Engineering Field Activity, West
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Final

Decision Document

Site 11, Paint Shop
Naval Air Station Fallon
Fallon, Nevada

January 3, 2005

Prepared for

ENGINEERING FIELD ACTIVITY WEST
Daly City, California

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DECLARATION OF THE DECISION

SITE NAME AND LOCATION

Site 11, Paint Shop
Naval Air Station Fallon
Fallon, Nevada

CERCLIS Identification Number
NV9170022173

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for Site 11, Paint Shop, at Naval Air Station (NAS) Fallon, in Fallon, Nevada. This decision is based on information contained in the Administrative Record for the site and is in accordance with the guidelines of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (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). This decision is also in accordance with Nevada Administrative Code (NAC) 445A.226 through 445A.22755.

The U.S. Navy selected the remedy, and the State of Nevada concurs with the remedy selection.

DESCRIPTION OF THE SELECTED REMEDIES

Based on the following observations and data, No Further Action is required at the Paint Shop (Installation Restoration [IR] Site 11), NAS Fallon, Nevada. Data collected within, upgradient, and, downgradient of Site 11 indicate that contaminants associated with Site 11 activities have not migrated from the site. No contaminants of concern identified for this site (lead or constituents of paint thinners), were detected in shallow soil samples at concentrations above the state action levels. Extractable-range petroleum was detected at concentrations above state action levels in near-surface soil at Site 11. These petroleum compounds have not migrated downward to groundwater, and the potential for future migration is minimized by the presence of concrete pavement in the former paint handling area and by the arid climate typical of NAS Fallon. Contaminants present in groundwater and capillary-zone soil at concentrations above the state action levels are within the petroleum hydrocarbon groundwater plume from Site 16, which is located upgradient of Site 11. The contaminants observed in soil and groundwater at Site 11 are being addressed as part of the ongoing remedial actions implemented for Site 16. As a result, No Further Action is required at Site 11.

STATUTORY DETERMINATIONS

The selected remedy for Site 11 is protective of human health and the environment and in compliance with federal and state applicable or relevant and appropriate requirements (ARARs). Petroleum hydrocarbons reported in near surface soil on Site 11 are not leaching downward toward groundwater, and the potential for future migration is minimized by the arid climate at NAS Fallon. Capillary-zone soil at the groundwater surface contains concentrations of petroleum hydrocarbons above state action levels. In addition, extractable-range TPH, 1,2-dichloroethane, benzene, and trichloroethene were detected at concentrations above the state action levels in groundwater. The areal extent of these compounds are within the petroleum hydrocarbon groundwater plume from Site 16 and are being addressed as part of the ongoing remedial actions implemented for Site 16. The site may be reopened for further evaluation and, if necessary, cleanup, on the basis of newly discovered information that leads the U.S. Navy and the Nevada Division of Environmental Protection (NDEP) to determine that the remedy may not be protective of human health and the environment.

SITE NAME AND LOCATION

Site 11, Paint Shop
Naval Air Station Fallon
Fallon, Nevada

CERCLIS Identification Number
NV9170022173

Captain Scott Ryder
Commanding Officer
Naval Air Station Fallon

14 Jan. 2005
Date

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

Jan 27, 2005
Date

CONTENTS

DECLARATION OF THE DECISION i

ABBREVIATIONS AND ACRONYMS vi

1.0 INTRODUCTION 1-1

2.0 SITE NAME, LOCATION, DESCRIPTION, AND HISTORY 2-1
- 2.1 SITE DESCRIPTION 2-1
- 2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES 2-2

3.0 COMMUNITY PARTICIPATION 3-1

4.0 SCOPE AND ROLE OF SITE 4-1

5.0 SITE CHARACTERISTICS 5-1
- 5.1 PHYSICAL SETTING 5-1
  - 5.1.1 Physical Setting of Facility 5-1
  - 5.1.2 Site 11 Physical Setting 5-2
- 5.2 ECOLOGY 5-2
  - 5.2.1 Vegetation 5-2
  - 5.2.2 Endangered and Threatened Plant Species 5-3
  - 5.2.3 Wildlife 5-3
  - 5.2.4 Aquatic Life 5-3
  - 5.2.5 Endangered Animal Species 5-3
- 5.3 GEOLOGY AND HYDROGEOLOGY 5-4
  - 5.3.1 Regional and Facility Geology 5-4
  - 5.3.2 Regional and Facility Hydrogeology 5-5
  - 5.3.3 Site 11 Geology and Hydrogeology 5-6
- 5.4 NUMERICAL VALUES FOR COMPARISON TO CONTAMINANT CONCENTRATIONS 5-8
- 5.5 NATURE AND EXTENT OF CONTAMINATION 5-10
  - 5.5.1 Qualitative Data From Groundwater Test Holes 5-11
  - 5.5.2 Quantitative Soil Data 5-11
  - 5.5.3 Groundwater Monitoring 5-13
- 5.6 CONTAMINANT FATE AND TRANSPORT 5-15
- 5.7 BASIS FOR DECISION 5-17

CONTENTS (Continued)

6.0 CURRENT AND POTENTIAL SITE AND RESOURCE USES 6-1

7.0 SUMMARY OF SITE RISKS 7-1

8.0 STATUTORY AUTHORITY FINDING 8-1

9.0 DOCUMENTATION OF SIGNIFICANT CHANGES 9-1

10.0 BIBLIOGRAPHY 10-1

APPENDIX

A Responsiveness Summary

CONTENTS (Continued)

FIGURES

2-1 Location Map, NAS Fallon 2-4
2-2 NAS Fallon Facility Map 2-5
2-3 Sampling Locations at Site 11, Paint Shop 2-7
5-1 Generalized Stratigraphy of NAS Fallon 5-19
5-2 Groundwater Surface Elevation Contours, Southern Station Area, November 2002 5-21
5-3 Generalized Distribution of Contaminants in Groundwater in the Vicinity of Site 11, Paint Shop 5-23

TABLES

4-1 Summary of Data From Sampling Locations Used as Basis of Decision for Site 11, Paint Shop 4-3
4-2 Chronological Quantitative Sampling Summary 4-4
5-1 Summary of Detected Organics in Soil Samples From Site 11, 1991 Through 2002 5-25
5-2 Summary of Detected Organics in Groundwater Samples From Site 11, 1991 Through 2003 5-26
5-3 Summary of Detected Metals in Groundwater Samples From Site 11, 1991 Through 2003 5-29

ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
cm/sec	centimeter per second
EPA	U.S. Environmental Protection Agency
GC	gas chromatograph
IR	Installation Restoration
LD	lower diagonal
MCL	maximum contaminant level
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/L	milligram per liter
NAC	Nevada Administrative Code
NAS	Naval Air Station Fallon
Navy	U.S. Navy
NDEP	Nevada Division of Environmental Protection
PA	preliminary assessment
PID	photoionization detector
PRG	preliminary remediation goal
PSCS	Preliminary Site Characterization Summary
RI	remedial investigation
SI	site inspection
SVOC	semivolatile organic compound
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
TPH-E	total petroleum hydrocarbons—extractable
TPH-P	total petroleum hydrocarbons—purgeable
VOC	volatile organic compound

1.0 INTRODUCTION

This decision summary describes the site-specific factors and analyses that led to the selection of No Further Action as the remedy for Site 11, Paint Shop, at Naval Air Station (NAS) Fallon, in Fallon, Nevada.

This decision document supersedes and replaces the *Draft Final Decision Document, Site 11, Paint Shop*, dated August 27, 1999. Documents supporting the decision are included in the Administrative Record for the site. Key documents are identified in Section 10.

The format and organization of this decision document are based on U.S. Environmental Protection Agency's (EPA's) *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents,* dated July 1999. 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—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—Site Name, Location, Description, and History.** Identifies and describes the site, provides location and property ownership information, and summarizes the history of the site that led to conditions observed at the site as well as previous investigation activities

- **Section 3—Community Participation.** Documents community participation activities throughout the decision making process, references the "responsiveness summary" in Appendix A, and describes the location and availability of the Administrative Record

- **Section 4—Scope and Role of Site.** Discusses Site 11 in relation to other sites at NAS Fallon and identifies when and where monitoring or remedial activities at other sites influence, or are influenced by, monitoring or remedial activities at Site 11

- **Section 5—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—Current and Potential Site and Resource Uses.** Discusses the current and potential future uses of the land

- **Section 7—Summary of Site Risks.** Discusses risks due to contamination present at the site

- **Section 8—Statutory Authority Finding.** States the conclusion that no further action is necessary at Site 11

- **Section 9—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—Bibliography.** Lists the sources of information used in preparing this decision document

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

2.0 SITE NAME, LOCATION, DESCRIPTION, AND HISTORY

NAS Fallon is located in west-central Nevada, approximately 6 miles southeast of the city of Fallon and 60 miles east of the city of Reno (Figure 2-1). NAS Fallon was originally established as a military facility in 1942, when the Civil Aviation Administration and Army Air Corps constructed four airfields in Nevada as part of the Western Defense Program. In 1943, the U.S. Navy (Navy) assumed control of the still-uncompleted facility, and on June 10, 1944, Naval Air Auxiliary Station (NAAS) Fallon was commissioned. The newly commissioned facility provided training, servicing, and support to air groups sent to the facility for combat training. From 1946 to 1951, NAAS Fallon experienced varying but reduced operational status and was eventually turned over to Churchill County and the Bureau of Indian Service.

In 1951, Fallon was used as an auxiliary landing field for NAS Alameda, California, and on October 1, 1953, NAAS Fallon was re-established. From 1945 to 1975, the Air Force also occupied part of the station as part of an early warning radar network. On January 1, 1972, NAAS Fallon was upgraded to its current status of NAS Fallon. NAS Fallon serves as the primary aircraft weapons delivery and tactical air combat training facility. With the construction of a new runway and additional aircraft maintenance facilities, NAS Fallon's training mission is expected to continue to expand.

2.1 SITE DESCRIPTION

Site 11, the Paint Shop, is located in the southeastern portion of NAS Fallon, in Building 15 at the southwest corner of the intersection of A Street and Sixth Street (Figure 2-2). Site 11 was investigated as one of the Group IV sites, nine sites that were grouped together because of their proximity and the potential for commingled contaminated areas.

The site's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number is listed as NV9170022173. NAS Fallon is the lead agency for site activities, and NDEP serves as the lead regulatory agency.

Prior to 1986, paint wastes were disposed of or spilled in the unpaved drum storage area north of the paint shop. Disposal activities stopped in 1986, at which time the ground surface was paved with concrete. Although the paint shop has been in operation since the early 1960s, documentation of disposal activities is available only for the period 1976 to 1986. Waste paints and thinners were introduced to soils either as a means of waste disposal or as a result of spills associated with transferal from drums.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The purpose of the Navy's Installation Restoration (IR) Program is to identify, assess, characterize, and clean up or control contamination from past hazardous material spills and waste disposal activities at Navy and Marine Corps facilities. As part of the IR Program, NAS Fallon conducted the following investigations/assessment activities:

- The preliminary assessment/site inspection (PA/SI) in 1987 at Site 11. It consisted of a records search, a site visit, and employee interviews. Additional investigation, including the collection of shallow soil samples for lead analysis, was recommended for Site 11. This additional investigation was recommended to assess reported historical disposal and spills of lead-based paint at Site 11.

- A Preliminary Site Characterization Summary (PSCS) was performed in 1989. The purpose of the PSCS for all of the Group IV sites was to assess the presence or absence and extent of contamination. The element of the PSCS investigation that directly applied to Site 11 was the installation of a groundwater test hole immediately east of the site (location 46), which indicated the presence of volatile contaminants in groundwater at the location (see Figure 2-3). Groundwater monitoring wells and piezometers were also installed east of, and some distance downgradient of, Site 11 during the PSCS. The PSCS recommended that two groundwater monitoring wells be installed at Site 11, one within the former paint handling area and one downgradient of the site. These recommendations were based on the detection of phenol compounds in monitoring well MW-25 (Figure 2-3), east of Site 11.

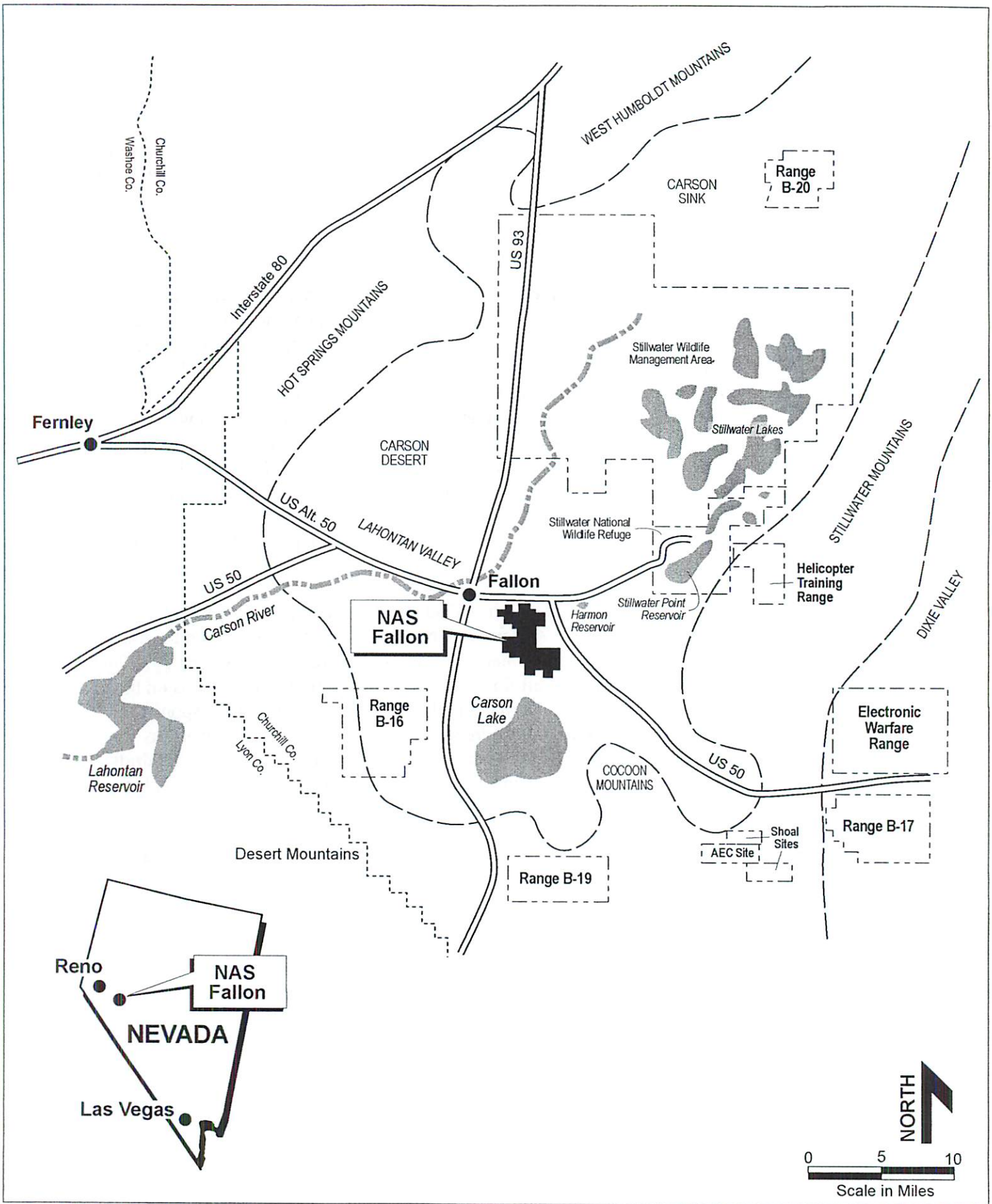
- In response to the recommendations presented in the PSCS, two groundwater monitoring wells were installed for the 1994 remedial investigation (RI) report: MW-63 and MW-64 (Figure 2-3). These wells were installed because contaminants identified in MW-25 (installed primarily as part of the Site 16 investigation) included several phenol compounds believed to be associated with paint shop wastes. MW-63 is located in the former paint waste disposal area. Groundwater samples were collected from these two wells and analyzed for total petroleum hydrocarbons (TPH) and volatile organic compounds (VOCs) during the RI.

- Post-RI monitoring was conducted from 1995 to 1999. Groundwater samples were collected from MW-63 during March 1995, September 1995, September 1996, September 1997, and November 1999. These samples were analyzed for petroleum hydrocarbons and VOCs.

- Supplemental soil and groundwater sampling was conducted at the site during 2002. Supplemental soil and groundwater sampling locations are shown on Figure 2-3. Soil samples were collected from three direct-push sampling locations within the former disposal area (locations 11000, 11001, and 11002). Soil samples from these three locations were analyzed for TPH, VOCs, and semivolatile organic compounds (SVOCs). A 1-inch-diameter groundwater monitoring well was installed at the downgradient corner (southeast corner) of the site using direct-push methods. Soil samples were collected from this well location (11003) and a groundwater sample was collected from the developed well. Soil and groundwater samples from this location were analyzed for TPH, VOCs, and SVOCs. A groundwater sample was also collected from well MW-63 during 2002 for TPH, VOC, and SVOC analysis.

After the RI was published, the Navy prepared a draft decision document (in June 1998) for Site 11 presenting a decision of No Further Action. The NDEP provided comments on the draft decision document. A draft final decision document for Site 11 was prepared in August 1999, and the NDEP provided comments on the draft final document. Responses to comments on the draft final decision document were presented to the NDEP. During the review and response process with the NDEP, the NDEP and the Navy agreed to substantially revise the decision document and to include additional data collected after the preparation of the August 1999 draft final decision document for Site 11. This decision document, therefore, supersedes and replaces all previous versions.

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



U.S. NAVY	Figure 2-1 Location Map, NAS Fallon	Delivery Order 0031 NAS Fallon DECISION DOCUMENT SITE 11

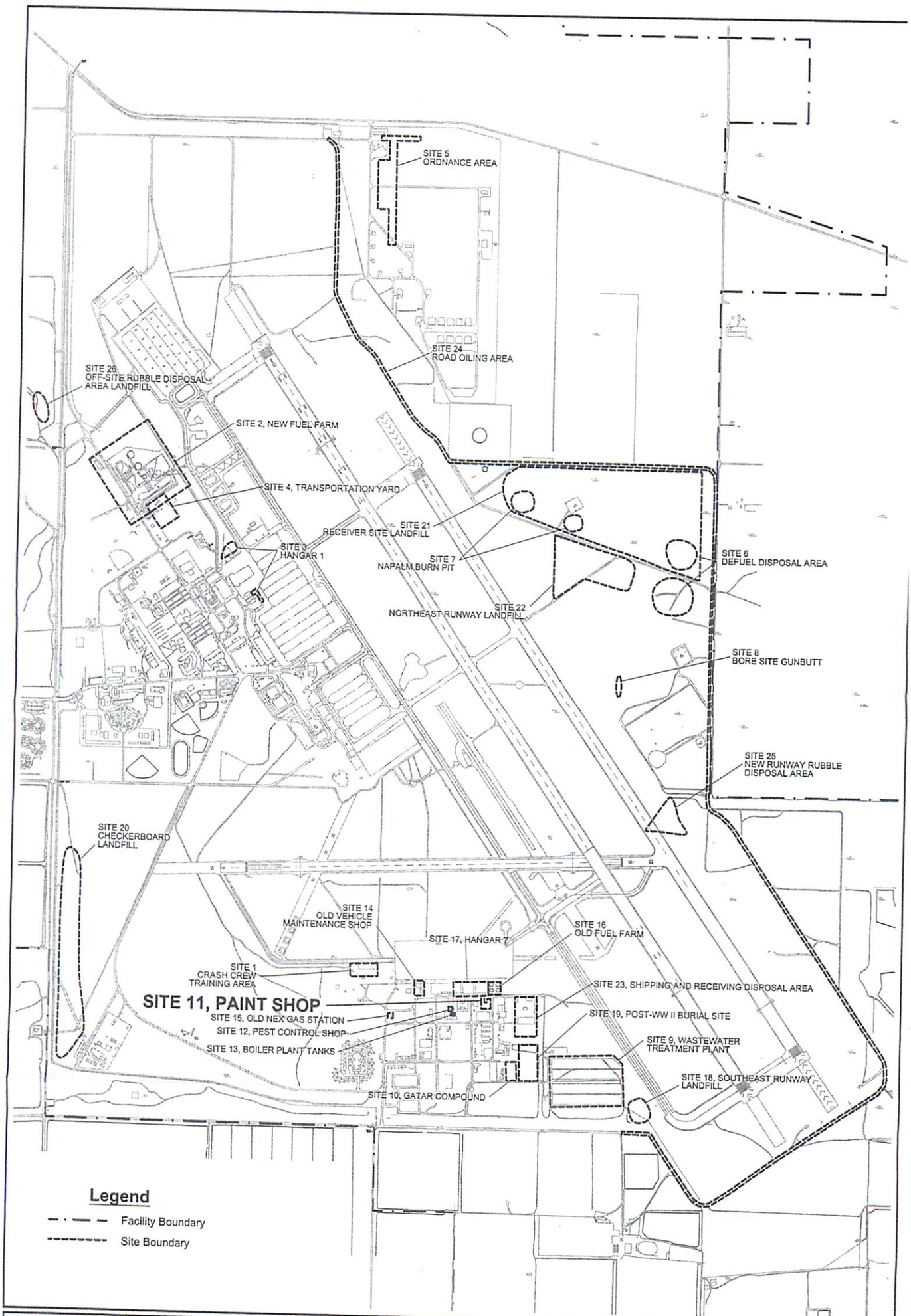


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Figure 2-2
NAS Fallon Facility Map

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SITE 11

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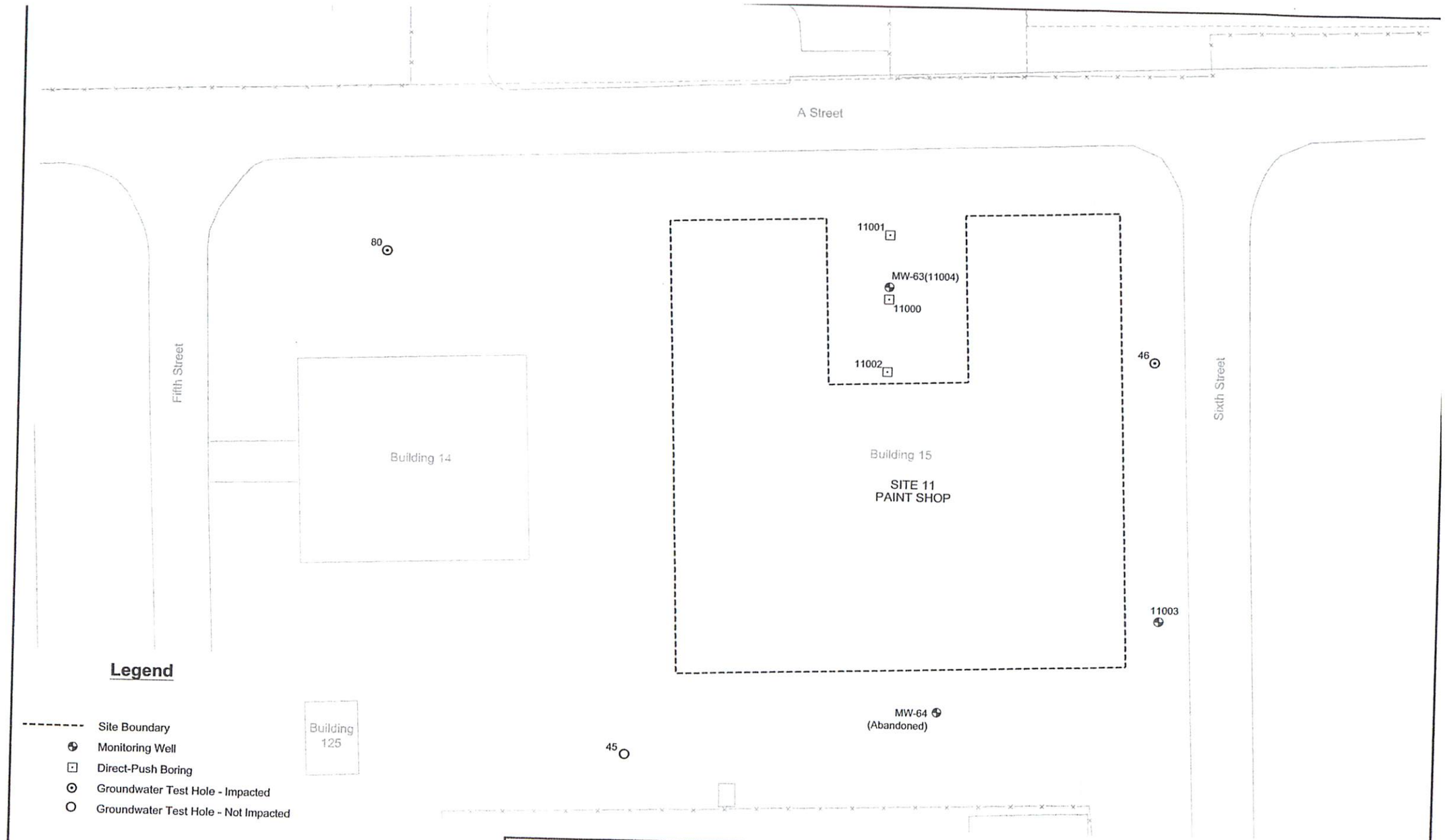

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Figure 2-3
Sampling Locations at Site 11, Paint Shop

3.0 COMMUNITY PARTICIPATION

Community participation is being encouraged under a community relations plan (CRP) drafted pursuant to Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). This plan was updated in 2004.

In 1989, a Technical Review Committee (TRC) was formed in an effort to increase community participation and awareness regarding the IR sites and to provide comments on proposed actions under the NAS Fallon's IR Program. The TRC consisted of state and local regulatory representatives and NAS Fallon personnel. The TRC met in June 1989 to discuss potential requirements for future PA/SI or RI and feasibility study (FS) activities at NAS Fallon. This meeting provided an opportunity for the regulatory agencies to comment on and provide input to the proposed IR Program at NAS Fallon.

In August 1994, a Restoration Advisory Board (RAB) was established to replace the TRC. The RAB meets once a year and consists of members originally on the TRC and representatives from the local community.

All documents associated with this site, such as the PA/SI report, the RI report, the CRP and the Proposed Plan for Site 11, were made available to the public in the Information Repositives at NAS Fallon (Fallon, Nevada) and the Churchill County Public Library (Fallon, Nevada), and in the Administrative Record at the Engineering Field Activity, West, Offices (Daly City, California). The notice of the availability of these documents was published in the *Lahontan Valley News* on November 17 and 18, 2004. A public comment period was held from November 15 to December 15, 2004. In addition, a public meeting was held on November 18, 2004, to present the Proposed Plan to the community. At this meeting, representatives from NAS Fallon and the NDEP presented the Proposed Plan.

4.0 SCOPE AND ROLE OF SITE

Originally, there were 27 IR sites identified at NAS Fallon. The additional sites, underground storage tank sites 395 and 805 have been added. The locations of all IR sites are shown on Figure 2-2. Site 11 (Paint Shop) is located in the southeastern portion of NAS Fallon, in Building 15 at the southwest corner of the intersection of A Street and Sixth Street (Figures 2-2 and 2-3). Site 11 was investigated as one of the Group IV sites, nine sites that were grouped together because of their proximity and the potential for commingled contaminated areas. Sites 16 and 17 are located across A Street to the northeast and northwest of Site 11, respectively. Site 23 is located approximately 400 feet east of Site 11. Based on characterization results, the Navy and NDEP have taken the decision that no further action is required at Sites 17, 19, and 23. These decisions were taken in June 2002 for Site 19 and November 2003 for Sites 17 and 23. Site 16 (Old Fuel Farm) is currently undergoing active remediation to address volatile organic impacts to groundwater that extend from Site 16 to the south and southeast. These groundwater impacts are observed beneath Site 16 and other sites in the area. The active groundwater remedy is currently addressing organic impacts to the subsurface beneath all affected sites or areas, including Site 11.

The sampling locations used to evaluate Site 11 are as follows:

- Two auger-boring locations (these locations are sometimes referred to as "groundwater test holes") positioned to the west (location 80) and to the east (46) of Site 11 from which groundwater samples were collected for qualitative analysis
- Four direct-push (11000, 11001, 11002, and 11003) sampling locations and two auger-boring locations (MW-63 and MW-64) from which soil samples were collected
- Three permanent monitoring wells (MW-63, MW-64, and MW-11003) located at Site 11 from which groundwater samples were collected

The sampling locations used as a basis for the decision for Site 11 are shown on Figure 2-3 and summarized in Table 4-1, along with the gradient relationships (upgradient, downgradient, on-site) to Site 11 and the uses of the data from each location. Table 4-2 provides a chronological summary of quantitative sampling activities at each location.

The two groundwater test holes were initially completed to qualitatively evaluate potential contamination related to Site 11, as well as to other Group IV sites. Soil sampling was conducted at six locations to evaluate the impacts of Site 11 activities on the soil at the site. The permanent monitoring wells located at Site 11 were used to assess the presence of contaminants in soil and groundwater related to Site 11 activities.

Table 4-1
Summary of Data From Sampling Locations Used as Basis of Decision for Site 11, Paint Shop

Sampling Location	Data Type	Data Uses
Within Site 11		
Well MW-63	Quantitative/ qualitative	The intent of sampling at this location during the RI was to quantitatively assess the presence or absence of potential contaminants in soil and groundwater related to activities at the site. However, laboratory reports for the resultant data are unrecoverable and the data summarized in the RI from this location is considered to be qualitative. Quantitative groundwater results were obtained from this location during 2002.
Boreholes 11000, 11001, and 11002	Quantitative	Quantitative assessment of presence or absence of potential contaminants in soil related to activities at the site
Upgradient of Site 11		
Groundwater test hole 80	Qualitative/ screening	Visual inspection for presence or absence of LNAPL on groundwater surface and qualitative assessment of volatile contaminants in groundwater, used to site permanent groundwater monitoring wells
Downgradient of Site 11		
Groundwater test hole 46	Qualitative/ screening	Visual inspection for presence or absence of LNAPL on groundwater surface and qualitative assessment of volatile contaminants in groundwater, used to site permanent groundwater monitoring wells
Well MW-64	Qualitative	The intent of sampling at this location during the RI was to quantitatively assess the presence or absence of potential contaminants in soil and groundwater related to activities at the site. However, laboratory reports for the resultant data are unrecoverable and the data summarized in the RI from this location is considered to be qualitative.
Well MW11003	Quantitative	Quantitative assessment of presence or absence of potential contaminants in soil and groundwater downgradient of the site

Note:
LNAPL – light nonaqueous-phase liquid
MW – monitoring well
RI – remedial investigation

Table 4-2
Chronological Quantitative Sampling Summary

Sampling Location	Matrix	Sampling Date(s)	Range of Analyses
MW-64	Soil	11/91	HBPHC, LBPHC, VOCs, SVOCs
Borehole 11000	Soil	4/02	TPH, VOCs, SVOCs, lead
Borehole 11001	Soil	4/02	TPH, VOCs, SVOCs, lead
Borehole 11002	Soil	4/02	TPH, VOCs, SVOCs, lead
MW-11003	Soil	4/02	TPH, VOCs, SVOCs
MW-63	Groundwater	12/91, 4/92, 10/93, 3/95, 9/95, 9/96, 3/97, 9/97, 3/98, 9/98, 4/99, 9/99, 11/99, 4/02, 10/02, 10/03	TPH, VOCs, SVOCs, metals
MW-64	Groundwater	12/91, 4/92	TPH, VOCs, SVOCs
MW-11003	Groundwater	4/02	TPH, VOCs, SVOCs

Notes:
HBPHC – high boiling point petroleum hydrocarbons
LBPHC – low boiling point petroleum hydrocarbons
MW – monitoring well
SVOCs – semivolatile organic compounds
TPH – total petroleum hydrocarbons
VOCs – volatile organic compounds

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 PHYSICAL SETTING

5.1.1 Physical Setting of Facility

NAS Fallon lies on a broad, flat alluvial plain in the southern Carson Desert referred to as the Lahontan Valley. The Carson Desert is part of the Basin and Range geological province. Carson Lake, a series of ditches and small marshes, is a few miles south of the facility. The Stillwater Lakes, a chain of small lakes, ponds, and marshes, extend for 20 miles south of the Carson Sink in the northern half of the Carson Desert (Figure 2-1). Carson Lake and the Stillwater Lakes are two wetland areas that serve as an important stopover for migratory birds during the spring and fall. Recent drought years have caused the Stillwater Lakes to shrink from approximately 100,000 acres of wetlands in 1983 to 4,000 acres of wetlands in 1991.

The Carson Desert is a hydrologically closed depression that forms the sink for the Carson River. The entire area is in the rain shadow of the Sierra Nevada Mountains; consequently, precipitation is about 5 inches per year. About 80 percent of the Carson Desert surface consists of the Carson River floodplain, with the rest composed of playas and alluvial fans. The surface soils are enriched with salts and cations such as arsenic, lithium, mercury, and molybdenum that have been transported to the basin by the river and have been concentrated as a result of evaporation of ancient Lake Lahontan.

The Carson River, augmented by the Truckee River via the Truckee canal (part of the Newlands Irrigation Project), provides more than 95 percent of all surface runoff received by the Carson Desert. Much of the area around the facility is irrigated; several irrigation ditches deliver water, and drainage canals remove excess water. The drainage canals generally intersect the shallow water table aquifer and drain excess water from the farmland.

There are two major drainage canals at NAS Fallon:

- The "lower diagonal (LD) drain," the alignment of which is along the southwestern edge of the facility and east along the southern boundary of the facility proper

- The "LD #1 drain," which crosses onto the facility just north of Site 2 (the New Fuel Farm), drains to the east from the west side of the facility, and then drains to the south

The most important distinction between the irrigation ditches and the drainage canals (drains) is that the drains are intended to intersect shallow groundwater as well as surface water and to conduct the water away from the drained areas. Conversely, the irrigation ditches deliver water to the fields. In the process of carrying off excess surface water and shallow groundwater, the drains remove minerals or salts leached from the farmland. The drains carry water southeastward to Carson Lake and northeastward to the Harmon and Stillwater Point Reservoirs.

The LD drain is approximately 500 feet south of the Group IV sites. In addition, an unnamed drain is located just east of Group IV Sites 23 and 19. The primary sources of water in this drain are backflow from the LD drain during the irrigation season and waste water treatment plant discharge. During rare storm events, stormwater in small ditches may enter the unnamed drain.

5.1.2 Site 11 Physical Setting

Site 11, Paint Shop, is located in Building 15, at the southwest corner of the intersection of A Street and Sixth Street, in the southern portion of NAS Fallon (Figures 2-2 and 2-3). Site 11 encompasses approximately 0.9 acre, extending approximately 200 feet east to west and 200 feet from north to south. The ground surface of Site 11 is covered predominantly by Building 15 or associated paved areas. NAS Fallon does not expect any change in the use of this land, or that of the surrounding sites in the foreseeable future. There are no areas of archaeological or historical significance at Site 11.

5.2 ECOLOGY

5.2.1 Vegetation

NAS Fallon was originally a greasewood community typical of alkali valley bottom lands, portions of which have since been irrigated and used as pasture. Typical plants for this area include saltbush, shadscale, quailbush, greasewood, milkweed, poverty weed, alkali sacaton, rabbitbrush, saltgrass, and alkali seepweed.

The flat, alkali bottom lands making up the southern portion of the Carson Sink currently receive sufficient irrigation return flow and Carson River water to be recognized as a wetland habitat, especially for waterfowl. Vegetation typical of these areas includes bullbush, cattail, pondweed,

widgeon grass, muskgrass, and coontail. Cottonwoods and willows occupy portions of the banks of various ponds, ditches, and drains.

5.2.2 Endangered and Threatened Plant Species

No endangered or threatened plant species designated by the state or federal government are known or likely to occur in the region.

5.2.3 Wildlife

Terrestrial wildlife in the region consists of species adapted to the desert or dependent on wetlands. About 67 species of mammals inhabit the area. Mountain ranges in the region, outside of the area of human impact, support large mammals such as mountain lions and mule deer. Common mammals of the area include bats, coyote, kit fox hare, jackrabbit, deer mouse, ground squirrel, and kangaroo rat.

More than 252 species of birds have been recorded regionally. Upland game birds of the desert are the ring-necked pheasant, sage grouse, the introduced chukar partridge, quail, and mourning dove. A variety of raptors and songbirds are also present.

The Stillwater National Wildlife Management Area, 7 miles east of NAS Fallon, and Carson Lake, 4 miles south of NAS Fallon, support the two largest concentrations of waterfowl and shorebirds in the state. Important game birds include canvasbacks, whistling swans, and Canada geese. Nongame species include the American avocet, black-necked stilt, white-faced ibis, and dowitchers.

5.2.4 Aquatic Life

The drains at NAS Fallon may be inhabited by mosquito fish, carp, bullhead, catfish, sunfish, muskrats, herons, and egrets.

5.2.5 Endangered Animal Species

Federally listed endangered and threatened animal species that may utilize the NAS Fallon and range areas include the bald eagle. These species are most likely to be found hunting the wetland portions of the area but may occasionally be seen elsewhere. The nearest breeding habitat is to the northwest, outside the boundaries of the NAS Fallon facility.

5.3 GEOLOGY AND HYDROGEOLOGY

5.3.1 Regional and Facility Geology

The area within and surrounding NAS Fallon consists of an intermontane valley. The mountains near NAS Fallon are composed primarily of a variety of consolidated igneous, sedimentary, and metamorphic rocks that range in age from Triassic to Quaternary in age.

The Basin and Range faulting that occurred during the Cenozoic Era probably formed the bedrock surface below the valley fill sediments. This formation of the intermontane valley was accompanied by deposition of valley-fill sediments on the floor to depths of several thousand feet. Sediment composing the valley fill was derived from three primary sources:

- Upstream valleys of the Carson River drainage
- Upstream valleys of the Humbolt River basin
- Mechanical weathering of consolidated rocks within the Carson Desert itself

It appears that most of the valley-fill sediments in and around NAS Fallon were transported into the valley by the ancestral Carson River.

The depositional character of the valley-fill sediments at NAS Fallon was greatly influenced by the presence of the ancient Lake Lahontan, a Quaternary-age lake that was subject to numerous cycles of advancement and retreat. Regional climatic changes caused dramatic oscillations of lake stages and shorelines throughout the Pleistocene Epoch. Subsurface stratigraphic evidence also suggests the existence of pre-Quaternary-age lakes in the valley. The pluvial influences on sediment deposition were extensive and probably varied during the greater part of Cenozoic time. The alternating influences of wave action, standing water, flowing water, and wind on the sediment transported into the valley by the Humbolt and Carson Rivers resulted in a complex sequence of interfingered and interbedded deposits of fluvial, deltaic, lacustrine, and eolian deposits.

Previously published descriptions of these deposits were generally confirmed during the installation of monitoring wells across the facility. However, the highly transmissive, coarse-grained deposits were found to be both laterally and vertically discontinuous. Below the upper 20 feet of interbedded coarse-grained and fine-grained deposits, a laterally continuous bed of fine-grained silts and clays forms an aquitard, providing a natural barrier to the downward migration of groundwater and contaminants.

The generalized geologic stratigraphy beneath NAS Fallon is presented in Figure 5-1.

5.3.2 Regional and Facility Hydrogeology

Abundant groundwater is present in the valley-fill sediments and the underlying volcanic strata of the Carson Desert as a result of the closed nature of the hydrologic basin and the remnants of Pleistocene Lake Lahontan that once covered the entire area. Groundwater occurs in three principal aquifer systems: (1) a shallow alluvial aquifer, (2) intermediate and deep alluvial aquifers, and (3) a basalt aquifer.

The shallow water-table aquifer occupies the alluvium from near the ground surface to about 25 feet below ground surface (bgs). The shallow aquifer is composed of many interconnected zones of varying permeability, ranging from highly transmissive channel sands to less-transmissive silty clay floodplain and lake deposits. The water quality is generally poor because the water has a high concentration of dissolved solids; however, freshwater recharge from the surface-water irrigation system helps maintain water quality in some parts of the valley.

Reports of regional water quality in the shallow alluvial aquifer and irrigation return flows contain information on the range of concentrations of various metals and anions. This information is summarized in the *Preliminary Site Characterization Summary*. Although the concentrations of these constituents vary considerably, there is a trend of increasing concentrations toward discharge areas at the Stillwater Lakes and Carson Lake. Concentrations of many trace metals exceed various criteria for the protection of aquatic life and crops, effect levels for fish reproduction, and limits for the propagation of wildlife. For example, background concentrations of boron in surface water often exceed the effect level for fish reproduction of 200 µg/L, and concentrations of arsenic in groundwater and surface water often exceed the Nevada criterion for the protection of aquatic life of 40 µg/L and the drinking water standard of 50 µg/L.

The regional groundwater flow direction is to the east and southeast toward Grimes Point and slightly diagonal to the drainage ditches that cross the facility. Glancey estimated the regional groundwater velocity to be approximately 35 feet per year in 1986. The site-specific groundwater flow velocities from numerous aquifer tests are highly variable.

Intermediate and deep alluvial aquifers are present beneath the shallow alluvial aquifer in the Wyemaha Formation. The boundary between the shallow and the intermediate aquifer is a relatively impermeable clay layer (Sehoo Formation), approximately 20 feet thick. The water in the intermediate and deep aquifers is generally of better quality than the water in the shallow aquifer. The boundary between the intermediate and deep aquifers is defined primarily on the basis of water quality, rather than the presence of a physical boundary. Water quality in the intermediate and deep alluvial aquifers generally improves with depth.

The deep alluvial aquifer extends to approximately 2,200 feet bgs near the center of the basin. The basalt aquifer lies within the intermediate and deep alluvial aquifers at a depth of approximately 600 feet bgs, within an approximately 4-mile radius around Rattlesnake Hill, a small volcanic cone that outcrops just north of the city of Fallon. The basalt aquifer is the only source of municipal domestic water in the area and is recharged from the intermediate and deep alluvial aquifers. The basalt aquifer is not present beneath NAS Fallon except possibly in the extreme northwest corner of the facility. However, NAS Fallon obtains all of its domestic water from this aquifer, through the city water treatment plant, using deep wells northwest of the facility.

Three monitoring wells penetrating the intermediate aquifer on the facility indicate a head difference of about 5 to 9 feet between the shallow unconfined aquifer and the intermediate confined aquifer. The head is higher in the intermediate aquifer, indicating artesian conditions that retard or preclude downward migration of groundwater at the facility. Because of this upward hydraulic gradient, investigations at the facility have focused on the shallow water-table aquifer, with three widely spaced wells drilled into the intermediate aquifer.

5.3.3 Site 11 Geology and Hydrogeology

The geologic information for the Site 11 was obtained by soil sampling during the installation of borings 11000, 11001, 11002, 11003, and monitoring wells MW-63, MW-64, and MW-11003 (Figure 2-3). Subsurface investigations at the site were limited to the shallow alluvial aquifer (Fallon Formation) because of the presence of a silty clay aquitard (Sehoo Formation) at the base of this aquifer. Monitoring well MW-63 is located within the former paint handling area at the site. Monitoring wells MW-64 and MW-11003 are located downgradient from the former paint handling area toward the south and southeast, respectively.

The monitoring wells listed in the previous paragraph typically penetrated the entire Fallon Formation and from 2 to 3 feet of the Sehoo Formation (see Figure 5-1 for the generalized stratigraphy in the area of NAS Fallon). Borings for these wells were completed to depths between 20 and 24.5 feet. The Sehoo Formation aquitard was generally first encountered at depths ranging from 18 to 22 feet bgs. Deltaic sands with variable amounts of silt constitute the main soil type of the Fallon Formation observed at the site above the aquitard. Channel deposits of the ancestral Carson River are observed within the Fallon Formation beneath Site 11. These channel deposits were observed from 4 to 10 feet bgs at MW-63 and from 4 to 16 feet bgs at MW-64.

The subsurface lithology at boring locations 11000, 11001, 11002, and MW-63 was very similar, consisting of coarse gravel subgrade (under concrete paving) underlain by silty fine sand, clay, fine to medium sand, and clayey sand. At locations 11000 and 11002, paint chips were observed

in shallow soils approximately 1 foot bgs. A 1.5- to 2.0-foot-thick clay layer was observed in the former paint handling area (locations 11000, 11001, and 11002) at a depth of approximately 2.5 to 3 feet bgs. Saturated soil was observed at a depth of approximately 9 feet bgs in the former paint handling area; however, depth to groundwater was measured in MW-63 at 6 feet bgs. This suggests the presence of an upward hydraulic gradient in this area. Subsurface lithology at location 11003 was similar to the other boring locations; the aquifer was predominately very fine to fine sand with varying amounts of clay. Clay was encountered at 18.2 feet bgs. At location 11003, saturated soil was encountered at approximately 6 feet bgs. After well development (location 11003), depth to groundwater was measured at approximately 4 feet bgs, also suggesting an upward vertical gradient.

Groundwater surface elevation contours indicate a gradient and flow direction at Site 11 that are consistent with the regional flow direction, which is to the southeast. Depth to groundwater in monitoring wells MW-63 and MW-65, used to evaluate groundwater flow conditions in the vicinity of Site 11, varies seasonally and ranges from approximately 5.3 to 6.8 feet bgs. The hydraulic gradient between these two wells was 0.0009 foot/foot during September 1997 and 0.0006 foot/foot during November 2002. Groundwater surface elevation contours for data collected in the southern station area during November 2002 are shown on Figure 5-2.

Bail tests were conducted on selected wells at the Group IV sites during April 1991 and June 1992. Wells MW-63, MW-64, and MW-65 were bail tested during June 1992. Multiple bail tests were conducted at each location. The highest calculated hydraulic conductivity for each well location follows:

- MW-63: 1.9 feet/day, or 6.7×10^{-4} cm/sec
- MW-64: 12.5 feet/day, or 4.4×10^{-3} cm/sec
- MW-65: 3.0 feet/day, or 1.1×10^{-3} cm/sec

The highest bail-test-derived hydraulic conductivity was observed at well MW-64, and the lowest hydraulic conductivity was observed at well MW-63. Assuming a porosity of 30 percent, and a hydraulic gradient of 0.0009 foot per foot, the range of groundwater velocities across the site is estimated to be 2.1 to 13.7 feet per year.

Appendix E of the RI indicates that bail tests may underestimate the hydraulic conductivity of materials at the facility from 5 to 125 times. Pumping tests were conducted at NAS Fallon in the area of Site 2. The lithology in the area of well W-20 at Site 2 similar to that observed in the area of Site 11. Pumping-test-derived hydraulic conductivities were estimated at 38.9 to 61.6 feet per day. These estimates are 3 to 5 times higher than the highest bail-test-based estimate of 12.5 feet per day at wells near Site 11, suggesting that groundwater velocity across the site could be as high as 68 feet per year. These velocity estimates are for groundwater and do

not necessarily represent contaminant transport velocities, which are usually slower than groundwater velocity. The degree to which contaminant velocity is "retarded" relative to groundwater depends on the amount of organic carbon in the saturated formation and the contaminant type. Contaminant velocities are typically slower than groundwater velocities because of chemical retardation.

5.4 NUMERICAL VALUES FOR COMPARISON TO CONTAMINANT CONCENTRATIONS

Comparative numerical values for action decisions at Site 11 are provided in the Nevada Administrative Code (NAC), which states the following:

- The "soil action level" established by NAC 445A.2272 is 100 mg/kg for petroleum substances (typically referred to as TPH).
- For contaminants in soil, compare the toxicity characteristics leaching procedure (TCLP)-allowable levels listed in 40 CFR Part 261.24 and the state action level pursuant to NAC 445A.2272 to contaminant concentrations detected during the investigation and/or remedial activities.
- If inhalation, ingestion or dermal exposure is the primary pathway of concern or an applicable level of concentration is not listed in the Toxicity Characteristics Leaching Rule, the presence of a hazardous substance, hazardous waste or a regulated substance in the soil at an appropriate level of concentration that is based on the protection of public health and safety and the environment. The appropriate level of concentration must be determined by the division using the Integrated Risk Information System, adopted by the Environmental Protection Agency, as it existed on October 3, 1996, or an equivalent method chosen by the division. (Note: The equivalent method is generally assumed by NDEP to be EPA Region 9 preliminary remediation goals [PRGs]).
- Except as otherwise provided by NAC 445A.2272, if more than one action level for soil may be established using the criteria set forth in subsection 1, the most restrictive action level must be used. In no case may the action level be more restrictive than the background concentration of the hazardous substance, hazardous waste or regulated substance.
- If contaminated soil is to be left in place, provide an A through K analysis pursuant to NAC 445A.227 to determine if corrective action is required.

- The presence of 1/2 inch or more of a petroleum substance that is free-floating on the surface of the water of an aquifer, using a measurement accuracy of 0.01 foot (NAC 445A.22735).

- For contaminants in groundwater, compare the maximum contaminant levels (MCLs) listed in the EPA Drinking Water Regulations and Health Advisories to contaminant concentrations detected during the investigation and/or remedial activities (NAC 445A.22735).

- The action level may be set at a level of concentration equal to the background concentration of a hazardous substance, hazardous waste or a regulated substance, if that level of concentration is greater than the maximum contaminant level for that hazardous substance, hazardous waste, or regulated substance.

- In the absence of an MCL, a level of concentration equal to the background concentration of a hazardous substance or an appropriate level of concentration that is based on the protection of public health and safety and the environment. The appropriate level of concentration must be determined by the division using the Integrated Risk Information System, adopted by reference in NAC 445A.2272, or an equivalent method approved by the division. (Note: The equivalent method is generally assumed by NDEP to be EPA Region 9 PRGs.)

The NAC does not provide a state action level for TPH in groundwater. The NDEP provided a guidance concentration of 1,000 µg/L in comments to the PA/SI. As a result, 1,000 µg/L has been used consistently as guidance for TPH in groundwater in various reports prepared by the Navy for work conducted at NAS Fallon.

In the absence of an MCL for groundwater, the Navy will use EPA Region 9 PRGs as goals for organic compounds. In the absence of a NAC-specified state action level for soil, the Navy will use EPA Region 9 PRGs as goals for organic compounds.

The PA/SI identified paint waste and thinners as the only waste materials that may have been released to the environment at Site 11.

5.5 NATURE AND EXTENT OF CONTAMINATION

This section first summarizes results of investigations at Site 11, then discusses in detail (in the following subsections) contaminants in soil and groundwater. Investigations at the site include the following:

- Qualitative analysis of groundwater test holes to assess the presence or absence of volatile contaminants at Site 11
- Soil sampling in the former paint handling area north of Building 15 to assess impacts from Site 11 activities on the soil at the site
- Soil sampling at locations downgradient from the Building 15 to assess if site activities have impacted downgradient soil
- Groundwater sampling in the former paint handling area north of Building 15 to assess if site activities have impacted on-site groundwater
- Groundwater sampling downgradient from the Building 15 to assess if site activities have impacted downgradient groundwater

The data are summarized below and discussed in detail in the following subsections.

Field screening of soil samples collected during initial drilling of monitoring wells MW-63 and MW-64 at Site 11 indicated the presence of contaminated soil within the capillary fringe located just above the groundwater surface (approximately 5 feet bgs) and at the bottom of the shallow aquifer (approximately 21 feet bgs). TPH—extractable (TPH-E) was detected in shallow soil samples (0.5 to 1.0 foot bgs) subsequently collected within the former paint handling area at Site 11. Contrary to field screening results, analyses of additional soil samples collected between 2.5 and 9.5 feet bgs in this vicinity identified no contaminants in soil at detectable concentrations. Furthermore, analyses of soil samples collected between 2.5 and 6.5 feet bgs at the downgradient location 11003 identified no contaminants in soil at detectable concentrations. The TPH-E detections in near-surface soil within the former paint handling area are interpreted to be the result of activities at Site 11. The observed TPH and benzene concentrations in groundwater at concentrations greater than state action levels are interpreted to be the result of petroleum hydrocarbons migrating from Site 16 by groundwater transport. Groundwater at Site 11 also contains 1,2-dichloroethane, trichloroethene, bis(2-ethylhexyl)phthalate, and pentachlorophenol at concentrations above state action levels. These compounds were not detected in soil samples collected from Site 11. The bis(2-ethylhexyl)phthalate detections were attributed to laboratory contamination and are not considered to be a result of Site 11 activities.

5.5.1 Qualitative Data From Groundwater Test Holes

Qualitative data were initially collected to assess the presence or absence of volatile contaminants in the general vicinity of the Group IV sites, including Site 11. Sampling locations were then selected for quantitative analysis of soil and groundwater samples on the basis of the qualitative results and the regional groundwater flow direction. The sampling locations from which qualitative data were collected were called "groundwater test holes"; they consisted of hollow-stem auger borings from which one-time groundwater samples were collected. Each groundwater test hole was screened with the use of a hand-held photoionization detector (PID) to analyze the air space of the open boring. Then a groundwater sample was collected from the boring, and an aliquot of air from the headspace above the groundwater sample was analyzed with the use of a portable field gas chromatograph (GC). The generated data consisted of "presence or absence" indicators, including detect or nondetect records for each instrument at each sampling location. The rationale and methodology for sampling from the groundwater test holes is described in detail in Appendix C of the RI report.

Three groundwater test holes were positioned in the vicinity of Site 11 as shown in Figure 2-3. The groundwater test holes provided screening-level data to assess the presence or absence of volatile contaminants that could be related to Site 11 or migrating onto and across Site 11 from upgradient sources. More specifically, results from the groundwater test holes were typically used as yes or no responses to the question "is contamination present or absent?" Different symbols were used on Figure 2-3 for the groundwater test holes to indicate whether volatile contaminants were present or absent during sampling. Contamination was qualitatively identified in two of the three groundwater test holes (Figure 2-3).

5.5.2 Quantitative Soil Data

This section discusses results of quantitative analyses performed on soil samples collected at Site 11. Results from soil samples collected in the former paint handling area are discussed separately from soil samples collected at downgradient locations.

Former Paint Handling Area

During 2002, 10 on-site soil samples were collected from three direct-push boring locations (11000 through 11002) within the former paint handling area north of Building 15 (Figure 2-3). Soil samples were collected at each of these locations from 0.5 to 1.0, 2.5 to 3, and 5 to 7 feet bgs. In addition, a soil sample was collected from location 11000 at a depth of 7.5 to 9.5 feet bgs. Soil samples collected from these locations were analyzed for TPH-P using EPA Method 8015G, TPH-E using EPA Method 8015D, VOCs using EPA Method 8260, SVOCs using EPA

Method 8270, and lead using EPA Method 6010. The analytical results for chemicals that were detected at least once in these soil samples are summarized in Table 5-1.

TPH-E was detected in 3 of the 12 soil samples collected from the former paint handling area at Site 11 during 2002. All three detected concentrations were above the state action level of 100 mg/kg for soil. The soil samples containing TPH-E at concentrations above state action levels were collected between 0.5 and 1.0 foot bgs from locations 11000, 11001, and 11002. No other analytes were detected in these shallow soil samples. As noted earlier, shallow groundwater was observed at these locations at approximately 6 feet bgs. Soil samples collected from these locations between 1.0 and 6.0 feet bgs did not contain detectable concentrations of TPH-P, VOCs, SVOCs, or lead.

In summary, analytical results performed on soil samples collected within the former paint handling area show that TPH-E is present in near surface soil (less than 1.0 foot bgs). Results of soil samples collected below 1 foot bgs did not contain TPH-E at concentrations greater than reporting limits. These results indicate a separation of at least 4 feet between the impacted soil at the site and groundwater at 5.3 to 6.8 feet bgs. The samples collected below 1 foot bgs did not contain TPH-E, TPH-P, VOCs, SVOCs, or lead at concentrations greater than the reporting limit.

Downgradient Locations

During 1991, soil samples were collected from one downgradient location MW-64 (Figure 2-3). This monitoring well was constructed approximately 10 feet south of Building 15. Soil samples were obtained continuously over the total depth explored at this location for field screening purposes. On the basis of field screening results, one soil sample obtained between 16.5 and 18 feet bgs from this boring was selected for analyses at an analytical laboratory. This sample was obtained at the base of a clean sand unit situated within the saturated zone approximately 10 feet below the groundwater surface. The soil sample was analyzed for high-boiling-point petroleum hydrocarbons using EPA Method 8015 modified, low-boiling-point petroleum hydrocarbons using EPA Method 8015/8020, VOCs using EPA Method 8240, and SVOCs using EPA Method 8270. The analytical results for chemicals that were detected at least once in this soil sample are summarized in Table 5-1.

The VOC methylene chloride and the SVOC bis(2-ethylhexyl)phthalate were detected in the soil sample collected from MW-64 at 0.004 mg/kg and 2.5 mg/kg, respectively. Both of these chemicals are common laboratory solvents. It was determined during the RI that the detected concentrations of these chemicals were likely the result of laboratory-induced contamination. No other chemicals tested for were detected in this soil sample.

During 2002, two soil samples were collected from direct-push boring 11003 (Figure 2-3). This boring, completed as groundwater monitoring well MW-11003, is situated downgradient from the former paint handling area near the southeast corner of Building 15. Soil samples at location 11003 were collected from 2.5 to 3 and 5.5 to 6.5 feet bgs. These samples were analyzed for TPH-P using EPA Method 8015G, TPH-E using EPA Method 8015D, VOCs using EPA Method 8260, and SVOCs using EPA Method 8270. No chemicals quantified by these analytical methods were detected in the shallow soil samples collected at this location.

5.5.3 Groundwater Monitoring

This section discusses results of quantitative analyses performed on groundwater samples collected at or in the vicinity of Site 11. Groundwater sampling was performed at three monitoring wells (MW-63, MW-64, and MW-11003) located in the vicinity of Site 11. Groundwater samples from well MW-63 are considered to represent conditions beneath the former paint handling area at the site, while samples from wells MW-64 and MW-11003 represent conditions at the downgradient edge of the site. Results from groundwater samples collected in the former paint handling area are discussed separately from groundwater samples collected at downgradient locations.

Former Paint Handling Area

Multiple groundwater samples were obtained from well MW-63 between April 1991 and October 2003 (Table 4-2). Groundwater samples were obtained from this well during 16 sampling events occurring in 12/91, 4/92, 10/93, 3/95, 9/95, 9/96, 3/97, 9/97, 3/98, 9/98, 4/99, 9/99, 11/99, 4/02, 10/02, and 10/03. Although the suite of chemical analyses varies depending upon sample date, the chemical analyses performed on groundwater samples collected from this well include petroleum hydrocarbons, VOCs, SVOCs, selected inorganics, and water quality. Table 5-2 provides a summary of detected organics in groundwater, and Table 5-3 provides a summary of the detected metals and total dissolved solids in groundwater.

Ten groundwater samples collected from MW-63 were tested for purgeable-range petroleum (as either TPH-P or TPH-gasoline) using Method 8015G. Purgeable-range TPH was detected in 8 of these 10 samples. The detected concentrations were below the guidance concentration of 1,000 µg/L. Fifteen groundwater samples collected from MW-63 were also tested for extractable-range petroleum (as either TPH-E or TPH-diesel or TPH-JP-5) using Method 8015D. Extractable-range TPH was detected in 11 of these 15 samples. The detected concentrations were greater than the guidance concentration of 1,000 µg/L in four of these groundwater samples. Lastly, three groundwater samples collected from MW-63 were tested for heavy end petroleum (as TPH-heavy fraction oil) using Method 8015D. Heavy fraction TPH was detected

in one of these 3 samples. The detected concentration was below the guidance concentration of 1,000 µg/L (Table 5-2).

All groundwater samples collected from MW-63 were tested for VOCs using either EPA Methods 8240, 8260, 8020, or 624. Twenty individual VOCs were reported at a detectable concentration in these samples (Table 5-2). At least one VOC was detected in 15 of the 16 groundwater samples collected. The detected concentrations were greater than the respective state action levels for 3 VOCs: 1,2-dichloroethane, benzene, and trichloroethene.

Three groundwater samples collected from MW-63 were tested for SVOCs using EPA Method 8270. Three individual SVOCs were reported at a detectable concentration in these samples (Table 5-2). At least one SVOC was detected in 2 of the 3 groundwater samples collected. No SVOCs were detected at concentrations above state action levels in the groundwater samples collected from well MW-63.

Four groundwater samples collected from MW-63 were tested for selected inorganics using EPA Method 6010. Two individual inorganics (iron and manganese) were reported at a detectable concentration in these samples (Table 5-3). Manganese was detected at a concentration greater than the EPA Region 9 PRG established for tap water. However, all metals were detected at concentrations consistent with naturally occurring background concentrations and are not considered to be a result of Site 11 activities.

Total dissolved solids (TDS) were measured in four groundwater samples collected from MW-63. TDS concentrations ranged from 15,700 to 42,200 mg/L, with an average of 29,400 mg/L. All samples collected exceeded the 10,000 mg/L criterion for potability according to NAC 445A.22725.

Downgradient Locations

Groundwater samples were obtained from downgradient well MW-64 during 2 sampling events occurring in 12/91 and 4/92. One groundwater sample was collected from downgradient well MW-11003, during April of 2002. Although the suite of chemical analyses varies depending upon sampling location, the chemical analyses performed on groundwater samples collected from these wells includes petroleum hydrocarbons, VOCs, SVOCs, and water quality. Table 5-2 provides a summary of detected organics in groundwater, and Table 5-3 provides a summary of the detected metals and total dissolved solids in groundwater.

All three groundwater samples collected from downgradient wells MW-64 and MW-11003 were tested for purgeable-range petroleum (as TPH-P) using Method 8015G and extractable-range petroleum (as TPH-E) using Method 8015D. Both TPH-P and TPH-E were detected in all three

samples. The detected concentrations for TPH-P were below the guidance concentration of 1,000 µg/L in all three samples. However, the detected concentration for TPH-E was above the guidance concentration of 1,000 µg/L in the one sample collected from MW-11003 (Table 5-2).

All three groundwater samples collected from downgradient wells MW-64 and MW-11003 were tested for VOCs using either EPA Methods 8240 or 8260. Seven individual VOCs were reported at a detectable concentration in these samples. Only 1,2-dichloroethane was detected at a concentration above state action levels in the groundwater sample collected from downgradient location MW-64. No VOCs were detected at concentrations above state action levels in downgradient well MW-11003 (Table 5-2).

All three groundwater samples collected from downgradient wells MW-64 and MW-11003 were tested for SVOCs using EPA Method 8270. Only bis-(2-ethylhexyl)phthalate and pentachlorophenol were reported at a detectable concentration in these samples. The detected concentrations of each of these SVOCs were greater than the respective state action levels in the groundwater samples collected from MW-64. No SVOCs were detected at concentrations above state action levels in MW-11003 (Table 5-2).

Total dissolved solids (TDS) were measured in the groundwater sample collected from well MW-11003. TDS was reported at a concentration of 17,000 mg/L in this sample (Table 5-3). This concentration exceeded the 10,000 mg/L criterion for potability according to NAC 445A.22725.

5.6 CONTAMINANT FATE AND TRANSPORT

Based on historical activities at Site 11, paint and paint thinners were suspected contaminants at this site. Qualitative analyses conducted on soil samples collected during 1991 indicated the presence of volatile contaminants in capillary-zone soil near the groundwater surface and at the bottom of the shallow aquifer beneath the site. Subsequent quantitative analyses of soil samples collected within the former paint handling area indicates that site activities resulted in the release of TPH-E into shallow soil situated less than 1.0 foot bgs. However, analyses of soil samples collected between 1.0 and 9.5 feet bgs in this area indicate a zone of soil that does not contain detectable TPH-E. This zone of uncontaminated soil separates the contaminated soil identified at the groundwater surface from soil containing TPH-E near ground surface. This separation suggests that TPH-E in near-surface soil beneath the former paint handling area is not migrating downward toward groundwater. The lack of vertical migration of the TPH-E from near-surface soil, combined with the paved ground surface within the former paint handling area, suggests that the potential for future leaching of contaminants to the groundwater surface is low. The arid

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

Extractable-range petroleum (TPH-E and TPH-diesel) and the VOCs 1,2-dichloroethane, benzene, and trichloroethene have been detected at concentrations above the state action level in groundwater samples collected from MW-63, located within the former paint handling area, and wells MW-64 and MW-11003, located downgradient from the former paint handling area. Because extractable-range petroleum and VOCs are not detected in soil or are detected at depths of 1 foot or less, the concentrations of these compounds in groundwater are interpreted to be a result of migration through groundwater transport of petroleum-related chemicals released at an upgradient site.

Site 16 was identified as the probable source of petroleum hydrocarbons and petroleum hydrocarbon constituents in capillary fringe soil and groundwater at Site 11. Because the groundwater surface elevation beneath Site 11 varies seasonally, the petroleum hydrocarbons and VOCs have adsorbed to soil during times of higher water levels, with residual concentrations remaining in soil near the groundwater surface during times of lower water level. This effect is sometimes referred to as "smearing." The reported depth to groundwater in the vicinity of Site 11 has fluctuated from 5 to 6.5 feet bgs.

Based on these observations, Site 11 does not appear to be a source of petroleum hydrocarbons. Site 11 may be a source of VOCs detected in groundwater beneath the site, however these compounds were not detected in soil samples collected from Site 11. The lateral extent of VOCs in groundwater at and in the vicinity of Site 11 are within the petroleum hydrocarbon plume that has originated from Site 16. A generalized distribution of contaminants in groundwater is shown on Figure 5-3.

An interim groundwater remediation system is currently operating to address the groundwater plume that has originated from Site 16. Figure 5-3 shows the location of active groundwater recovery wells that are currently capturing contaminants in groundwater as part of the interim system. Under the interim system, captured groundwater is treated prior to discharge to an infiltration gallery located upgradient of Site 16 and within the capture zone of the groundwater extraction network. Captured groundwater is currently being pumped through two oil/water separators followed by carbon filtration. Carbon filtration is an effective treatment method for the groundwater containing low levels of chlorinated solvents (VOCs) observed at and near Site 11.

To insure that re-infiltrated water meets cleanup goals, system effluent samples are being collected and analyzed for petroleum hydrocarbons and VOCs (EPA Method 8260). This analytical method includes all of the compounds identified at Site 11. Groundwater monitoring

currently being conducted as part of interim system operation includes analyses of samples for VOCs (EPA Method 8260). Regular operation and maintenance is being performed to insure system performance and monitor remedial progress. Regular monitoring reports are provided to NDEP for review. These monitoring reports indicate that the treatment system is capturing or will capture impacted groundwater beneath Site 11 for treatment.

A feasibility study is currently being conducted to assess final remedial system options for Site 16. All of the options being considered for the final Site 16 remedial system include components that will address the low level VOC concentrations observed in groundwater at or near Site 11. Performance monitoring of the final remedy for Site 16 and all future ground water monitoring efforts will include monitoring for VOCs to insure that the compounds observed in groundwater at and near Site 11 are effectively addressed.

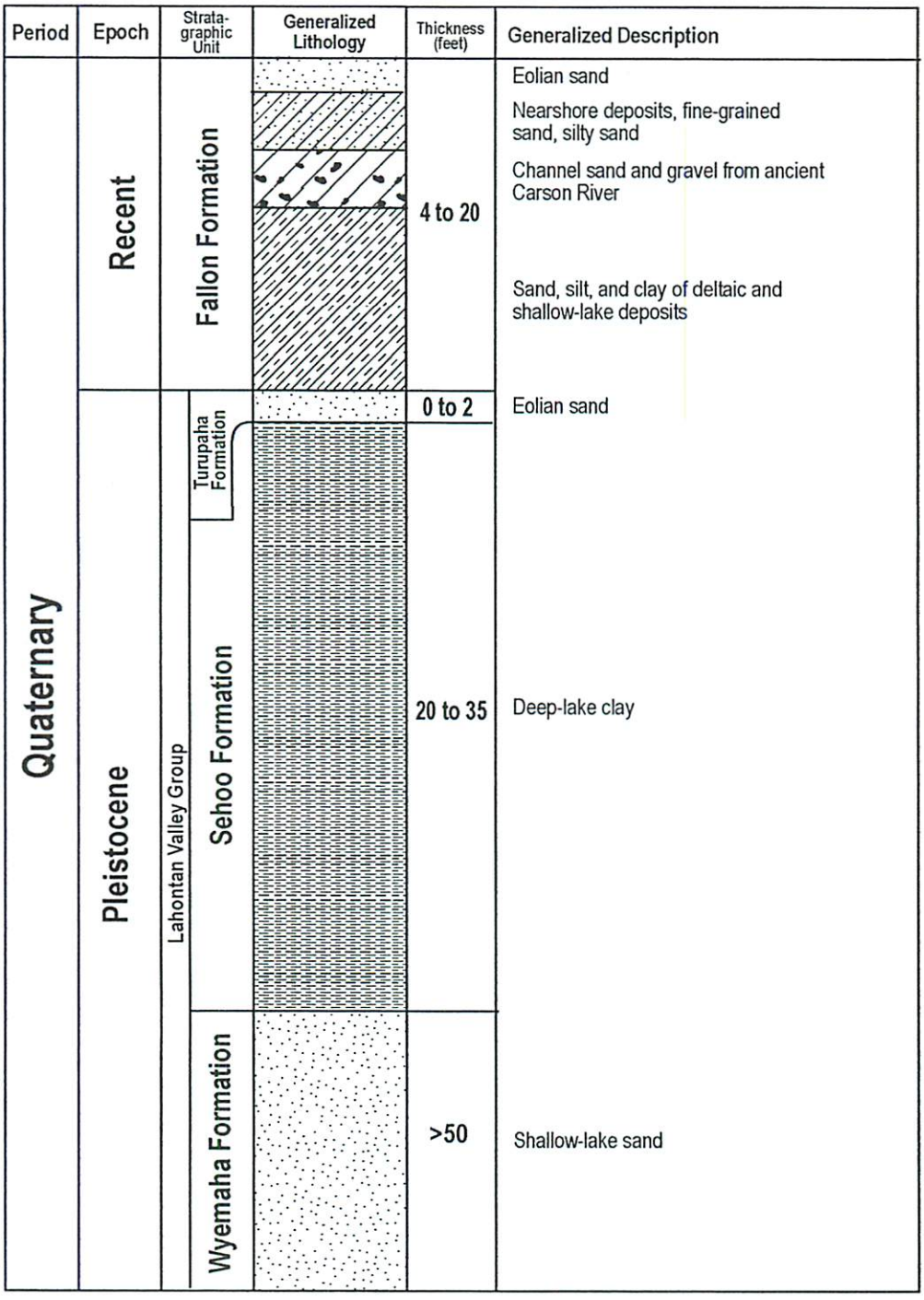
5.7 BASIS FOR DECISION

The Navy has selected No Further Action as the preferred alternative for Site 11 for the following reasons:

- Site 11 has no ongoing contaminant sources and the ground surface at the former paint handling area was capped with pavement in 1986.
- Lead from waste paints and thinners, which are the contaminants of concern at this site, were not detected in soil within the former paint handling area at concentrations above the state action levels.
- Although extractable-range petroleum was detected in shallow soil (0.5 to 1.0 foot bgs) in the former paint handling area at concentrations above the state action level, these compounds were not detected in soil between this shallow soil and the groundwater surface within this area at Site 11.
- Although extractable-range TPH, 1,2-dichloroethane, benzene, and trichloroethene were detected at concentrations above the state action levels in groundwater beneath the site, they were not detected or were detected in soil at depths of less than 1 foot bgs.
- The VOCs and TPH observed in groundwater beneath Site 11 will be addressed through Site 16 actions.

- The Navy does not expect any change in the use of Site 11, or of the surrounding sites, in the foreseeable future.

In summary, No Further Action is required for this site because there is no ongoing source of contamination at the site and it does not present a risk to human health or the environment. TPH in shallow unsaturated soil does not appear to be migrating vertically toward groundwater, and the potential for future migration is minimized by the arid climate at NAS Fallon and the existing concrete cap. Contaminants present in capillary-zone soil near the groundwater surface and groundwater at concentrations above the state action levels are within the petroleum hydrocarbon plume from Site 16, and will therefore be addressed as part of the ongoing remedial actions for Site 16.



U.S. NAVY

Figure 5-1
Generalized Stratigraphy of NAS Fallon

Delivery Order 0031
NAS Fallon
DECISION DOCUMENT
SITE 11

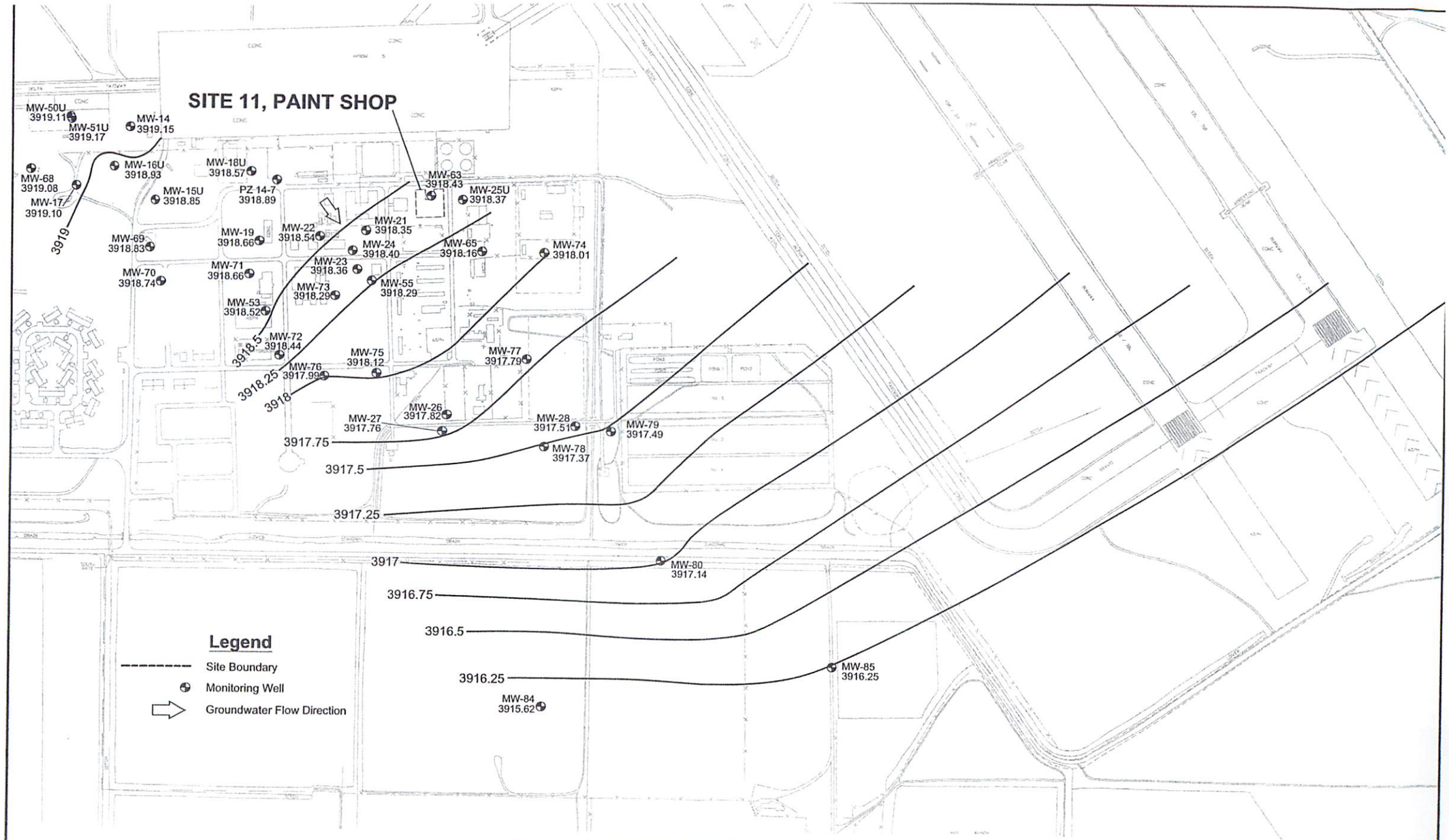


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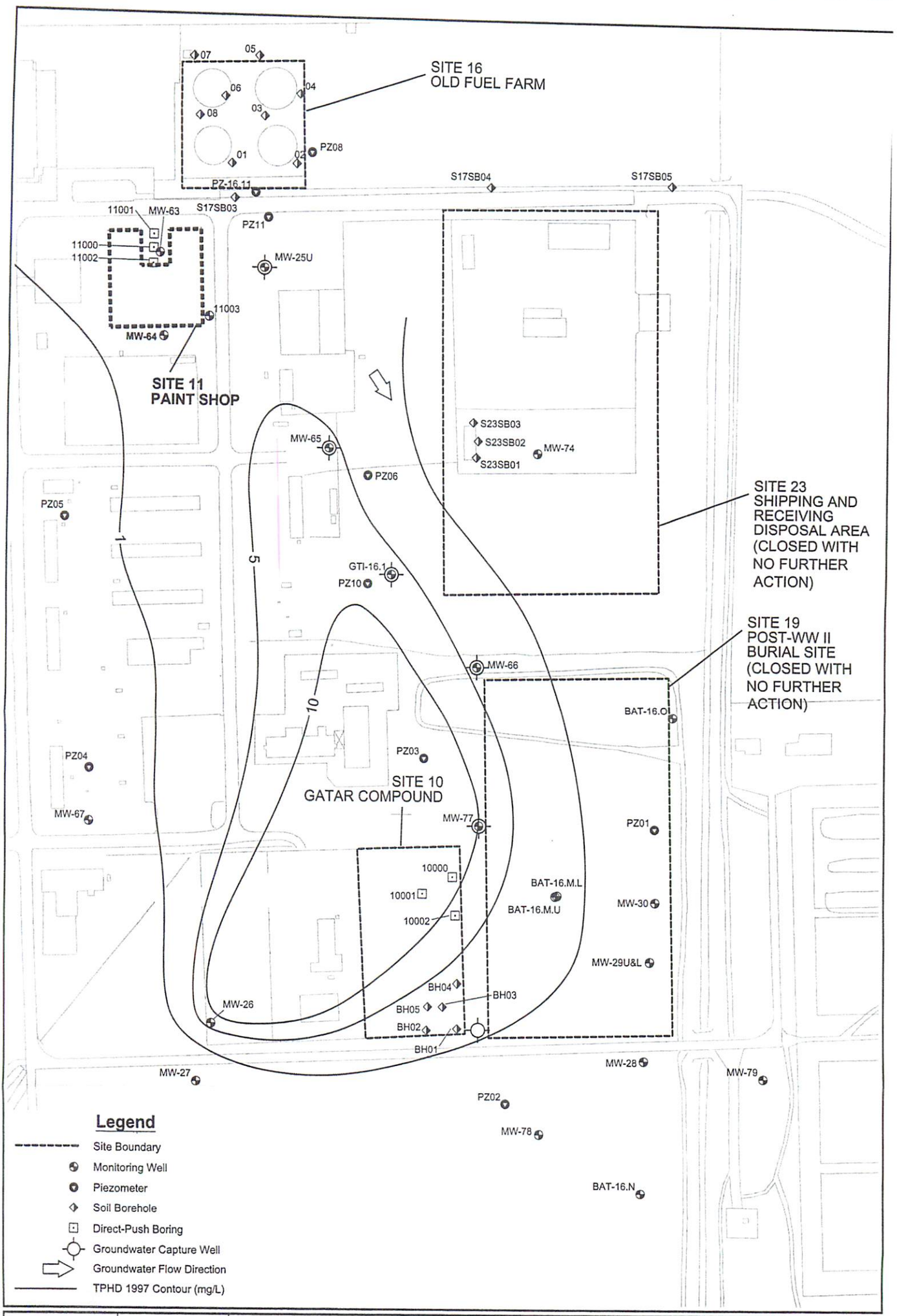
Figure 5-2
Groundwater Surface Elevation Contours, Southern Station Area, November 2002



U.S. NAVY	0 35 70 140 SCALE IN FEET	Figure 5-3 Generalized Distribution of Contaminants in Groundwater	Delivery Order 0031 NAS Fallon DECISION DOCUMENT SITE 11

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Table 5-1
Summary of Detected Organics in Soil Samples From Site 11, 1991 Through 2002

Analyte	No. of Samples Tested	No. of Detections	Minimum Concentration (mg/kg)	Average Concentration (mg/kg)	Maximum Concentration (mg/kg)	Action Level (mg/kg)	No. of Detections Greater Than Action Level	Location IDs With Detections Greater Than Action Level
Petroleum Hydrocarbons								
TPH-extractable	12	3	620	3,073	6,000	100[a]	3	11000, 11001, 11002
Volatile Organic Compounds[b]								
Methylene chloride	13	1	0.004	0.004	0.004	20.5[c]	0	MW-64
Semivolatile Organic Compounds[b]								
Bis(2-ethylhexyl)phthalate	13	1	2.5	2.5	2.5	1,200[c]	0	MW-64

[a]Nevada Administrative Code
[b]Methylene chloride and bis(2-ethylhexyl)phthalate were detected in one sample obtained during the remedial investigation. The detected concentrations are considered to be the result of suspected laboratory contaminant.
[c]EPA Region 9 preliminary remediation goals – residential soil

Notes:
mg/kg - milligram per kilogram
TPH - total petroleum hydrocarbon

Table 5-2
Summary of Detected Organics in Groundwater Samples From Site 11, 1991 Through 2003

Parameter	No. of Samples Tested	No. of Detections	Minimum Concentration (µg/L)	Average Concentration (µg/L)	Maximum Concentration (µg/L)	Action Level (µg/L)	No. of Detections Greater Than Action Level	Location IDs With Detections Greater Than Action Level
Petroleum Hydrocarbons								
TPH-purgeable	11	9	61	209	680	1,000[a]	0	None
TPH-gasoline	4	4	93	218	330	1,000[a]	0	None
TPH-extractable	11	8	60	428	2,400	1,000[a]	1	MW-11003
TPH-diesel	7	7	51	2,424	4,714	1,000[a]	4	MW-63
TPH-JP-5	2	1	50	50	50	1,000[a]	0	None
TPH-heavy fraction/oil	3	1	300	300	300	1,000[a]	0	None
Volatile Organic Compounds								
1,1-Dichloroethane	9	1	0.74	0.74	0.74	810[c]	0	None
1,1-Dichloroethene	11	3	0.21	0.83	1.2	7[b]	0	None
1,2-Dichloroethane	19	17	6	25.8	66	5[b]	17	MW-63, MW-64
1,2-Dichloropropane	9	1	0.2	0.2	0.2	5[b]	0	None
2-Hexanone	2	1	16	16	16	NE	NA	NA
4-Isopropyltoluene	8	1	0.36	0.36	0.36	NE	NA	NA
Benzene	18	16	0.49	82	330	5[b]	12	MW-63
Chlorobenzene	9	1	50	50	50	100[b]	0	None
Chloroethane	9	2	0.56	0.78	1.0	4.6[c]	0	None
Chloroform	18	17	2	13.7	49	80[b]	0	None
cis-1,2-Dichloroethene	10	5	0.64	1.3	2.4	70[b]	0	None

Table 5-2 (Continued)
Summary of Detected Organics in Groundwater Samples from Site 11, 1991 Through 2003

Parameter	No. of Samples Tested	No. of Detections	Minimum Concentration (µg/L)	Average Concentration (µg/L)	Maximum Concentration (µg/L)	Action Level (µg/L)	No. of Detections Greater Than Action Level	Location IDs With Detections Greater Than Action Level
Volatile Organic Compounds (Continued)								
Ethylbenzene	12	2	1.0	1.9	2.8	700[b]	0	None
Isopropylbenzene	8	4	0.66	0.97	1.2	660[c]	0	None
Propane	4	2	2	2.5	3	NE	NA	NA
sec-Butylbenzene	8	1	0.14	0.14	0.14	243[c]	0	None
Toluene	13	1	1.0	1.0	1.0	1000[b]	0	None
Trichloroethene	16	14	0.3	4.3	12	5[b]	4	MW-63
m,p-Xylene	9	1	12	12	12	10,000[c]	0	None
o-Xylene	11	1	3	3	3	10,000[c]	0	None
Xylenes	4	2	0.7	1.35	2	10,000[c]	0	None
Semivolatile Organic Compounds								
Burylbenzylphthalate	3	1	2	2	2	7300[c]	0	None
Bis-(2-ethylhexyl)phthalate	7	5	2	5	8	6[b]	1	MW-64
Pentachlorophenol	4	3	7	11.3	16	1.0[b]	3	MW-64

Table 5-2 (Continued)
Summary of Detected Organics in Groundwater Samples from Site 11, 1991 Through 2003

[a]Nevada Department of Environmental Protection guidance concentration
[b]Maximum contaminant level
[c]EPA Region 9 preliminary remediation goals – tap water

Notes:
µg/L - microgram per liter
NA - not applicable
TPH - total petroleum hydrocarbons

Table 5-3
Summary of Detected Metals in Groundwater Samples From Site 11, 1991 Through 2003

Parameter	No. of Samples Tested	No. of Detections	Minimum Concentration (mg/L)	Average Concentration (mg/L)	Maximum Concentration (mg/L)	PRG/MCL (mg/L)	Naturally Occurring Background (mg/L)	No. of Detections Greater Than PRG/MCL	Location IDs With Detections Greater Than PRG/MCL
Metals									
Iron	4	1	0.048	0.048	0.048	11[a]	0.011 to 3.04	0	None
Manganese	4	4	0.098	0.654	1.16	0.88[a]	0.002 to 8.95	1	MW-63
Water Quality									
Total dissolved solids	4	4	15,700	26,300	42,200	NA	NA	NA	None

[a]U.S. Environmental Protection Agency (EPA) Region 9 preliminary remediation goals – tap water

Notes:
MCL - maximum contaminant level
mg/L - milligram per liter
NA - not applicable
PRG - EPA Region 9 preliminary remediation goal

6.0 CURRENT AND POTENTIAL SITE AND RESOURCE USES

NAS Fallon currently serves primarily as an aircraft weapons delivery and tactical air combat training facility. The Navy is expected to maintain NAS Fallon in the foreseeable future. Operations at the Paint Shop were modified during 1986 to eliminate disposal of paint waste onto the ground. In addition, the paving of the former paint handling area reduces the possibility of accidental release of paint or paint waste into the soil at the site. NAS Fallon does not expect any change in the use of this land or that of the surrounding sites in the foreseeable future.

The Overview Plan for NAS Fallon includes a discussion of all potentially contaminated areas in the IR Program and their locations. Any future construction projects conducted at Site 11 will be subjected to an environmental review. The Environmental Department at NAS Fallon oversees the environmental review process. Projects are reviewed by the Occupational Safety and Health Office, the Fire Department, the Security Department, the Engineering and Planning Divisions of Public Works, and the Environmental Department. This review process is included in all NAS Fallon planning activities. Information provided by the Environmental Department relates to potential contact with contaminated soil and groundwater as a result of these projects.

Groundwater at the site is not currently used as a drinking water or other water source. The Navy does not expect to use groundwater at this site for any purpose in the foreseeable future.

7.0 SUMMARY OF SITE RISKS

The analytical results from sampling at Site 11 have confirmed the presence of one contaminant, extractable-range TPH, above the state action level in soil. TPH associated with Site 11 activities is located in the upper 1 foot of soil at the site and is not migrating to groundwater. TPH is also present in capillary-zone soil near the groundwater surface beneath Site 11, as the result of migration of petroleum-related chemicals in groundwater from Site 16. The contaminant plume emanating from Site 16 also results in the presence extractable-range TPH in groundwater beneath Site 11. The VOCs 1,2-dichloroethane, benzene, and trichloroethene in groundwater beneath Site 11 at concentrations above state action levels may be a result of Site 11 activities, however these compounds were not detected in soil samples collected from Site 11. Contaminants from Site 16 and contaminants that are present beneath Site 11 are being addressed through actions relative to Site 16.

A baseline risk assessment was not performed for Site 11 soils due to the absence of detected contaminants of concern in the single soil sample collected from location MW-64 during 1991. The subsequent collection and analyses of 12 soil samples from Site 11 during 2002 did not identify detectable concentrations of COCs other than extractable-range TPH, as discussed in the preceding paragraph. The site continues to be used as a Paint Shop and is anticipated to continue under this usage into the future. Given this anticipated future use and the fact that the ground surface within the former paint handling area at the site is paved with concrete, the only completed exposure route to on-site soil is to construction workers during excavation activities. Exposure to these soils through excavation is controlled by the Overview Plan review process for all construction projects at NAS Fallon.

A baseline risk assessment was performed for groundwater at the Group IV sites. The maximum detected concentration was used for each chemical detected at the Group IV sites to estimate risks from human exposure to groundwater at the Group IV sites. Chloroform was the only compound detected at Site 11 which represented the maximum detection in the Group IV Sites and was used in the Group IV baseline risk assessment. The detected chloroform concentration of 49 µg/L is below the state action level of 80 µg/L. Since the maximum detected concentrations reported for the remaining COCs at the Group IV sites were not reported from samples collected at Site 11, the risk calculated for the Group IV sites is not representative of the risk at Site 11. Therefore, the results of the risk assessment are not presented here.

However, a qualitative analysis of site risks is possible based on the sampling results. TPH-E, 1,2-dichloroethane, benzene, bis-(2-ethylhexyl)phthalate, pentachlorophenol, and trichloroethene were the compounds detected in groundwater above the state action levels at Site 11. Since the concentrations for these compounds exceed the state action levels, risks due to exposure to these

chemicals may be unacceptable. Although risks may exist due to exposure to these compounds, the lateral extent of these compounds in groundwater is within the petroleum hydrocarbon plume from Site 16. Therefore, the risk posed by these chemicals in groundwater at Site 11 is being mitigated through remedial actions for the upgradient Site 16. Therefore, the preferred alternative for Site 11 is No Further Action.

8.0 STATUTORY AUTHORITY FINDING

Extractable-range TPH was detected in soil and groundwater at concentrations above the respective state action levels. TPH-E in soil was found in two discrete intervals: near-surface soil less than 1 foot bgs and capillary-zone soil near the groundwater surface. In addition, 1,2-dichloroethane, benzene, bis-(2-ethylhexyl)phthalate, pentachlorophenol, and trichloroethene were detected at concentrations above the state action levels in groundwater. The presence of bis-(2-ethylhexyl)phthalate and pentachlorophenol in groundwater samples was attributed to laboratory cross contamination during the RI. Petroleum hydrocarbon compounds (TPH and benzene) in groundwater and capillary-zone soil near the groundwater surface are determined to be the result of releases at Site 16 and are being addressed as part of the remedial actions implemented for Site 16. TPH-E in near-surface soil is interpreted to be the result of paint handling or disposal activities at Site 11, but has not migrated downward towards groundwater. The potential for soil contaminants to migrate downward to groundwater is minimized by the presence of concrete pavement in the former paint handling area and the arid climate typical of NAS Fallon. VOCs in groundwater at and in the vicinity of Site 11 are being addressed via ongoing remedial actions relative to Site 16.

Based on these observations, TPH-E in near surface soil (1 foot bgs or less) does not pose a risk to human health or the environment. The risks posed by VOCs in groundwater are being mitigated by ongoing remedial actions relative to Site 16. Accordingly, no further action is required at this site. This action is in accordance with and complies with applicable statutes and regulations.

9.0 DOCUMENTATION OF SIGNIFICANT CHANGES

No public comments were received during the public comment period. As a result, there were no significant changes to the Proposed Plan or this decision document.

10.0 BIBLIOGRAPHY

This document was prepared with the use of information contained in the Administrative Record for Site 11, Paint Shop, NAS Fallon, Nevada. The Administrative Record is available at NAS Fallon; the Churchill County Public Library in Fallon, Nevada; and at Engineering Field Activity, West, Offices in Daly City, California. The primary documents used as sources of the information contained in this decision document are listed below.

Glancy, P.A. 1986. Geohydrology of the Basalt and Unconsolidated Sedimentary Aquifers of the Fallon Area, Churchill County, Nevada. U.S. Geological Survey Water Supply Paper 2263.

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APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Notice of the public comment period was published in the *Lahontan Valley News* on November 17 and 18, 2004. The public comment period extended from November 15, 2004 through December 15, 2004. The public meeting presenting the Proposed Plan was held at the Agricultural Service Center, on November 18, 2004. As of December 20, 2004, the Navy had received no public comments.