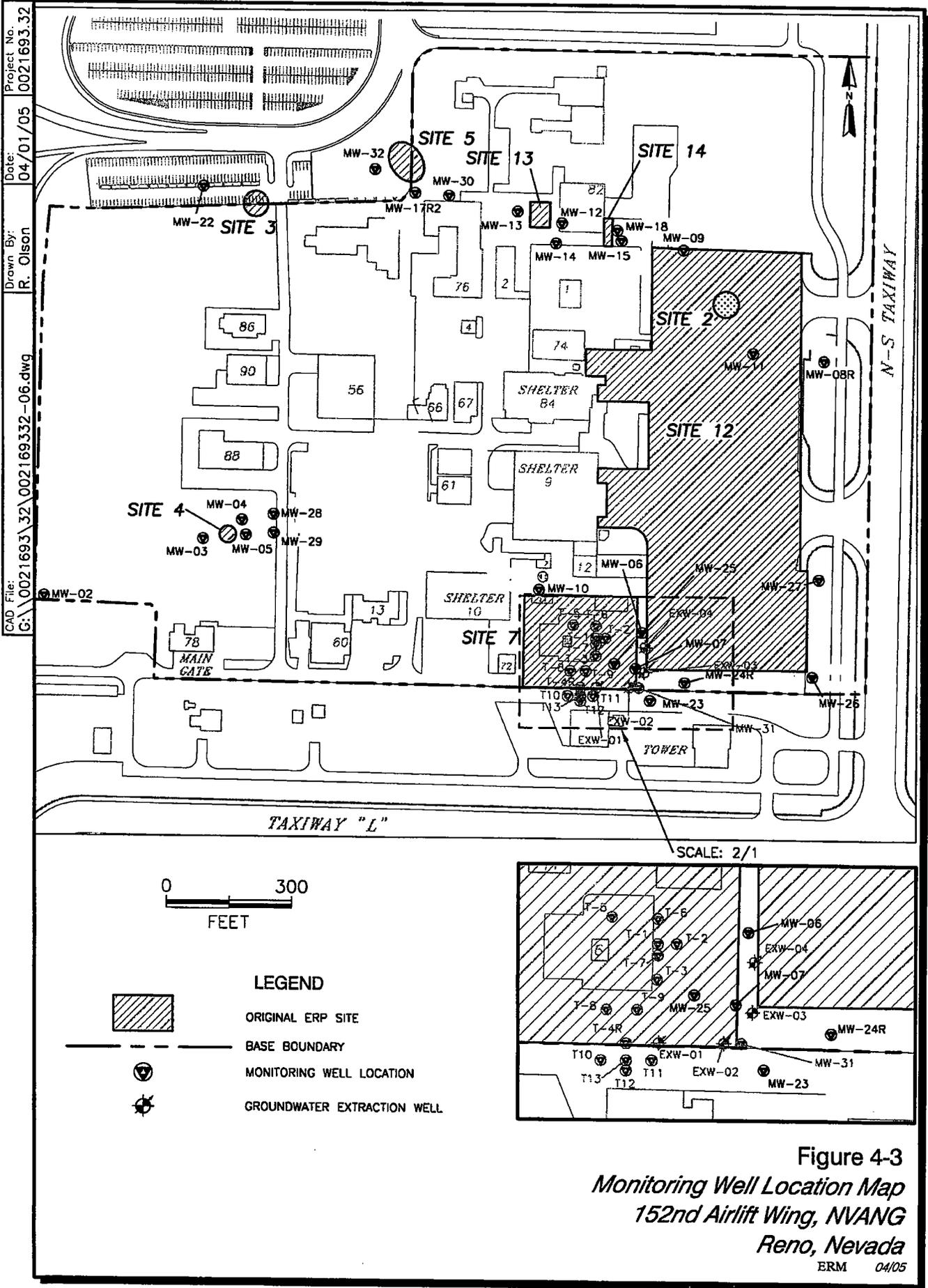
Figure 4-2  
 ERP Site 4 Soil Boring Locations  
 ERP Site 4, Site Investigation  
 152nd Airlift Wing, NVANG  
 Reno, Nevada

ERM 04/05

- Five permanent monitoring wells (MW-03, MW-04, MW-05, MW-28, and MW-29) were installed for groundwater monitoring and sampling. Monitoring well locations are shown on [Figure 4-3](#).

Sampling locations used as a basis for the decision for Site 4 are summarized in [Table 4-1](#), along with the gradient relationships to Site 4 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 4  
152nd Airlift Wing  
Nevada Air National Guard  
Reno, Nevada**

Sampling Location	Data Type	Data Uses
<b>Within Site 4</b>		
One GSM location	Qualitative	Qualitative assessment of the extent of dissolved-phase chemicals within the suspected source area
BH14	Quantitative	The intent of sampling at this location during the RI was to quantitatively assess the presence or absence of chemicals within the site boundaries as defined in the PA.
<b>Upgradient or cross-gradient of Site 4</b>		
Nine GSM locations	Qualitative	Qualitative assessment of the lateral extent of dissolved-phase chemicals near the suspected source area
BH11, BH15, SB4-1, SB4-5, SB4-6, and SB4-7 PZ-14, PZ19, MW03	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.
<b>Downgradient of Site 4</b>		
11 GSM locations	Qualitative	Qualitative assessment of the extent of dissolved-phase chemicals within the suspected source area.
BH12, BH13, SB4-2, SB4-3, SB4-5, MW04, MW05, MW28, and MW29	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

SB - Soil boring

**Table 4-2**

**Chronological Quantitative Sampling Summary for ERP Site 4  
152nd Airlift Wing  
Nevada Air National Guard  
Reno, Nevada**

Sampling Location	Matrix	Sampling Date(s)	Range of Analyses
BH11 through BH15	Soil	12/92	TPH, VOCs, SVOCs
SB4-1 through SB4-7	Soil	5/95	TPH, VOCs, SVOCs
MW03	Groundwater	12/92, 3/93, 5/95, 8/95, 11/95,	TPH, VOCs, SVOCs, metals
MW04	Groundwater	12/92, 3/93, 5/95, 7/95, 8/95, 11/95, 2/97, 8/97, 3/98, 8/98,	TPH, VOCs, SVOCs, metals
MW05		12/92, 3/93, 5/95, 7/95, 8/95, 11/95, 8/96, 2/97, 8/97, 3/98, 8/98, 5/99, 11/99, 5/00, 11/00, 9/01, 3/02, 10/02, 4/03, 10/03, 9/04	TPH, VOCs, SVOCs, metals
MW28		5/95, 7/95, 8/95, 11/95, 2/97, 8/97, 3/98, 8/98, 5/99	TPH, VOCs, SVOCs
MW29	Groundwater	5/95, 7/95, 8/95, 11/95, 2/97, 8/97, 3/98, 8/98, 5/99, 11/99, 5/00, 11/00, 9/01, 3/02, 10/02, 4/03, 10/03, 9/04	TPH, VOCs, SVOCs

**Key:**

HBPHC - High boiling point petroleum hydrocarbons

LBPHC - Low boiling point petroleum hydrocarbons

MW - Monitoring well

SVOC - Semivolatile organic compound

TPH - Total petroleum hydrocarbons

VOC - Volatile organic compound

## SECTION 5.0

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**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 FR 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.

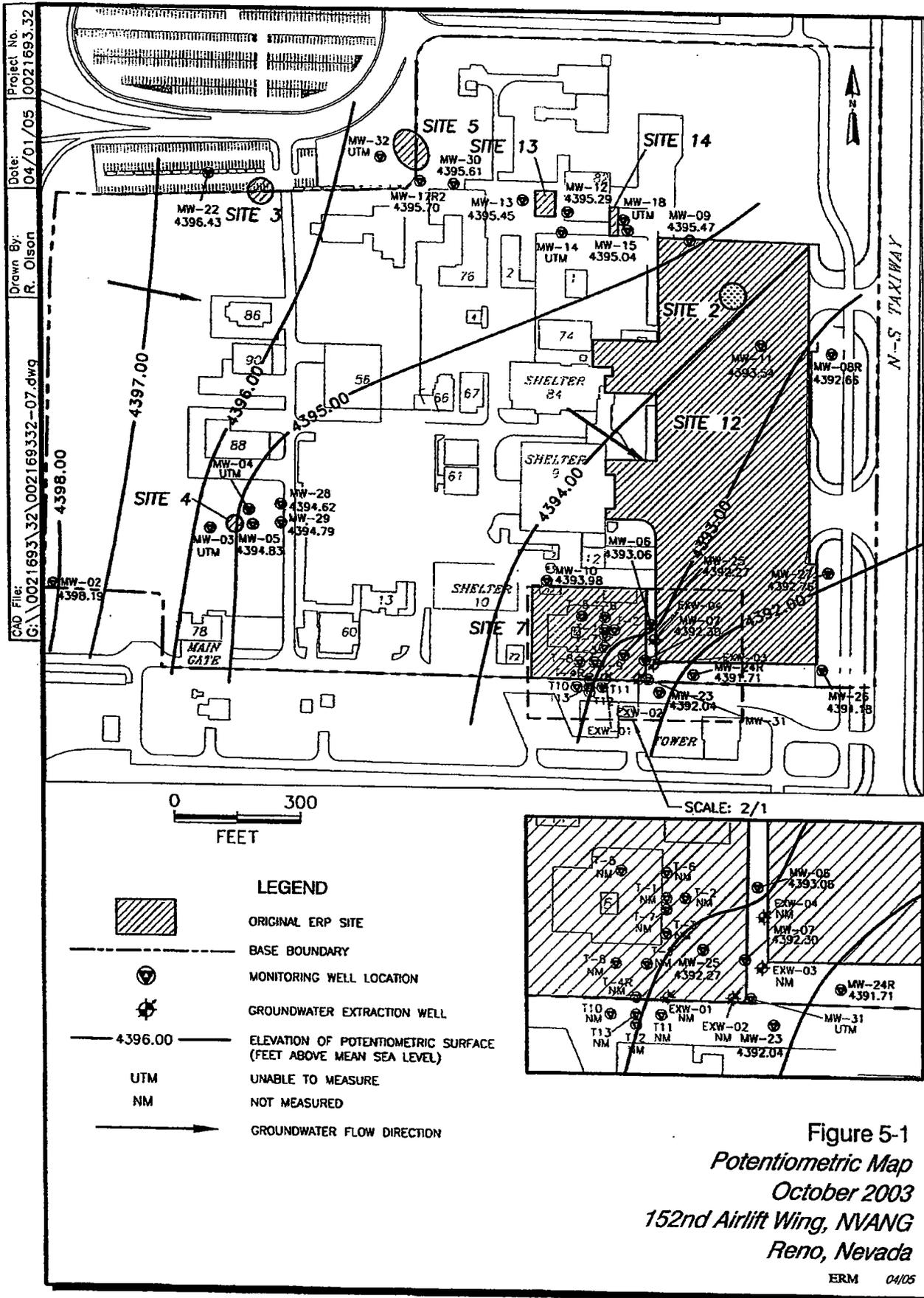
Cohen and Loeltz (1964) suggest that 70 percent of the recharge to the groundwater in the Truckee Meadows is from infiltration by crop irrigation practices and 30 percent can be attributed to the infiltration of streamflow and underflow from tributary valleys. Increasing urbanization in the Meadows, 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 0.2 (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. Gradients range from 0.01 feet per foot in the vicinity of Site 4 to 0.0015 feet per foot between Site 4 and Site 7. These results are consistent with groundwater gradient and flow directions observed during previous events (ERM, 2003a).

## **5.5 Cleanup Goals for Soil and Groundwater**

Cleanup levels for impacted soil and groundwater at NVANG (created for the RI/FS) 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 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 4 soils. Groundwater protective cleanup levels are presented because they are more conservative than the human health cleanup levels for the chemicals of concern.



**Table 5-1**  
**Summary of Soil Cleanup Levels**  
**ERP Site 4**  
**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
<i>Volatile Organic Compounds (micrograms per kilogram)</i>			
Acetone	8,000,000	350,000	Subpart S x 100
Benzene	24,000	500	TCLP
2-Butanone	48,000,000	200,000	TCLP
Chlorobenzene	1,600,000	100,000	TCLP
Chloroform	120,000	6,000	TCLP
1,2-dichlorobenzene	7,200,000	60,000	MCL x 100
1,3-dichlorobenzene	7,200,000	60,000	MCL x 100
1,4-dichlorobenzene	29,000	7,500	TCLP
Ethylbenzene	8,000,000	70,000	MCL x 100
2-Hexanone	400,000	17,500	Subpart S x 100
Methylene Chloride	93,000	500	MCL x 100
Toluene	16,000,000	100,000	MCL x 100
1,2,4-Trichlorobenzene	800,000	7,000	MCL x 100
Xylenes	160,000,000	1,000,000	MCL x 100
<i>Semivolatile Organic Compounds (micrograms per kilogram)</i>			
Bis(2-ethylhexyl)phthalate	50,000	600	MCL x 100
2,4-Dichlorophenol	240,000	11,000	Subpart S x 100
2-Methylnaphthalene	3,200,000	140,000	Subpart S x 100
4-Methylphenol	400,000	200,000	TCLP
Naphthalene	3,200,000	140,000	Subpart S x 100
Pyrene	2,400,000	110,000	Subpart S x 100
TPH (milligrams per kilogram)	4,800	210	Subpart S x 100

**Key:**

MCL = Maximum contaminant level

TCLP = Toxicity characteristic leaching procedure

TPH - Total petroleum hydrocarbons

Consistent with NDEP guidance, potential cleanup levels for groundwater were based primarily on Federal MCLs. For compounds with no established MCLs, the USEPA Region 9 Preliminary Remediation Goals (USEPA, 2004) for tap water was selected as the cleanup level. [Table 5-2](#) summarizes cleanup goals for Site 4 groundwater. The RI report (ERM, 1996) contains further details on calculation of soil and groundwater cleanup levels.

## **5.6 Nature and Extent of Contamination**

This section summarizes results of investigations at Site 4 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 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 120 feet north and 90 feet west of the suspected source area. SI soil samples collected within the area of groundwater impact contained detectable TPH, VOCs and semivolatile organic compounds (SVOCs). The highest concentrations occurred in BH14, located within the footprint of the suspected source area, and in BH12, 40 feet northeast of the suspected source area. SI groundwater samples indicated the presence of dissolved TPH and VOCs (including benzene and trichloroethene [TCE]) primarily in MW-05, located west of the suspected source area. MW-03 and MW-04 were non-detect for all compounds, with the exception of low concentrations of acetone and methylene chloride in MW-04.

Soil samples collected during the RI contained VOCs, SVOCs, and TPH, with the highest concentrations detected in boring SB4-5, which was approximately 40 feet south of the suspected source area. Groundwater samples collected between May and November 1995 indicated chlorinated and fuel VOCs and trace concentrations of SVOCs were present in MW-05. Concentrations in other wells were low to non-detect.

**Table 5-2**  
**Summary of Groundwater Cleanup Levels**  
**ERP Site 4**  
**152nd Airlift Wing, Nevada Air National Guard**  
**Reno, Nevada**

Compound	Groundwater Cleanup Level (µg/L)	Source
<i>Volatile Organic Compounds</i>		
Acetone	5,500	USEPA Region 9 Tap Water PRG
Benzene	5.0	USEPA Region 9 MCL
n-Butylbenzene	240	USEPA Region 9 Tap Water PRG
sec-Butylbenzene	240	USEPA Region 9 Tap Water PRG
tert-Butylbenzene	240	USEPA Region 9 Tap Water PRG
Chlorobenzene	100	USEPA Region 9 MCL
Chloroform	0.17	USEPA Region 9 Tap Water PRG
cis-1,2-Dichloroethene	70	USEPA Region 9 MCL
1,2-dichlorobenzene	600	USEPA Region 9 MCL
1,3-dichlorobenzene	600	USEPA Region 9 MCL
1,4-dichlorobenzene	75	USEPA Region 9 MCL
Ethylbenzene	700	USEPA Region 9 MCL
n-Propylbenzene	240	USEPA Region 9 Tap Water PRG
Methylene Chloride	4.3	USEPA Region 9 Tap Water PRG
Methyl tert Butyl Ether	20	NDEP Interim Action Level
Trichloroethene	5.0	USEPA Region 9 MCL
Toluene	1,000	USEPA Region 9 MCL
1,2,4-Trimethylbenzene	12	USEPA Region 9 Tap Water PRG
1,3,5-Trimethylbenzene	12	USEPA Region 9 Tap Water PRG
1,2,4-Trichlorobenzene	7.2	USEPA Region 9 Tap Water PRG
Xylenes	10,000	USEPA Region 9 MCL
<i>Semivolatile Organic Compounds</i>		
Bis(2-ethylhexyl)phthalat	6.0	EPA Region 9 MCL
Butyl phthalate	3,600	USEPA Region 9 Tap Water PRG
Butylbenzyl phthalate	7,300	USEPA Region 9 Tap Water PRG
2,4-Dichlorophenol	110	USEPA Region 9 Tap Water PRG
2,4-Dimethylphenol	700	USEPA Region 9 MCL
Di-n-octyl phthalate	1,500	USEPA Region 9 Tap Water PRG
2-Methylnaphthalene	1,400	USEPA Region 9 MCL
4-Methylphenol	180	USEPA Region 9 Tap Water PRG
Naphthalene	6.2	USEPA Region 9 Tap Water PRG
Phenanthrene	1,400	Subpart S
Styrene	1,600	USEPA Region 9 Tap Water PRG

**Key:**

µg/L = Micrograms per liter

USEPA = United States Environmental Protection Agency

MCL = Maximum contaminant level

NDEP = Nevada Division of Environmental Protection

Results from long-term groundwater monitoring indicate the dissolved contamination is localized in the vicinity of MW-05. Analytical results from monitoring well MW-03 were consistently non-detectable for the chemicals of concern between 1992 and 1995. Concentrations in MW-04 (cross-gradient of MW-05) and MW-28 and MW-29 (downgradient) have historically been low to non-detectable.

### **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 4 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 in [Table 5-3](#) and the area of impact is shown on [Figure 4-1](#). As shown on [Figure 4-1](#), the area of likely impact extended approximately 120 feet north and 90 feet west of the suspected source area.

### **5.6.2 Quantitative Soil Data**

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

During the SI, five soil borings (BH11 through BH15) were advanced within the footprint of likely groundwater impact, as defined by the GSM survey. Soil samples were collected for analysis at depths ranging from 2 to 8 feet bgs. Samples were analyzed for VOCs, SVOCs, TPH, and metals. All metals results were within the background ranges reported in the SI. [Tables 5-4](#) and [5-5](#) summarize results for organic chemicals in soil and [Figure 4-2](#) shows the locations of the borings. As indicated, detectable VOCs, including benzene, toluene, ethylbenzene, and total xylenes (BTEX); methylene chloride; and chloroform were reported in BH12, BH14, and BH15, with the maximum concentration (4,600 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) total xylenes) occurring in BH12 at 8 feet bgs.

**Table 5-3**  
**GSM Survey Results**  
**ERP Site 4**  
**152nd Airlift Wing, Nevada Air National Guard**  
**Reno, Nevada**

GSM Location	Grid Coordinates (x,y)	PID (ppm)	GC Decision
S401	0, 0	0	Negative
S402	0, 100	0.4	Negative
S403	0, 200	0.9	Negative
S404	90, 200	0.3	Negative
S405	100, 100	0	Negative
S406	25, 100	11.6	Positive
S407	50, 150	1.0	Positive
S408	100, 150	1.0	Negative
S409	75, 100	9.4	Positive
S410	50, 75	0.0	Negative
S411	25, 125	140	Positive
S412	25, 75	0.5	Negative
S413	50, 125	60	Positive
S414	0, 125	1.4	Negative
S415	25, 150	160	Positive
S416	25, 175	260	Positive
S417	25, 200	0.6	Positive
S418	50, 175	5	Negative
S419	100, 175	0.4	Negative
S420	75, 125	2	Positive
S421	100, 125	0.2	Positive

**Key:**

GC = Gas chromatograph

GSM = Groundwater screening method

PID = Photoionization detector

ppm = Parts per million

Table 5-4  
 Volatile Organic Compounds Detected in Soil  
 ERP Site 4  
 152nd Airlift Wing, Nevada Air National Guard  
 Reno, Nevada

Location Identifier	Date Sampled	Acetone	Chlorobenzene	Chloroform	1,2-Dichloro-benzene	1,3-Dichloro-benzene	1,4-Dichloro-benzene	1,2,4-Trichloro benzene	Methylene Chloride	2-Hexanone	2-Butanone	Benzene	Ethylbenzene	Toluene	Xylenes (total)
<b>Site Investigation Results</b>															
BH12-2	12/04/92	ND	NR	ND	NR	NR	NR	NR	ND	NR	NR	ND	ND	NR	ND
BH12-6	12/04/92	ND	NR	ND	NR	NR	NR	NR	ND	NR	NR	ND	ND	NR	ND
BH12-8	12/04/92	ND	NR	ND	NR	NR	NR	NR	1,900 J	NR	NR	ND	1,300 J	NR	4,600
BH13-2	12/04/92	ND	NR	ND	NR	NR	NR	NR	ND	NR	NR	ND	ND	NR	ND
BH13-4	12/04/92	ND	NR	ND	NR	NR	NR	NR	ND	NR	NR	ND	ND	NR	ND
BH13-8	12/04/92	ND	NR	ND	NR	NR	NR	NR	ND	NR	NR	ND	ND	NR	ND
BH14-4	12/04/92	ND	NR	1 J	NR	NR	NR	NR	ND	NR	NR	ND	ND	NR	ND
BH14-6	12/04/92	ND	NR	2 J	NR	NR	NR	NR	ND	NR	NR	ND	ND	NR	ND
BH14-8	12/04/92	1,800 J	NR	ND	NR	NR	NR	NR	ND	NR	NR	ND	400 J	NR	1,000 J
BH15-2	12/04/92	ND	NR	ND	NR	NR	NR	NR	ND	NR	NR	5 J	72	NR	170
BH15-6	12/04/92	ND	NR	ND	NR	NR	NR	NR	ND	NR	NR	ND	ND	NR	2 J
BH15-6D	12/04/92	ND	NR	ND	NR	NR	NR	NR	ND	NR	NR	ND	ND	NR	ND
<b>Remedial Investigation Results</b>															
SB4-1-3.5	05/15/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-1-5.5	05/15/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-1-9.5	05/15/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-1-9.5*	05/15/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-2-2.0	05/16/95	30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-2-5.5	05/16/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-2-7.5	05/16/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-3-1.5	05/16/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-3-3.5	05/16/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-3-5.5	05/16/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-4-5.5	05/15/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-4-7.5	05/15/95	24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-4-9.0	05/15/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-4-9.0*	05/15/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-5-5.5	05/15/95	1,910	356	ND	ND	3,440	3,650	6,410	ND	ND	1,160	ND	311	ND	2,670
SB4-5-7.5	05/15/95	1,750	2,350	ND	22,500	8,320	8,960	10,500	ND	ND	827	79	3,400	120	12,000
SB4-5-9.0	05/15/95	979	245	ND	2,940	1,170	1,220	2,640	ND	ND	475	ND	374	ND	976
SB4-6-5.5	05/15/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-6-10.0	05/15/95	201	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

**Table 5-4**  
**Volatile Organic Compounds Detected in Soil**  
**ERP Site 4**  
**152nd Airlift Wing, Nevada Air National Guard**  
**Reno, Nevada**

Location Identifier	Date Sampled	Acetone	Chlorobenzene	Chloroform	1,2-Dichloro-benzene	1,3-Dichloro-benzene	1,4-Dichloro-benzene	1,2,4-Trichloro benzene	Methylene Chloride	2-Hexanone	2-Butanone	Benzene	Ethylbenzene	Toluene	Xylenes (total)
<b>Remedial Investigation Results (continued)</b>															
SB4-6-11.5	05/15/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-7-3.5	05/16/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-7-5.5	05/16/95	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-7-7.5	05/16/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cleanup Level		350,000	100,000	6,000	60,000	60,000	7,500	7,000	500	17,500	200,000	500	70,000	100,000	1,000,000

**Key:**  
 \* / D = Duplicate sample  
 NA = Not analyzed  
 NR = Not reported  
 J = Reported value is below the contract required detection limit but above the instrument detection limit. Values are estimated quantities.

Table 5-5  
Semivolatile Organic Compounds and Total Petroleum Hydrocarbons Detected in Soil  
ERP Site 4  
152nd Airlift Wing, Nevada Air National Guard  
Reno, Nevada

Location Identifier	Date Sampled	Acenaphthene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Carbazole	Chrysene	Dibenzofuran	2,4-Dichlorophenol	Dibenzo(a,h)anthracene	Fluorene	Fluoroanthene	Indeno(1,2,3-cd)pyrene	2-Methylnaphthalene	4-Methylphenol	Naphthalene	Phenanthrene	Pyrene	Phenol	bis(2-Ethylhexyl)phthalate	TPH (mg/kg)
<b>Site Investigation Results</b>																								
BH12-2	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	170 J	0.01 J
BH12-6	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	180 J	ND
BH12-8	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	910	NR	1500	NR	ND	ND	590 J	630
BH13-2	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	230 J	ND
BH13-4	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	190 J	ND
BH13-8	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	120 J	120
BH14-4	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	330 J	0.10 J
BH14-6	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	73 J	ND
BH14-8	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	1200	NR	2100	NR	ND	ND	500	3800
BH15-2	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	45 J	ND	97 J	9.2
BH15-6	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	83 J	0.39 J
BH15-6D	12/04/92	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	52 J	590	250
<b>Remedial Investigation Results</b>																								
SB4-1-3.5	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-1-5.5	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-1-9.5	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-1-9.5*	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-2-2.0	05/16/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-2-5.5	05/16/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-2-7.5	05/16/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-3-1.5	05/16/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-3-3.5	05/16/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB4-3-5.5	05/16/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
SB4-4-5.5	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	3.42
SB4-4-7.5	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
SB4-4-9.0	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
SB4-4-9.0*	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
SB4-5-5.5	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	634	714	ND	ND	ND	NA	ND	324
SB4-5-7.5	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	240	ND	ND	ND	ND	728	659	ND	ND	ND	NA	ND	1,400
SB4-5-9.0	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	178
SB4-6-5.5	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
SB4-6-10.0	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	192
SB4-6-11.5	05/15/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
SB4-7-3.5	05/16/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
SB4-7-5.5	05/16/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
SB4-7-7.5	05/16/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND
Cleanup Level		210,000	1,050,000	200	200	200	140,000	200	180	480	14,000	11,000	200	140,000	140,000	200	140,000	200,000	140,000	140,000	110,000	None	600	210

Key:  
 \*/D = Duplicate sample  
 mg/kg = milligrams per kilogram  
 NA = Not analyzed  
 ND = Not detected or flagged unusable during data validation  
 NR = Not reported  
 J = Reported value is below the contract required detection limit but above the instrument detection limit. Values are estimated quantities.

Bis(2-ethylhexyl)phthalate was detected in all borings. Other SVOCs (2-methylnaphthalene, naphthalene, pyrene, and phenol) were detected only in BH12 and BH14. Detectable TPH was reported in all borings at concentrations ranging from 0.01 mg/kg (BH12) to 3,800 mg/kg (BH14). The highest concentrations of organic compounds occurred in BH14, located within the suspected source area, and BH12, approximately 60 feet northeast of the suspected source area. Concentrations in other borings were generally an order of magnitude lower.

During the RI, seven soil borings (SB4-1 through SB4-7) were advanced to further define the extent of soil impacts near the suspected source area. Soil samples collected from depths ranging from 2 to 11.5 feet bgs were analyzed for VOCs (Method 8240), SVOCs (Method 8270), and TPH (Method 8015M). Analytical results are summarized in [Tables 5-4](#) and [5-5](#) and boring locations are shown on [Figure 4-2](#). As indicated, detectable VOCs were reported in samples from SB4-2 and SB4-4 through SB4-7, including acetone (24 to 1,910 µg/kg), BTEX (benzene to 79 µg/kg), 2-butanone (475 to 1,160 µg/kg), and chlorobenzene (245 to 2,350 µg/kg). SVOCs (dichlorobenzenes, 2,4-dichlorophenol, 2-methylnaphthalene, and 4-methylphenol) were detected only in SB4-5. TPH was detected in SB4-3, and SB4-5 at concentrations ranging from 3.42 to 1,400 mg/kg. In general, the highest concentrations of most organic analytes occurred in SB4-5, located approximately 30 feet southwest of SI boring BH14.

Reported concentrations of three analytes exceeded the cleanup levels described in [Section 5.5](#). 1,4-Dichlorobenzene and 1,2,4-trichlorobenzene exceeded cleanup levels for protection of groundwater (7,500 µg/kg and 7,000 µg/kg, respectively) in one soil sample (SB4-5-7.5), which contained 8,960 µg/kg 1,4-dichlorobenzene and 10,500 µg/kg 1,2,4-trichlorobenzene. TPH exceeded the cleanup level for protection of groundwater (210 mg/kg) in five samples from four locations (BH12, BH14, BH15, and SB4-5). The exceedances ranged from 250 to 3,800 mg/kg TPH.

### **5.6.3 Groundwater Monitoring**

Groundwater samples were collected from site-related monitoring wells (shown on [Figure 4-3](#)) as part of both the SI and RI. [Table 5-6](#) summarizes available groundwater analytical results from site-related monitoring wells for the period 1992 to 1997. SI and RI groundwater sample collected from MW-05 indicated the presence of dissolved benzene (5.8 to 24 micrograms per liter [µg/L]) and TCE (4.1 to 20 µg/L). Trace to moderate concentrations of toluene, ethylbenzene, xylenes, methylene chloride, dichlorobenzenes, naphthalene, and phthalates were also

Table 5-6  
 Volatile Organic Compounds Detected in Groundwater (1992 to 1997)  
 ERP Site 4  
 152nd Airftt Wing, Nevada Air National Guard  
 Reno, Nevada

Location Identifier	Date Sampled	Acetone	Chlorobenzene	Chloroform	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Methylene Chloride	Trichloroethene	Benzene	Ethylbenzene	Toluene	Xylenes (total)
MW03	Dec-92	ND	NR	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mar-93	ND	NR	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	May-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Nov-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW04	Dec-92	ND	NR	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Mar-93	2.0	NR	NR	ND	ND	ND	3	ND	ND	ND	ND	ND
	Jul-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Jul-95	ND	ND	0.86(j)	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Nov-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Feb-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
MW05	Aug-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Dec-92	ND	NR	NR	1	ND	ND	ND	20	18	17	24	210
	Dec-92	ND	NR	NR	2	ND	ND	ND	14	17	12	21	200
	Mar-93	ND	NR	NR	5	2	2	ND	8	24	27	37	450
	Mar-93	ND	NR	NR	11	3	4	ND	9	23	24	33	450
	Jul-95	ND	ND	ND	ND	ND	ND	4	5	9	14	15	145
	Jul-95	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	50	690
	Aug-95	ND	ND	ND	3.1	1.1	1.2	ND	12	23	150	2.2	24
	Nov-95	ND	2.4	ND	13	4.1	5.3	ND	4.1	2.5	2.2	1.1	24
	Nov-95	ND	1	ND	7	3	3	0.3(j)	0.5(j)	ND	ND	ND	0.4(j)
MW28	Feb-97	NR	NR	NR	7.7	1.7	2.8	NR	5.6	14	ND	27	640
	Aug-97	NR	NR	NR	ND	ND	ND	NR	ND	ND	ND	ND	ND
	Jul-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW29	Nov-95	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Feb-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Aug-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Jul-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Jul-95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-95	ND	ND	ND	1.5	ND	ND	ND	ND	ND	ND	ND	ND
Cleanup Level	Nov-95	ND	1.2	ND	8	2.4	3.3	ND	ND	ND	ND	ND	ND
	Feb-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Aug-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	350,000	100	0.17	600	600	75	500	5	5	700	1,000	10,000	

Key:  
 ND = Not detected  
 NR = Not analyzed or not reported  
 j = Reported value is below the contract required detection limit but above the instrument detection limit. Values are estimated quantities.

detected in MW-05. Groundwater samples collected from MW-04 (cross gradient of MW-05) and MW-29 (downgradient of MW-05) contained low to trace concentrations of acetone, methylene chloride, chlorobenzene, and dichlorobenzenes. Groundwater samples collected from MW-03 (upgradient of the suspected source area) and MW-28 were consistently non-detectable for all organic analytes.

Long-term groundwater monitoring was conducted at Site 4 between 1992 and 2004. Samples were initially collected from wells MW-04, -05, -28, and -29 (MW-03 was excluded from the monitoring program because no compounds were detected in this well during the SI and RI). Monitoring wells MW-04 and MW-28 were consistently non-detectable for all analytes during 1997 and 1998; therefore, both wells were removed from the monitoring program after third quarter 1998. Sample collection continued in wells MW-05 and MW-29 through third quarter 2004. VOC analytical results for 1997 are summarized in [Table 5-6](#). All available SVOC and TPH analytical results are summarized in [Table 5-7](#). VOC analytical results from MW-05 and MW-29, for the period of 1998 through 2004, are summarized in [Table 5-8](#). All groundwater samples were analyzed for VOCs (Methods 8010, 8020, 8260) and SVOCs (Method 8270C).

As indicated in the [Table 5-6](#) and [5-8](#), trace to moderate concentrations of benzene (1.7 to 23  $\mu\text{g/L}$ ), chlorobenzene (1 to 11  $\mu\text{g/L}$ ), 1,2-dichlorobenzene (8.2 to 190  $\mu\text{g/L}$ ), 1,3-dichlorobenzene (2.8 to 58  $\mu\text{g/L}$ ), and 1,4-dichlorobenzene (3.8 to 79  $\mu\text{g/L}$ ) were consistently detected in MW-05 between 1997 and 2004. TCE (2.7 to 10  $\mu\text{g/L}$ ) has only been detected in MW-05 three times since 1997. Chlorobenzene (1.2 to 31  $\mu\text{g/L}$ ), 1,2-dichlorobenzene (2.8 to 17  $\mu\text{g/L}$ ), 1,3-dichlorobenzene (2.1 to 4.2  $\mu\text{g/L}$ ), and 1,4-dichlorobenzene (1.3 to 6.3  $\mu\text{g/L}$ ) were detected in MW-29 between 1997 and 2002. MTBE has been consistently detected in MW-05 and MW-29 since 1997. However, 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 4 wells is believed to have originated upgradient of the NVANG.

Groundwater samples were most recently collected from MW-05 and MW-29 during third quarter 2004 ([Table 5-8](#)). As shown on [Table 5-8](#), MW-29 was non-detectable for all analytes, with the exception of MTBE (480  $\mu\text{g/L}$ ) and 1,2-dichlorobenzene (1  $\mu\text{g/L}$ ). MW-05 contained

**Table 5-7**  
**Semivolatile Organic Compounds and Total Petroleum Hydrocarbons in Groundwater**  
**ERP Site 4**  
**152nd Airlift Wing, Nevada Air National Guard**  
**Reno, Nevada**

Location Identifier	Date Sampled	Concentrations in micrograms per liter										TPH (mg/L)			
		Butylbenzyl phthalate	2,4-Dimethylphenol	Di-n-butyl phthalate	Di-n-octyl phthalate	2-Methyl naphthalene	Naphthalene	Phenanthrene	bis(2-Ethylhexyl) phthalate						
MW03	Dec-92	ND	ND	ND	NR	ND	ND	NR	ND	ND	NR	ND	ND	ND	
	Mar-93	ND	ND	ND	NR	ND	ND	NR	ND	ND	NR	ND	ND	ND	
	May-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Aug-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Nov-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
MW04	Dec-92	ND	ND	ND	NR	ND	ND	NR	ND	ND	NR	ND	ND	ND	
	Mar-93	ND	ND	ND	NR	ND	ND	NR	ND	ND	NR	ND	ND	ND	
	May-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Aug-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Nov-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Feb-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Aug-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
MW05	Dec-92	ND	2.0	ND	NR	ND	NR	NR	NR	NR	NR	NR	NR	1.2	
	Dec-92	ND	1.0	ND	NR	ND	NR	NR	NR	NR	NR	NR	NR	0.74	
	Mar-93	ND	ND	ND	NR	ND	NR	NR	NR	NR	NR	NR	NR	2.4	
	Mar-93	2.0	ND	2.0	NR	4.0	NR	NR	17	NR	NR	NR	NR	0.74	
	May-95	NR	ND	NR	ND	ND	ND	ND	70	ND	ND	ND	ND	2,100	
	Aug-95	NR	ND	NR	ND	ND	ND	ND	16	ND	ND	ND	ND	5,000	
	Nov-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,300	
	Nov-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,000	
	Feb-97	NR	ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
	Aug-97	NR	ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
	Mar-98	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Aug-98	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
May-99	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
Nov-99	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
May-00	NR	NR	NR	NR	NR	NR	NR	NR	44	NR	NR	NR	NR		
									20						

**Table 5-7**  
**Semivolatile Organic Compounds and Total Petroleum Hydrocarbons in Groundwater**  
**ERP Site 4**  
**152nd Airlift Wing, Nevada Air National Guard**  
**Reno, Nevada**

Location Identifier	Date Sampled	Concentrations in micrograms per liter										TPH (mg/L)	
		Butylbenzyl phthalate	2,4-Dimethylphenol	Di-n-butyl phthalate	Di-n-octyl phthalate	2-Methyl naphthalene	Naphthalene	Phenanthrene	bis(2-Ethylhexyl) phthalate				
MW28	May-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	2(0)	ND
	Aug-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Nov-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Feb-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
MW29	Aug-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	May-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	May-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cleanup Level	Aug-95	NR	ND	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Nov-95	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Feb-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Aug-97	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	Cleanup Level	7,300	700	3,600	1,500	1,400	6.2	1,400	1,400	6.0	6.0	None	

Notes:  
mg/L = Milligrams per liter  
NR = Not analyzed or not reported  
ND = Not detected or flagged unusable during data validation  
J = Reported value is below the contract required detection limit but above the instrument detection limit. Values are estimated quantities.

Table 5-8  
 Volatile Organic Compounds Detected in Groundwater (1998 to 2004)  
 ERP Site 4  
 152nd Airlift Wing, Nevada Air National Guard  
 Reno, Nevada

Site	Date	BZ 5 (1)	n-BB 240 (2)	s-BB 240 (2)	t-BB 240 (2)	CDS 1000 (2)	CB 100 (1)	CE 4.6 (2)	1,2-DCB 600 (1)	1,3-DCB 600 (1)	1,4-DCB 75 (1)	1,1-DCA 810 (2)	1,1-DCE 7 (1)	cis-1,2-DCE 70 (1)	trans-1,2-DCE 100 (1)	DBCM 100 (1)	EB 700 (1)	2-HEX *	IPB *	p-IPT *	4-M-2-P *	MTBE 20 (4)	NAP 6.2 (2)	n-PB 240 (2)	1,1,2,2-PCA 0.055 (2)	STY 100 (1)	TOL 1000 (1)	TCE 5 (1)	1,1,1-TCA 200 (1)	1,1,2-TCA 5 (1)	1,2,4-TCP *	1,2,4-TMB 12 (2)	1,3,5-TMB 12 (2)	XYL (total) 10000 (1)		
MW-05	Mar-98	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Aug-98	21	ND	ND	ND	ND	6.0	ND	ND	ND	ND	ND	ND	0.59	ND	ND	99	ND	ND	ND	ND	NA	ND	ND	ND	ND	46	10	ND	ND	ND	ND	ND	ND	ND	970
	May-99	ND	ND	ND	ND	ND	ND	ND	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	68	ND	ND	ND	ND	2.0	ND	ND	ND	ND	ND	ND	ND	ND	91
	Nov-99	23	14	13	ND	ND	5.5	ND	5.8	ND	ND	ND	ND	ND	ND	ND	41	ND	55	7.7	ND	160	44	48	ND	ND	62	ND	ND	ND	200	53	ND	1,100		
	May-00	4.7	ND	13	22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	52	ND	47	13	ND	227	20	29	ND	6.9	19	ND	ND	ND	ND	ND	ND	160	642	
	Nov-00	9.0	ND	ND	ND	ND	5.9	ND	11	2.8	3.8	ND	ND	ND	ND	ND	82	ND	ND	ND	ND	52	ND	ND	ND	ND	19	4.8	ND	ND	ND	ND	ND	ND	560	
	Sep-01	8.1	NA	NA	NA	NA	6.1	ND	30	9.4	12	ND	ND	ND	ND	ND	83	NA	NA	NA	NA	74	NA	NA	ND	NA	13	ND	ND	ND	NA	NA	NA	NA	450	
	Mar-02	1.7	NA	NA	NA	NA	1.0	ND	8.2	2.1	2.8	ND	ND	ND	ND	ND	1.7	NA	NA	NA	NA	94	NA	NA	ND	NA	1.4	ND	ND	ND	NA	NA	NA	NA	200	
	Oct-02	3.9	NA	NA	NA	NA	9.7	ND	110	27	35	ND	ND	ND	ND	ND	2.2	NA	NA	NA	NA	91	NA	NA	ND	NA	1.7	ND	ND	ND	NA	NA	NA	NA	137	
	Apr-03	3.7	NA	NA	NA	NA	6.5	<2.0 (3)	100	26	33	<2.0 (3)	<2.0 (3)	<2.0 (3)	<2.0 (3)	<2.0 (3)	<1.0	NA	NA	NA	NA	80	NA	NA	<2.0 (3)	NA	<1.0	<2.0 (3)	<2.0 (3)	<2.0 (3)	NA	NA	NA	NA	23	
Oct-03	7.7	NA	NA	NA	NA	11	<1.0	190	58	79	<1.0	<1.0	1.8	<1.0	<1.0	1.1	NA	NA	NA	NA	99	NA	NA	<1.0	NA	<1.0	2.7	<1.0	<1.0	NA	NA	NA	NA	51		
Sep-05	1.9	NA	NA	NA	NA	2.1	<1.0	23	7.6	9.1	<1.0	<1.0	NA	<1.0	<1.0	<1.0	NA	NA	NA	NA	860	NA	NA	<1.0	NA	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	<1.0		
MW-29	Mar-98	ND	ND	ND	ND	ND	ND	ND	2.8	ND	1.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Aug-98	ND	ND	ND	ND	ND	1.6	ND	9.9	3.0	4.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	May-99	ND	ND	ND	ND	ND	ND	ND	8.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Nov-99	ND	ND	ND	ND	ND	ND	ND	6.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	82	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	May-00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	130	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Nov-00	ND	ND	ND	ND	ND	1.2	ND	8.8	2.3	2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	210	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Sep-01	ND	NA	NA	NA	NA	3.1	ND	17	4.2	6.3	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	210	NA	NA	ND	NA	ND	ND	ND	NA	NA	NA	NA	ND		
	Mar-02	ND	NA	NA	NA	NA	1.4	ND	8.3	2.1	3.2	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	120	NA	NA	ND	NA	ND	ND	ND	NA	NA	NA	NA	ND		
	Oct-02	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	9.9	NA	NA	ND	NA	ND	ND	ND	NA	NA	NA	NA	NA	ND	
	Apr-03	<0.50	NA	NA	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.50	NA	NA	NA	NA	9.1	NA	NA	<1.0	NA	<0.50	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	<0.50	
Oct-03	<1.0	NA	NA	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	4.6	NA	NA	<1.0	NA	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	<1.0		
Sep-05	<1.0	NA	NA	NA	NA	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<1.0	<1.0	NA	NA	NA	NA	480	NA	NA	<1.0	NA	<1.0	<1.0	<1.0	<1.0	NA	NA	NA	NA	<1.0		

Notes:  
 Concentrations reported in micrograms per liter  
 Bold indicates detection is above compound action level  
 Action Level NA = Not available  
 NA = Not analyzed  
 ND = Non-detect  
 NS = Not sampled  
 USEPA = United States Environmental Protection Agency  
 \* = No established value  
 (1) = USEPA Region 9 Maximum Contaminant Level  
 (2) = USEPA Region 9 Tap Water Preliminary Remediation Goal  
 (3) = Reporting limits were increased due to high dilution ratio of target analytes  
 (4) = Nevada Division of Environmental Protection Interim Action Level

Abbrev.	Compound	Abbrev.	Compound
BZ	Benzene	2-Hex	2-Hexanone
n-BB	n-Butylbenzene	IPB	Isopropylbenzene
s-BB	sec-Butylbenzene	p-IPT	p-Isopropyltoluene
t-BB	tert-Butylbenzene	4-M-2-P	4-Methyl-2-pentanone
CDS	Carbon disulfide	MTBE	Methyl tert-butyl ether
CB	Chlorobenzene	NAP	Naphthalene
CE	Chloroethane	n-PB	n-Propylbenzene
1,1-DCA	1,1-Dichloroethane	1,1,2,2-PCA	1,1,2,2-Tetrachloroethane
1,2-DCB	1,2-Dichlorobenzene	STY	Styrene
1,3-DCB	1,3-Dichlorobenzene	TOL	Toluene
1,4-DCB	1,4-Dichlorobenzene	1,1,1-TCA	1,1,1-Trichloroethane
1,1-DCE	1,1-Dichloroethene	1,1,2-TCA	1,1,2-Trichloroethane
cis-1,2-DCE	cis-1,2-Dichloroethene	TCE	Trichloroethene
DBCM	Dibromochloromethane	1,2,4-TCP	1,2,4-Trichloropropane
1,2-DCA	1,2-Dichloroethane	1,2,4-TMB	1,2,4-Trimethylbenzene
EB	Ethylbenzene	1,3,5-TMB	1,3,5-Trimethylbenzene
		XYL	Xylenes

detectable MTBE (860 µg/L), benzene (1.9 µg/L), chlorobenzene (2.1 µg/L), 1,2-dichlorobenzene (23 µg/L), 1,3-dichlorobenzene (7.6 µg/L), and 1,4-dichlorobenzene (9.1 µg/L). These detected concentrations are the lowest reported since first quarter 2002 and all are well below established cleanup goals (except for MTBE).

## **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, BTEX, and polynuclear aromatic hydrocarbons (which are produced during combustion of JP-4) have been detected in vadose zone soils and groundwater at Site 4. Potential routes of migration for JP-4 constituents include the following:

- Lateral flow of floating non-aqueous 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 or equal to the MCL in groundwater samples collected from MW-05. 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 4 monitoring wells indicates the residual dissolved-phase impact beneath Site 4 is limited to the immediate vicinity of MW-05 and appears to have decreased in concentration since site assessment began in 1992. VOCs have not been detected in MW-04 and MW-28 since before 1996. Downgradient well MW-29 periodically contained detectable VOCs and SVOCs between 1995 and 2003; however, during the most recent sampling event (third quarter 2004), only MTBE (480 µg/L) and 1,2-dichlorobenzene (1 µg/L) were detected. MTBE has been regularly reported in both MW-05 and MW-29 during sampling but is believed to originate from an off-site, upgradient source (see [Section 5.6.3](#)).

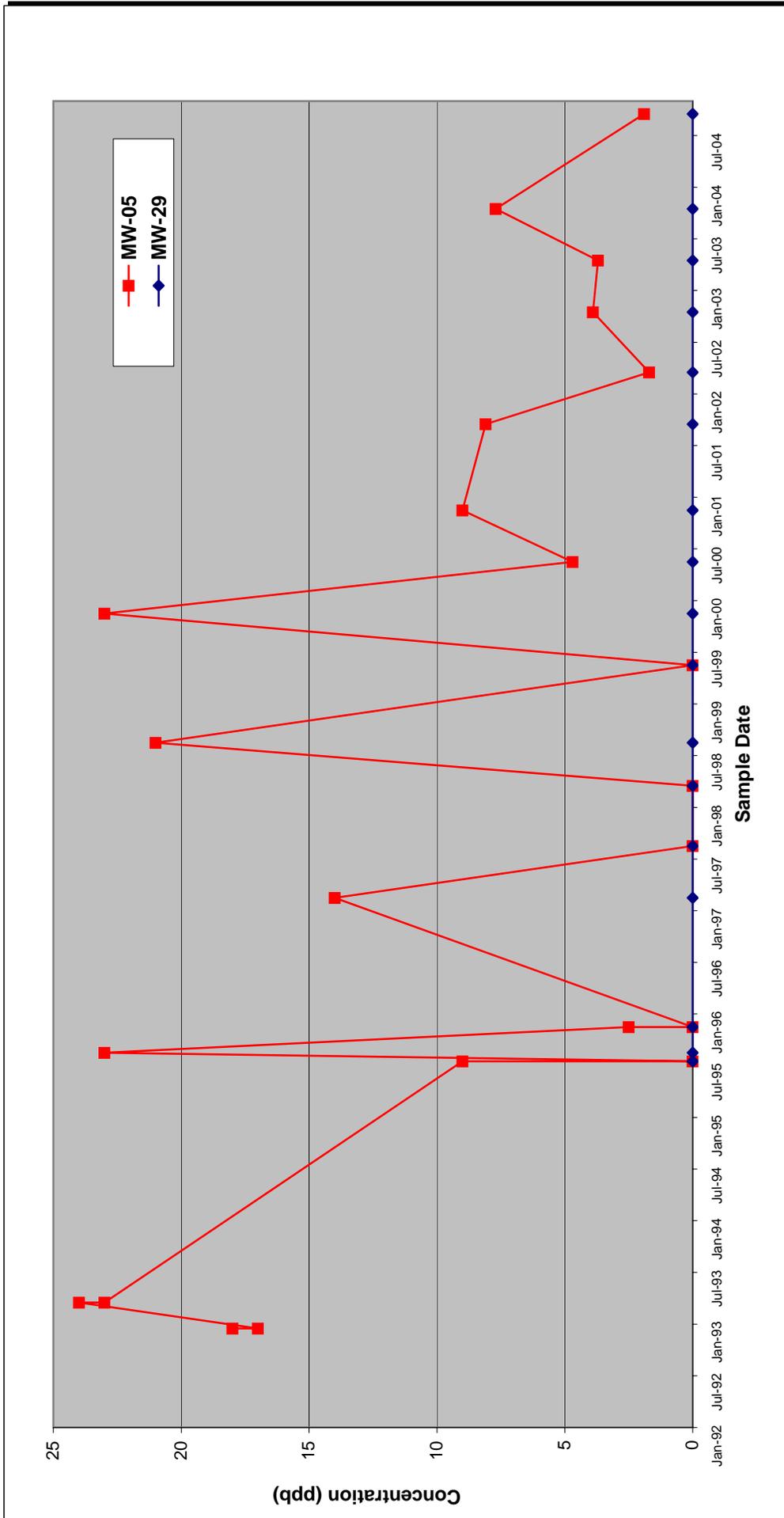
Soil analytical data collected between 1992 and 1995 indicated residual petroleum hydrocarbons, VOCs, and SVOCs were present in soil in the vicinity of the suspected source area. However, based on dissolved concentration trends (e.g., benzene, 1,2-dichlorobenzene, and TCE) in MW-05, which have remained relatively stable or decreased since groundwater monitoring began, continued leaching of residual chemicals to groundwater does not appear significant. In addition, the site is now completely covered by paved roadway and landscaped areas. The arid

climate at NVANG also minimizes the potential for these contaminants to migrate downward toward groundwater in the future.

## **5.8 Basis for Decision**

The ANG has selected No Further Action as the preferred alternative for Site 4 for the following reasons:

- Based on soil analytical data collected between 1992 and 1995, inorganic chemicals in soil were all within normal background ranges reported in the SI (ORNL/ETS, 1994). Several organic chemicals (1,3-dichlorobenzene, 1,4-dichlorobenzene, and TPH) were detected at concentrations exceeding groundwater protection cleanup levels reported in the RI (ERM, 1996). However, dichlorobenzenes exceeded cleanup levels in only one sample (SB4-5-7.5). TPH exceeded the cleanup level for protection of groundwater (210 mg/kg) in five samples, but all concentrations were well below the human health cleanup levels (4,800 mg/kg; see RI Section 8). All other samples and all other analyte concentrations were less than applicable cleanup levels for soil.
- The dissolved-phase plume beneath Site 4 is localized in the immediate vicinity of MW-05 and appears to have decreased in size since site assessment began in 1992. All samples collected from MW-03 (upgradient of MW-05) between 1992 and 1995 were non-detect for all analytes; therefore, this well was not included as part of the long-term monitoring program. VOCs were not detected in MW-04 (cross-gradient of MW-05) and MW-28 (downgradient of MW-05) after 1996; therefore, these wells were removed from the monitoring program in 1998. Downgradient well MW-29 periodically contained detectable VOCs and SVOCs between 1995 and 2003; however, only MTBE (480 µg/L) and 1,2-dichlorobenzene (1 µg/L, well below the USEPA Region 9 MCL for this compound) were detected during the most recent sampling event (third quarter 2004). Benzene concentrations in MW-05 have shown an overall decrease since third quarter (Figure 5-2).
- With the exception of benzene and MTBE, all VOCs in groundwater have been below cleanup levels since at least first quarter 1998. Although benzene periodically exceeded the cleanup level in MW-05 between 1998 and 2001, it has exceeded the cleanup goal (5 µg/L) only once since first quarter 2001 and was well below the cleanup level during the last sampling event conducted in third quarter 2004



**Figure 5-2**  
**Historic Benzene Concentrations in Monitoring Wells MW-05 and MW-29**  
**ERP Site 4**  
**152nd Airlift Wing, NVANG**  
**Reno, Nevada**

(1.9 µg/L). As indicated in [Section 5.6.3](#), dissolved MTBE detected in MW-05 is believed to originate from an off-site, upgradient source and is not related to releases at Site 4.

- Based on the observation that concentration trends in MW-05 and MW-29 have been fairly stable since first quarter 2002, continued leaching of residual chemicals to groundwater does not appear significant. In addition, the site is now completely covered by a paved roadway and landscaping, effectively capping the site and minimizing the potential for continued leaching of source chemicals to groundwater. The arid climate at NVANG also minimizes the potential for these contaminants to migrate downward toward groundwater in the future.
- The ANG does not expect any change in the use of Site 4, or of the surrounding area, in the foreseeable future.

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

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***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 4 has been paved over and is covered by the main roadway entrance to the base. Because the site was paved over in 2002, 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

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**SUMMARY OF SITE RISKS**

Analytical results from soil samples obtained between 1992 and 1995 indicated that 1,3-dichlorobenzene, 1,4-dichlorobenzene, and TPH were present in soil at concentrations above cleanup levels for the protection of groundwater. However, all concentrations were less than cleanup levels for protection of human health, which are summarized in Section 8 of the RI (ERM, 1996). In addition, the site is now completely covered by an asphalt roadway and a cemented building entrance, further minimizing potential for exposure to affected soil and any downward migration to groundwater. The extent of soil impact was well defined and localized primarily in the immediate vicinity of borings BH14 and SB4-5.

Dissolved chemicals (excluding MTBE, which likely originated off site) have exceeded groundwater protection cleanup levels only in MW-05. Dissolved petroleum hydrocarbon compounds detected in groundwater (e.g., benzene, dichlorobenzene, TPH) are susceptible to natural aerobic and anaerobic biodegradation. TCE is biodegraded primarily under anaerobic conditions, and is more persistent in the environment. However, TCE has not been detected in site wells since fourth quarter 2000 and has not exceeded the cleanup level since 1998. In addition, 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 4. Therefore, the preferred alternative for Site 4 is No Further Action.

## SECTION 8.0

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***STATUTORY AUTHORITY FINDING***

Analytical results from soil samples collected at Site 4 were below soil cleanup levels for protection of human health. Detected concentrations of 1,4-dichlorobenzene and 1,2,4-trichlorobenzene in soil boring B4-5 and TPH in soil borings BH12, BH14, BH15, and SB4-5 exceeded cleanup levels for protection of groundwater. However, based on the limited extent of impacts to groundwater beneath Site 4 and the fact that the dissolved plume in MW-05 appears to be stable or decreasing in size, continued migration of chemicals in soil to groundwater does not appear significant. In addition, Site 4 was paved with asphalt and concrete in 2002, effectively capping the site and limiting potential vertical migration of residual contamination. With the exception of MTBE, which is believed to originate from an off-site source, dissolved concentrations in Site 4 wells have exceeded cleanup levels only once since third quarter 2001, and current concentrations are all below groundwater cleanup levels.

Based on these observations and conditions, Site 4 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**

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***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

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**REFERENCES**

This document was prepared with the use of information contained in the Administrative Record for Site 4, 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.

Automated Sciences Group (ASG). 1989. *Installation Restoration Program Preliminary Assessment for the Nevada Air National Guard 152nd Tactical Reconnaissance Group (TRG), Reno Cannon International Airport, Reno Nevada.*

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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 4.

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 4.