Decision Document
for
Site 12, Pest Control Shop

Naval Air Station Fallon
Fallon, Nevada

Delivery Order 0029

November 2003

ARCHITECT-ENGINEERING SERVICES
ENVIRONMENTAL RESTORATION PROJECTS

ENGINEERING FIELD ACTIVITY NORTHWEST, NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO: N44255-00-D-2476

THE URS TEAM

URS Group, Inc.

White Shield, Inc.

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EnviroIssues

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DECLARATION OF THE DECISION

SITE NAME AND LOCATION

Site 12, Pest Control 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 12, Pest Control 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 general 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 Pest Control Shop (Installation Restoration [IR] Site 12), NAS Fallon, Nevada. Data collected within, upgradient, and downgradient of Site 12, indicate that contaminants associated with Site 12 activities have not migrated from the site. No pesticide compounds, the contaminants of concern for this site, were detected in soil samples, or the most recent groundwater samples, at concentrations above the state action levels. Contaminants present in groundwater and soil in the smear zone at concentrations above state the action levels are associated with releases from Site 14, which is located upgradient of Site 12. Contaminants observed in soil and groundwater at Site 12 that are related to Site 14 will be addressed as part of the planned remedial actions for Site 14. Petroleum hydrocarbon contamination in near-surface soil at Site 12 has not migrated to groundwater, and the potential for future migration is minimized by the arid climate at NAS Fallon.

STATUTORY DETERMINATIONS

The selected remedy for Site 12 is protective of human health and the environment and in compliance with federal and state applicable or relevant and appropriate requirements (ARARs). Although soil at and near the groundwater surface contains concentrations of petroleum hydrocarbons above state action levels, this contamination is associated with releases from Site 14. Petroleum hydrocarbons in near surface soil are not leaching to groundwater. TPH, 1,2-dichloroethane, benzene, chloroform, methylene chloride, and naphthalene were detected at concentrations above the state action levels in groundwater. However, these compounds are associated with releases at Site 14 and will therefore be addressed as part of the planned remedial actions for Site 14. TPH contamination in near-surface soil at Site 12 has not migrated to groundwater, and the potential for future migration is minimized by the arid climate at NAS Fallon. Chloromethane, 2,4-dichlorophenol, and alpha-BHC have historically been detected in Site 12 groundwater at concentrations exceeding the state action levels, but these chemicals were not detected in the most recent groundwater samples analyzed for these compounds (1993 for 2,4-dichlorophenol and 2002 for chloromethane and alpha-BHC). Finally, although carbon tetrachloride was detected in groundwater at Site 12 but not Site 14, the presence of breakdown compounds of carbon tetrachloride in groundwater at Site 14 indicates that Site 14 is also the source of carbon tetrachloride at Site 12. 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 (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 12, Pest Control Shop
Naval Air Station Fallon
Fallon, Nevada

CERCLIS Identification Number
NV9170022173

Captain Brad T. Goetsch
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26 NOV 03
Date

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25 NOV 03
Date

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ABBREVIATIONS AND ACRONYMS

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cm/sec	centimeter per second
CRP	community relations plan
EPA	U.S. Environmental Protection Agency
ER, N	Environmental Restoration, Navy
FS	feasibility study
GC	gas chromatograph
HBP PHC	high-boiling-point petroleum hydrocarbons
HI	hazard index
IR	Installation Restoration
LBP PHC	low-boiling-point petroleum hydrocarbons
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
NPL	National Priorities List
PA	preliminary assessment
PID	photoionization detector
RAB	Restoration Advisory Board
RI	remedial investigation
SI	site inspection
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbons
TPH-E	total petroleum hydrocarbons—extractable
TPH-P	total petroleum hydrocarbons—purgeable
TRC	technical review committee
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 12, Pest Control Shop, at Naval Air Station (NAS) Fallon, in Fallon, Nevada.

This decision document supersedes and replaces the *Draft Final Decision Document, Site 12, Pest Control 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 decisionmaking 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 12 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 12

- **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 12

- **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 70 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 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 as 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 12, Pest Control Shop, is located in the northwestern part of the southern portion of NAS Fallon, north of Site 13 and southeast of Site 14 (Figure 2-2). 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 the Nevada Division of Environmental Protection (NDEP) serves as the lead regulatory agency.

Site 12 was investigated as part of the Group IV sites, nine sites that were grouped together because of their proximity and the potential for commingled contaminated areas. The surface of Site 12 consists generally of both paved and unpaved areas with no buildings.

The Pest Control Shop was located in Building 224 and was in operation starting in the early 1960s (Figure 2-3). However, records of site activities are available only for 1974 to the present (ORNL 1994). Operations at the Pest Control Shop were terminated in September 1997, and all pesticides were subsequently removed from the site. Building 224 (Pest Control Shop) was demolished shortly thereafter.

During the initial environmental investigation at Site 12, two potentially contaminated leach field areas were identified near the Pest Control Shop: the northern leach field (north of the shop) and the southern leach field. During the operational period, the northern leach field received residual water from the mixing of pesticides and water generated during the rinsing of empty containers inside the shop. The southern leach field received runoff generated during the rinsing of pest control vehicles.

The volume of pesticides released on site between 1974 and 1987 was estimated to be 30 gallons of pesticide-bearing liquid (i.e., 15 gallons per leach field). The estimate was based on the assumption that 2,000 gallons of pesticides were used per year and that 0.001 gallons of waste per gallon of pesticide was released to the environment. Prior to 1974, no records were available on the pesticide usage. Therefore, it was assumed that the pre 1974 usage was the same as the post 1974 usage, and the total gallons of pesticide-bearing liquid was estimated to be 60 gallons (NEESA 1988). Prior to 1974, 4,4-DDT was reportedly in use on site. After 1974, the pesticides malathion, pyrethrin, diazinon, and 2,4-dichlorophenoxyacetic acid (2,4-D) were used.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The purpose of the Navy's 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:

- Phase I consisted of a preliminary assessment (PA)/site inspection (SI). The PA/SI consisted of a records search, a site visit, and employee interviews. No environmental samples were collected. Additional study in the form of soil and groundwater testing to assess the vertical and lateral extent of contamination was recommended for Site 12 because of historical practices of disposing pesticide-bearing waters into on-site leach fields.

- Phase II consisted of a Preliminary Site Characterization Summary (PSCS). The purpose of the PSCS was to assess the presence or absence of contamination through soil and groundwater testing and, if necessary, to recommend appropriate remedial measures. The site characterization consisted of the completion of 3 groundwater test holes and 6 soil borings (three from each of the suspected leach fields) from which soil samples were collected, and the installation of one groundwater monitoring well (MW-22), located downgradient of the two suspected leachfields. One soil sample was collected from the borehole of well MW-22 prior to well construction, and one groundwater sample was collected from the

completed well. The analytical results for samples collected from the soil borings indicated the presence of 4,4-DDT, 4,4-DDD, and 4,4-DDE in 3 samples. In addition, the groundwater sample collected from well MW-22 (in April 1991) contained TPH-P, benzene, the pesticide 2,4-dichlorophenol, chloroform, and several unidentified SVOCs. Based on the presence of these chemicals in soil and groundwater, more soil borings were recommended to further characterize site soils. Also recommended was the installation of an additional groundwater monitoring well.

- Phase III activities consisted of a remedial investigation. In response to the recommendations presented in the PSCS, one additional soil boring was drilled in the northern leach field in August 1991. No pesticides were detected in this boring. In August 1991, groundwater from well MW-22 was tested for petroleum hydrocarbons, pesticides, SVOCs, and VOCs. Petroleum hydrocarbons and related compounds, TPH-E, benzene, and total xylenes, were detected. The SVOCs and VOCs 1,2-dichlorobenzene, 2,4-dichlorophenol, 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, 1,1,1-trichloroethane and 1,1-dichloroethane were detected. The pesticides gamma-benzene hexachloride [gamma-BHC or lindane] and alpha-benzene hexachloride [alpha-BHC] were detected.

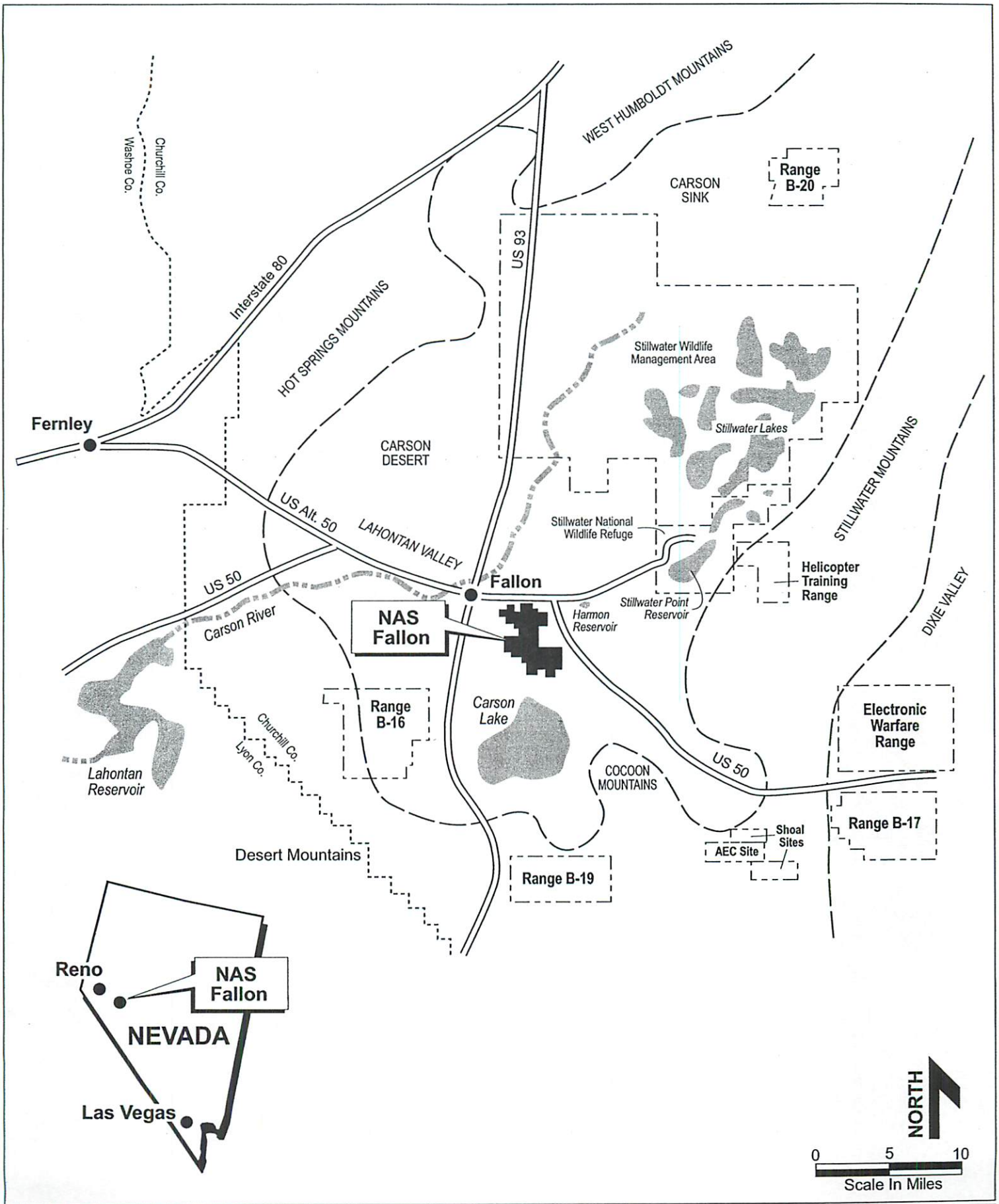
- Phase IV consisted of periodic groundwater monitoring between 1995 and 1999. Groundwater samples were collected from upgradient wells and piezometers (MW-18L, MW-18U, PZ-14-7, PZ-14-6, GTI-14-2, MW-52, MW-20, and BAT-14-F), the on-site well (MW-22), and downgradient wells (MW-21 and MW-24).

- Phase V was conducted to collect additional site characterization data in response to a NDEP request. The scope of the Phase V activities was negotiated with and approved by NDEP. Additional samples were collected from three direct-push borings. Two borings were located in each of the former leach fields, and one was positioned upgradient. Soil and groundwater samples were obtained from each direct-push boring. In addition, groundwater samples were collected from four existing monitoring wells located on-site or downgradient of the site. The primary target compounds (pesticides) were detected at very shallow depths in soil not in contact with groundwater, and at concentrations below state action levels. Pesticides were not detected in groundwater samples collected from the site at concentrations above reporting limits. TPH-E was detected in 5 soil samples at concentrations greater than the state action level of 100 mg/kg. TPH-E was detected in one groundwater sample greater than the guidance concentration of 1,000 µg/L. Petroleum hydrocarbons were not reportedly handled or disposed of at

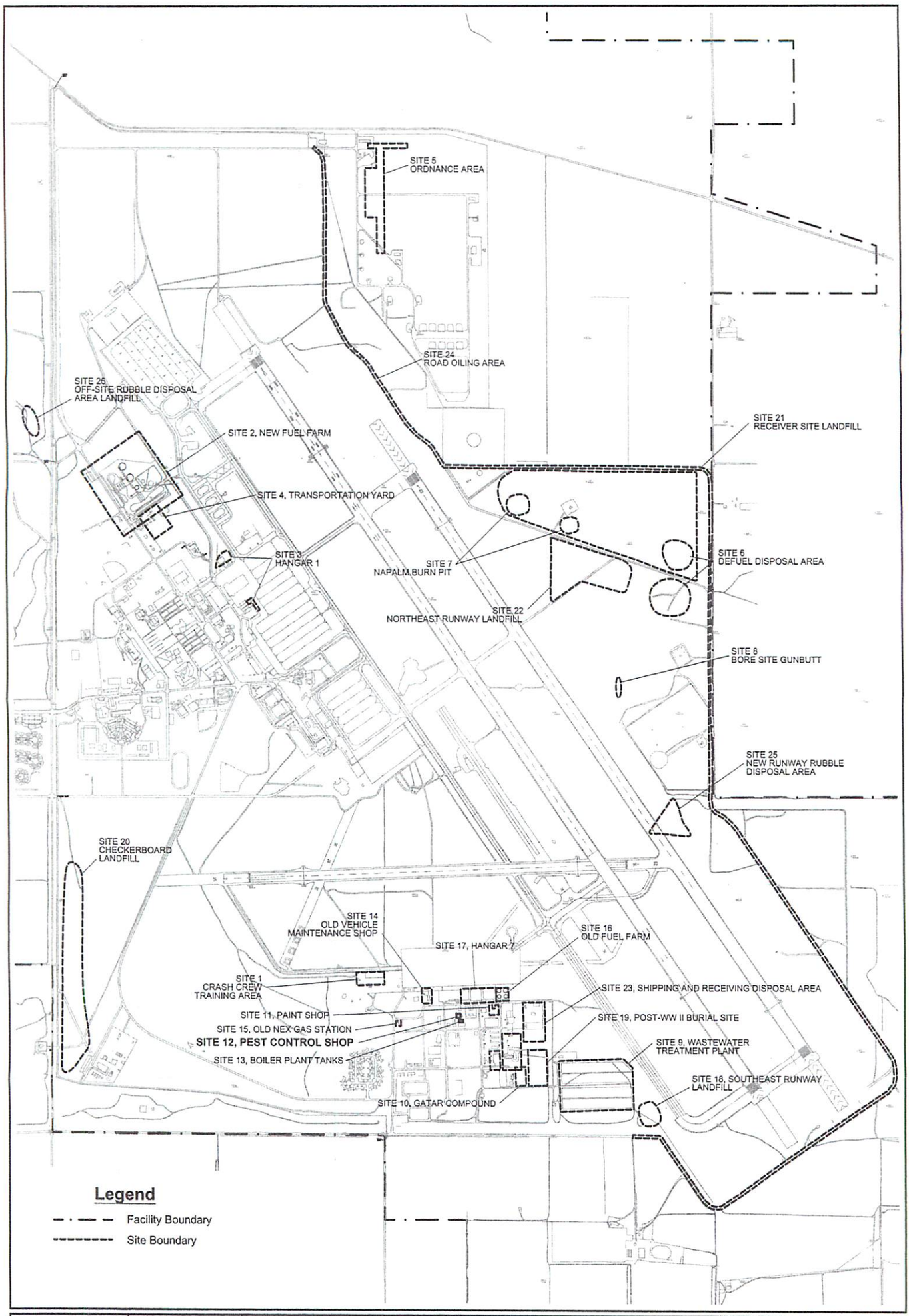
Site 12. The VOCs, 1,2-Dichloroethane, benzene, carbon tetrachloride, chloroform, and naphthalene, were detected in groundwater samples collected from Site 12 at concentrations greater than state action levels. None of these analytes were detected in soil samples collected from Site 12. Solvents were reportedly used at Site 14, upgradient of the site.

After the RI was published, the Navy prepared a draft decision document (in June 1998) for Site 12 presenting a decision of No Further Action. The NDEP provided comments on the draft decision document. A draft final decision document for Site 12 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 12. 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 0029 NAS Fallon DECISION DOCUMENT SITE 12



U.S. NAVY	N; 0 350 700 1400 SCALE IN FEET	Figure 2-2 NAS Fallon Facility Map	Delivery Order 0029 NAS Fallon DECISION DOCUMENT SITE 12

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Figure 2-3
Site 12, Pest Control 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).

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 12, were made available to the public in the Administrative Record at NAS Fallon (Fallon, Nevada), the Churchill County Public Library (Fallon, Nevada), the University of Nevada Reno Library (Reno, Nevada), and at the Engineering Field Activity, Northwest, Offices (Poulsbo, Washington). The notice of the availability of these documents was published in the *Lahontan Valley News* on October 3, 2003. Notices were also sent to the RAB Co-Chair. A public comment period was held from October 8 through November 7, 2003. In addition, a public meeting was held on October 15, 2003, 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

There are 27 IR sites at NAS Fallon. The locations of all 27 IR sites are shown on Figure 2-2. Site 1 (Crash Crew Training Area) is located in the southern station area northwest of Site 12. Intrinsic remediation is being implemented at Site 1 to address hydrocarbon and volatile organic impacts. Site 2 (New Fuel Farm) and Site 4 (Transportation Yard) are combined in the RI as "Group I Sites" and are located in the northwestern portion of the station. A feasibility study will be completed in late 2003 to evaluate alternatives for product recovery and dissolved hydrocarbon impacts at these two sites. Site 3 (Hangar 1) consists of two areas located southeast of the Group I Sites. Site 5 (Ordnance Area) is located in the extreme northern portion of the station and has been determined to require no further action (i.e., it is a "NOFA" site). Site 6 (Defuel Disposal Area), Site 7 (Napalm Burn Pit), Site 21 (Receiver Site Landfill), and Site 22 (Northeast Runway Landfill) are combined in the RI as Group II Sites and are located in the eastern portion of the station. Site 7 is a NOFA site. Site 8 (Bore Site Gunbutt) is NOFA site located in the eastern portion of the station just south of the Group II Sites. Site 9 (Wastewater Treatment Plant) and Site 18 (Southeast Runway Landfill) are combined in the RI as Group III Sites and are located in the southeastern portion of the station. Site 10 (GATAR Compound), Site 11 (Paint Shop), Site 12 (Pest Control Shop), Site 13 (Boiler Plant tanks), Site 14 (Old Vehicle Maintenance Shop), Site 15 (Old NEX Gas Station), Site 16 (Old Fuel Farm), Site 17 (Hangar 7), Site 19 (Post-WW II Burial Site), and Site 23 (Shipping and Receiving Disposal Area) are combined in the RI as Group IV Sites and are located in the southern portion of the station. Air-sparging is being conducted within the source area of Site 14 to address petroleum hydrocarbon and volatile organic impacts to groundwater at Site 14. Intrinsic remediation is planned for the downgradient extent of the plume originating from Site 14, which also underlies Site 12. Intrinsic remediation is also planned for the hydrocarbon plume originating from Site 16. Site 20 (Checkerboard Landfill) is located in the southeastern portion of the station. Site 24 (Road Oiling Area) is a road located along the eastern perimeter of the station. Site 25 (New Runway Disposal Area) is a no further action site located along the eastern boundary of the station. Site 26 (Off-Site Rubble Disposal Area Landfill) is a no further action site located along the western border of the station. Site 27 (Diesel Fuel Spill Site) is a no further action site located along the access road to bombing range B-17.

The sampling locations used to evaluate Site 12 are as follows:

- Three auger-boring locations adjacent to Site 12 from which groundwater samples were collected for qualitative analysis (these locations are sometimes referred to as "groundwater test holes")
- Seven auger-boring locations within Site 12 from which soil samples were collected

- One permanent monitoring well located at Site 12 from which a soil sample and groundwater samples were collected
- Eleven permanent monitoring wells or piezometers located upgradient and downgradient of Site 12 from which groundwater samples were collected
- Three direct-push borings in the vicinity of Site 12 from which soil and groundwater samples were collected

The sampling locations used as a basis for the decision for Site 12 are summarized in Table 4-1, along with the gradient relationships to Site 12 and the uses of the data from each location. Table 4-2 provides a chronological summary of quantitative sampling activities at each location.

The three groundwater test holes were initially completed to qualitatively evaluate potential contamination related to Site 12, as well as other Group IV Sites. The seven auger-boring locations were installed to evaluate the impacts of Site 12 activities on the soils at Site 12. The permanent monitoring well located at Site 12 was used to assess the presence of contaminants in the soil and groundwater related to Site 12 activities. The seven permanent monitoring wells and piezometers located upgradient of Site 12 were used to assess whether contaminants were migrating onto Site 12 from the upgradient source at Site 14. The two permanent monitoring wells located downgradient of Site 12 were used to assess whether contaminants were migrating from Site 12 to adjoining areas. Two of the three direct-push borings were installed to evaluate the impacts of Site 12 activities on the soils at Site 12. One of the three direct-push borings was installed to further assess whether contaminants were migrating onto Site 12 from the upgradient source at Site 14.

Table 4-1
Summary of Data From Sampling Locations Used as Basis of Decision for Site 12, Pest Control Shop

Sampling Location	Data Type	Data Uses
Locations Within Site 12		
Groundwater test holes 28, 29, and 30	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
Boreholes BH-01 through BH-07	Quantitative	Quantitative assessment of presence or absence of potential contaminants in soil related to the activities at the Pest Control Shop
Boreholes 12002 and 12003	Quantitative	Quantitative assessment of presence or absence of potential contaminants in soil and groundwater related to the activities at the Pest Control Shop
Well MW-22	Quantitative	Quantitative assessment of presence or absence of potential contaminants in soil and groundwater related to activities at the Pest Control Shop
Locations Upgradient of Site 12		
Borehole 12001	Quantitative	Quantitative assessment of presence or absence of potential contaminants migrating on-site from upgradient source (Site 14)
Wells BAT-14-F, MW-18U, MW-18L, MW-20, MW-52, GTI-14-2 and piezometers PZ-14-2, PZ-14-6 and PZ-14-7	Quantitative	Quantitative assessment of presence or absence of potential contaminants migrating on-site from upgradient source (Site 14)
Locations Downgradient of Site 12		
Well MW-21 and MW-24	Quantitative	Quantitative assessment of presence or absence of potential contaminants in groundwater downgradient of the Pest Control Shop

Note:
BH - borehole
LNAPL - light nonaqueous-phase liquid
MW - monitoring well

Table 4-2
Chronological Quantitative Sampling Summary

Sampling Location	Matrix	Sampling Dates	Range of Analyses[a]
Boreholes BH-01, BH-02, BH-03, BH-04, BH-05, BH-06, and BH-07	Soil	3/91	PCBs and pesticides
MW-18U	Soil and Groundwater	4/91, 10/93, 9/96, 9/97, 9/98, 4/99, 9/99, 11/99	TPH, VOCs, SVOCs, pesticides, metals
MW-18L	Soil and Groundwater	4/91, 10/93, 9/96, 9/97, 9/98, 4/99, 9/99, 11/99	TPH, VOCs, SVOCs, pesticides, metals
MW-22	Soil	3/91	Petroleum hydrocarbons, PCBs, pesticides, VOCs, and SVOCs
MW-22	Groundwater	4/91, 8/91, 10/93, 3/95, 9/95, 9/96, 3/97, 9/97, 3/98, 9/98, 4/99, 9/99, 11/99, 4/02	Petroleum hydrocarbons, PCBs, pesticides, VOCs, SVOCs, metals, and water quality parameters
MW-20	Groundwater	4/91, 8/91	Petroleum hydrocarbons, PCBs, pesticides, VOCs, SVOCs, metals, and water quality parameters
MW-21	Groundwater	4/91, 8/91, 10/93, 3/95, 9/96, 3/97, 9/97, 12/97	Petroleum hydrocarbons, PCBs, pesticides, VOCs, SVOCs, metals, and water quality parameters
MW-24	Groundwater	4/91, 8/91, 10/93, 3/95, 9/96, 3/97, 9/97, 4/02	Petroleum hydrocarbons, PCBs, pesticides, VOCs, SVOCs, metals, and water quality parameters
MW-52	Groundwater	12/91	TPH, VOCs, SVOCs, metals,
12002 and 12003	Soil	4/02	Petroleum hydrocarbons, pesticides, VOCs, and metals
12001	Soil	4/02	Petroleum hydrocarbons, pesticides, and VOCs
12001, 12002, and 12003	Groundwater	4/02	Petroleum hydrocarbons, pesticides, and VOCs
BAT-14-F	Groundwater	9/97	Petroleum hydrocarbons, VOCs, metals (iron and manganese only), and water quality parameters
GTI-14-2	Groundwater	9/96, 3/97, 3/98, 9/98, 4/99, 9/99	TPH, VOCs, SVOCs, pesticides, metals
PZ-14-2	Groundwater	3/95, 9/95, 9/96, 3/97, 9/97, 3/98, 11/99	TPH, VOCs, metals
PZ-14-6	Groundwater	10/93, 3/95, 9/95, 9/96, 3/97, 9/97, 3/98, 9/98, 4/99, 9/99, 11/99	TPH, VOCs, metals
PZ-14-7	Groundwater	3/95, 9/95, 9/96, 3/97, 9/97, 3/98, 11/99	TPH, VOCs, metals

[a]All analyses in the range shown were not necessarily performed on each sampling date.

Notes:
BH - borehole
MW – monitoring well
PCBs – polychlorinated biphenyls
SVOCs - semivolatile organic compounds
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 source of water in this drain is backflow from the LD drain during the irrigation season. During rare storm events, stormwater in small ditches may enter the unnamed drain.

5.1.2 Site 12 Physical Setting

Site 12, Pest Control Shop, is located in the northwestern part of the southern portion of NAS Fallon, north of Site 13 and southeast of Site 14 (Figure 2-2). Site 12 encompasses approximately 0.2 acres, extending approximately 90 feet east to west and 90 feet from north to south (excluding the leach fields). The surface of Site 12 consists generally of unpaved areas. The pest control shop building was removed in late 1997. 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 12.

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.

A generalized geologic fence diagram showing the stratigraphy beneath NAS Fallon is provided 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). Many residents living outside of the city of Fallon have shallow wells in this aquifer, which are used for domestic water, livestock watering, and irrigation. 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. The velocity of the regional groundwater flow has been estimated to be 35 feet per year. 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 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 12 Geology and Hydrogeology

The geologic information for the Site 12 was obtained by soil sampling or cone penetrometer investigation during the installation of monitoring wells BAT-14-F, MW-20, MW-21, MW-22, MW-24, and soil borings 12001 through 12003 (Figure 5-2). Subsurface investigations at the site were limited to the shallow alluvial aquifer because of the presence of a silty clay aquitard at the base of this aquifer. None of the monitoring wells are located within the site boundaries. BAT-14-F is located upgradient of the site to the northwest. MW-20 and MW-21 are located crossgradient of the site to the west and east respectively. MW-22 and MW-24 are located downgradient to the south of the site.

The monitoring wells listed in the previous paragraph typically penetrated the entire Fallon Formation and from 2 to 10 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 25 feet. A generalized fence diagram is provided as Figure 5-3.

The aquitard was generally observed at depths ranging from 15 to 19.5 feet bgs. The aquitard was not encountered to a depth of 20 feet at MW-20. Sand with variable amounts of silt was the main soil type observed at the site above the aquitard. Silt was observed from the ground surface to a depth of approximately 8 feet bgs at BAT-14-F. This silt extends to location 12001 and 12002 and appears to pinchout to the southwest (Figure 5-3).

Groundwater surface elevation contours derived from November 2002 data collected across the southern station area indicate a gradient and flow direction at Site 12 that are consistent with the regional flow direction, which is to the southeast. Depth to groundwater in wells used to evaluate conditions at Site 12 varies seasonally and ranges from 6.5 to 7.0 feet bgs. The average hydraulic gradient across the site was approximately 0.0006 in November 2002. Groundwater surface elevation contours for data collected in November 2002 is shown on Figure 5-4.

Bail tests were conducted on selected wells at the Group IV sites in April 1991 and June 1992. Wells MW-21 and MW-24 were bail tested in June 1992. Multiple bail tests were conducted at each location. The highest calculated hydraulic conductivity for each well location follows:

- MW-21: 1.14 feet/day, or 4.0×10^{-4} cm/sec
- MW-24: 0.69 feet/day, or 2.4×10^{-4} cm/sec

The highest bail test-derived hydraulic conductivity was observed at Well MW-21, and the lowest hydraulic conductivity was observed at Well MW-24. Assuming a porosity of 30 percent, the range of groundwater velocities across the site is 0.5 to 0.8 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 in the area of Site 2. The lithology in the area of well W-20 is similar to that observed in the area of Site 17. Pumping test-derived hydraulic conductivities were estimated at 38.9 to 61.6 feet per day. These estimates are 30 to 60 times higher than the highest bail test-based estimate of 1.14 feet per day at wells near Site 12, suggesting that groundwater velocity across the site could be as high as 48 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 12 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 total petroleum hydrocarbons [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 feet (NAC 445A.22735).

- For contaminants in groundwater, compare the maximum contaminant levels (MCLs) listed in the U.S. Environmental Protection Agency (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 Preliminary Remediation Goals [PRGs]).

The Nevada Administrative Code does not provide a state action level for TPH in groundwater. The Nevada Division of Environmental Protection 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. In the absence of a NAC specified state action level for soil, the Navy will use EPA Region 9 PRGs as goals.

The PA/SI identified rinse water from rinsing pest control vehicles and empty pesticides containers as the only waste materials that may have been released to the environment at Site 12.

5.5 NATURE AND EXTENT OF CONTAMINATION

This section first summarizes results of investigations at Site 12, then discusses in detail (in the following subsections) contaminants in soil and groundwater. Investigations at the site include:

- Qualitative analysis of groundwater test holes to assess the presence of absence of volatile contaminants at Site 12
- Soil sampling to the north and south of existing site buildings to determine impacts from Site 12 activities on the soil at the site
- Groundwater sampling at the Site to determine if site activities have impacted site groundwater
- Groundwater sampling upgradient and downgradient of the Pest Control Shop to determine if site activities have impacted site groundwater

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

TPH-E, TPH-P, VOCs, SVOCs, pesticides, and metals were detected in soil samples collected at Site 12. TPH, VOCs, and SVOCs were not considered chemicals of concern at Site 12. TPH-E was detected in a total of 7 samples, of which 5 of the detected concentrations were above the state action level of 100 mg/kg. Two of these detections were in soil at depths less than 1.25 feet bgs. The remaining TPH-E detections greater than state action levels were from depths below saturation (7 to 9 feet bgs). Results reported for soil samples collected below the water table are biased by the presence of contaminated groundwater in the samples. Petroleum and other organic compounds have been released from Site 14, which is located approximately 400 feet upgradient of Site 12 (Figure 2-2). The TPH-E detections in near-surface soil are interpreted to be the result of activities of Site 12. The detections of TPH-E in soil near the water table at Site 12 are interpreted to be the result of migration of petroleum hydrocarbons from Site 14 in groundwater. TPH-P was detected in 2 of the 17 samples analyzed for TPH. None of the TPH-P detections were above the state action level of 100 mg/kg.

A total of 17 soil samples were collected and analyzed for VOCs. Acetone, naphthalene, and o-xylene were detected in one or more of the samples collected at Site 12. However, no detected VOCs exceeded the state action level. Only one sample was collected and analyzed for SVOCs. Bis(2-ethylhexyl)phthalate was the only SVOC detected in this sample and the detected concentration was below the state action level.

A total of 30 soil samples were collected and analyzed for pesticides. 4,4-DDD, 4,4-DDE, 4,4-DDT, alpha-chlordane, beta-BHC, endosulfan sulfate, and gamma-chlordane were detected in one or more of the samples collected from Site 12. However, the state action levels were not exceeded for any of the pesticides detected in soil at Site 12. A total of 10 soil samples were collected and analyzed for the following metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. All metals were detected at concentrations consistent with the naturally occurring background levels. In summary, TPH-E was the only contaminant detected in soil above the action levels.

TPH-E, TPH-P, VOCs, SVOCs, pesticides, and metals were detected in groundwater samples collected at Site 12. TPH-E was detected in 7 of the 10 groundwater samples collected from Site 12. The concentration of TPH-E in groundwater at the site was above the guidance concentration of 1,000 µg/L in two samples from the site. TPH-P was detected in 5 of the 10 groundwater samples collected from Site 12. The concentration of TPH-P in the samples obtained from the site were all below the guidance concentration of 1,000 µg/L. VOCs were detected in 16 of the 17 samples collected from Site 12. A total of 21 VOCs were detected in one or more samples collected from Site 12. Of these, seven VOCs exceeded their respective state action levels in groundwater samples collected at Site 12. The VOCs that exceeded their

state action levels are 1,2-dichloroethane, benzene, carbon tetrachloride, chloroform, chloromethane, methylene chloride, and naphthalene. SVOCs were detected in 2 of the 3 samples collected and analyzed for this range of organic compounds. A total of 5 SVOCs were detected in the groundwater samples collected at Site 12. The SVOCs that were detected at the site are 1,2-dichlorobenzene, 2,4,6-trichlorophenol, 2,4-dichlorophenol, 2-methylnaphthalene, and bis(2-ethylhexyl)phthalate. Of these SVOCs, only 2,4-dichlorophenol was detected at concentrations above the state action level. Pesticides were detected in 1 of the 7 samples collected from Site 12 and analyzed for pesticides. Lindane and alpha-BHC were detected in the sample. Lindane was detected at a concentration less than the state action level. Alpha-BHC was detected at a concentration greater than the state action level. However, neither pesticide was detected in samples collected from the same location during subsequent sampling events, which occurred in October of 1993 and April of 2002. All metals were detected at concentrations consistent with naturally occurring background concentrations. In summary, TPH-E, seven VOCs, one SVOC, and one pesticide were detected at concentrations greater than the state action levels in groundwater samples collected at Site 12. The VOCs and SVOCs detected in groundwater at concentrations greater than the state action levels were not detected at concentrations above the reporting limits in soil samples collected from the same locations. Either the VOCs detected at concentrations above state action levels at Site 12, or breakdown compounds of those VOCs, were also detected in samples collected from upgradient wells at Site 14. Only the pesticides appear to be directly attributable to activities at the site, and pesticides were not detected in the most recent sampling events (1993 and 2002).

5.5.1 Qualitative Data From Groundwater Test Holes

Qualitative data was initially collected to assess the presence or absence of volatile contaminants in the general vicinity of the Group IV sites, including Site 12. 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 12 as shown in Figure 5-2. The groundwater test holes provided screening-level data to assess the presence or absence of volatile contaminants that could be related to Site 12 or migrating onto and across Site 12 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 5-2 for the groundwater test holes to indicate whether volatile contaminants were present or absent during sampling. Contamination was found to be present in all three of the groundwater test holes (Figure 5-2).

5.5.2 Quantitative Soil Data

In March of 1991, soil samples were collected from seven auger-boring locations: BH-01, BH-02, BH-03, BH-04, BH-05, BH-06, and BH-7. Four of these samples (BH-01, BH-02, BH-03, and BH-07) were obtained from the northern leach field, and three of the samples (BH-04, BH-05, and BH-06) were obtained from the southern leach field. Two samples were obtained from BH-01, BH-02, BH-03, BH-04, BH-05, and BH-06 at depth intervals of 5 to 7 feet bgs and 7 to 9 feet bgs. Only one soil sample was obtained from BH-07 at a depth of 5 to 7 feet. In addition, a soil sample was also obtained when the monitoring well MW-22 was installed in the southern leach field. A soil sample was obtained from the 7 to 9 foot depth interval from this well. All soil samples were analyzed for PCBs and pesticides using EPA Method 3550/8080. In addition, the soil sample from MW-22 was analyzed for TPH-E (EPA Method 8015 Mod), TPH-P (EPA Method 8015/8020), VOCs (EPA Method 8240), and SVOCs (EPA Method 3550/8270). The analytical results are summarized in Table 5-1.

In 2002, soil samples were collected from three direct-push boring locations: 12001 through 12003. Boring 12001 was located upgradient of the northern leach field, boring 12002 was located in the northern leach field, and boring 12003 was located in the southern leach field. The soil samples from location 12001 and 12002 were collected from 1 to 1.25 feet bgs, 2.5 to 3 feet bgs, 5 to 7 feet bgs, 7.5 to 9.5 feet bgs, 10 to 11.5 feet bgs, and 12 to 13 feet bgs. The soil samples from location 12003 were collected from 1 to 1.25 feet bgs, 2.5 to 3 feet bgs, 5 to 7 feet bgs, and 7 to 8.25 feet bgs. All soil samples were analyzed for TPH-E and TPH-P (EPA Methods 8015 modified and 8015 modified), VOCs (EPA Method 8260) and pesticides (EPA Methods 8081 and 8141). In addition, borings 12002 and 12003 were analyzed for metals (EPA Method 6000/7000). The analytical results for the organic chemicals are summarized in Table 5-1. The analytical results for the metals are summarized in Table 5-2.

A total of 17 soil samples were collected and analyzed for TPH-E and TPH-P. TPH-E was detected in a total of 7 samples, of which 5 of the detected concentrations were above the TPH state action level of 100 mg/kg. Three of the samples that exceeded the TPH action level were collected from boring 12001, which is upgradient of the site, and two were collected from boring

12003, which is located in the southern leach field. Soil samples collected from location 12001 at depths of 1 to 1.25, 7.5 to 9.5, and 10 to 11.5 feet bgs contained TPH-E at concentrations of 220, 1,200, and 280 mg/kg respectively, all of which are above the state action level of 100 mg/kg. The samples collected from this location at depths of 2.5 to 3, and 5 to 7 feet bgs did not contain TPH-E at concentrations greater than the reporting limit. Saturated soil was observed at this location at approximately 11.5 feet bgs. Soil samples collected from location 12003 at depths of 1 to 1.25 feet bgs and 7 to 8.25 feet bgs contained TPH-E at concentrations of 140 and 230 mg/kg respectively. These two detections are greater than the state action level of 100 mg/kg. The soil samples collected from this location at depths of 2.5 to 3 and 5 to 7 feet bgs did not contain TPH-E at concentrations above the reporting limits. Saturated soil was observed at this location at approximately 7 feet bgs. TPH-E was detected in samples from location 12002 at depths of 1 to 1.25 feet bgs and 7.5 to 9.5 feet bgs at concentrations of 76 mg/kg and 71 mg/kg respectively, both of which are below the state action level of 100 mg/kg. TPH-E was not detected at concentration greater than reporting limits in soil samples collected from 2.5 to 3 feet bgs, and 5 to 7 feet bgs at this location.

The results show that TPH-E is present in near surface soil (less than 1.25 feet bgs) and at depths near or below saturation (7 to 9 feet bgs). These two impacted depths are separated by soil from approximately 2 to 7 feet bgs that did not contain TPH-E at concentrations greater than the reporting limit. Soil sample results reported for samples collected below the groundwater surface are biased by the presence of contaminated groundwater in the samples.

TPH-P was detected in 2 of the 17 samples analyzed for TPH. TPH-P was detected in one soil sample from location 12002 at a depth of 7.5 to 9.5 feet bgs. It was detected at a concentration of 23 mg/kg. TPH-P was detected in one soil sample from location 12003 at a depth of 7 to 8.25 feet bgs. It was detected at a concentration of 8.2 mg/kg. None of the TPH-P detections were above the state action level of 100 mg/kg.

A total of 17 soil samples were collected and analyzed for VOCs. The state action levels were not exceeded for any of the VOCs detected at Site 12 (Table 5-1). Acetone, naphthalene, and o-xylene were detected in one or more of the samples collected at Site 12. Acetone was detected in one of the samples from boring 12003 (at a depth interval of 7 to 8.25 ft bgs), at a concentration of 0.086 mg/kg, which is less than the state action level of 1,600 mg/kg. Naphthalene was detected in two samples at concentrations of 0.032 mg/kg (boring 12001, depth interval 7.5 to 9.5 ft bgs) and 0.056 (boring 12002, depth interval 7.5 to 9.5 ft bgs). Both of these concentrations are below the state action level of 56 mg/kg. Finally, o-xylene was detected in two samples from boring 12001 (at the 10 to 11.5 foot and the 7.5 to 9.5 foot depth intervals) at concentrations of 0.0076 mg/kg and 0.0089 mg/kg. These concentrations are below the state action level for total xylenes of 270 mg/kg.

Only one sample was collected and analyzed for SVOCs. This sample was collected from MW-22 at the 7 to 9 foot depth interval. The only SVOC detected above the detection limit in the soil sample from MW-22 was bis(2-ethylhexyl)phthalate. Bis(2-ethylhexyl)phthalate was detected at a concentration 0.06 mg/kg, which is below the state action level of 35 mg/kg. It is possible that the detection of bis(2-ethylhexyl)phthalate was the result of contamination of the sample by the laboratory.

A total of 30 soil samples were collected and analyzed for pesticides. The action levels were not exceeded for any of the pesticides detected in soil at Site 12. 4,4-DDD, 4,4-DDE, 4,4-DDT, alpha-chlordane, beta-BHC, endosulfan sulfate, and gamma-chlordane were detected in one or more of the samples collected from Site 12. 4,4-DDD was detected in 5 of the 30 soil samples collected at Site 12. This compound was detected in samples obtained from boreholes BH-01 (at the 5 to 7 foot and the 7 to 9 foot depth intervals), BH-02 (at the 7 to 9 foot depth interval), 12001 (at the 1 to 1.25 foot depth interval), and 12002 (at the 1 to 1.25 foot depth interval) at concentrations ranging from 0.0036 mg/kg to 0.37 mg/kg. All detected concentrations were below the state action level of 2.4 mg/kg. 4,4-DDE was detected in 9 of the 30 soil samples. This compound was detected in samples obtained from boreholes BH-01 (at the 5 to 7 foot and the 7 to 9 foot depth intervals), BH-02 (at the 7 to 9 foot depth interval), BH-03 (at the 7 to 9 foot depth interval), 12001 (at the 1 to 1.25 foot and the 2.5 to 3 foot depth interval), 12002 (at the 1 to 1.25 foot depth interval), and 12003 (at the 1 to 1.25 foot depth interval) at concentrations ranging from 0.003 mg/kg to 1 mg/kg, all of which are below the state action level of 1.7 mg/kg. 4,4-DDT was detected in 11 samples collected at Site 12. This compound was detected in samples obtained from boreholes BH-01 (at the 5 to 7 foot and the 7 to 9 foot depth intervals), BH-02 (at the 5 to 7 foot and the 7 to 9 foot depth intervals), BH-03 (at the 7 to 9 foot depth interval), 12001 (at the 1 to 1.25 foot and the 2.5 to 3 foot depth interval), 12002 (at the 1 to 1.25 foot and the 2.5 to 3 foot depth interval), and 12003 (at the 1 to 1.25 foot and the 2.5 to 3 foot depth interval) at concentrations ranging from 0.014 mg/kg to 1.1 mg/kg. All detected concentrations were below the state action level of 1.7 mg/kg. Alpha-chlordane, beta-BHC, endosulfan sulfate, and gamma-chlordane were each detected in one of the samples collected from either boring 12001 or 12003 at concentrations of 0.032 mg/kg, 0.0091 mg/kg, 0.029 mg/kg, and 0.037 mg/kg, respectively. These pesticides were detected in samples collected from the 1 to 1.25 foot depth interval. All of these concentrations were below their respective state action levels.

A total of 10 soil samples were collected and analyzed for the following metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Barium and chromium were detected in all 10 samples. However, all of the detected concentrations were below the PRG. Lead was detected in one of the 10 samples, also at a concentration less than the PRG. Arsenic was detected in all 10 samples, and the detected concentration exceeded the PRG in all 10 samples. Mercury was detected in 7 of the 10 samples, and the detected concentration exceeded the PRG

in all 7 samples. However, the arsenic and mercury concentrations and the other metal concentrations, are consistent with naturally occurring background concentrations (Table-5-2) and are not considered to be a result of Site 12 activities.

5.5.3 Groundwater Monitoring

Groundwater sampling was performed at monitoring well MW-22 and direct-push borings 12001 through 12003. Groundwater samples were obtained from MW-22 during 14 sampling events occurring in 4/91, 8/91, 10/93, 3/95, 9/95, 9/96, 3/97, 9/97, 3/98, 9/98, 4/99, 9/99, 11/99, and 4/02. Groundwater samples were obtained only once from borings 12001 through 12003 in April of 2002. Table 5-3 provides a summary of detected organics in groundwater, and Table 5-4 provides a summary of the detected metals in groundwater.

As previously discussed, groundwater samples were obtained from MW-22 during 14 separate sampling events. The April and August 1991 groundwater samples were analyzed for TPH-P (EPA Method 8015 modified), TPH-E (EPA Method 8015/8020), PCBs/pesticides (EPA Method 608), SVOCs (EPA Method 625), VOCs (EPA Method 624), and metals (EPA Method 6010). During the October 1993 sampling event, the sample from MW-22 was analyzed for TPH-P (EPA Method 8015 modified), pesticides (EPA Method 8080), SVOCs (EPA Method 8270), and VOCs (EPA Method 8240). The only analytes tested for in the sample obtained in March of 1995 from MW-22 were TPH-E (EPA Method 8015 modified) and VOCs (EPA Method 624). Samples obtained from MW-22 during September of 1995 and September of 1996 were analyzed for VOCs (EPA Method 8240). In March of 1997, the sample from MW-22 was tested for TPH-P (EPA Method 8015 modified), TPH-E (EPA Method 8015 modified), VOCs (EPA Methods 8020, 8240, and 8260), and metals (EPA Method 6010, iron and manganese only). The sample obtained from MW-22 in September of 1997 was tested for TPH-P (EPA Method 8015 modified) and VOCs (EPA Method 8240). The samples obtained during March and September of 1998 were analyzed for VOCs (EPA Method 8260), metals (EPA Method 6010, iron and manganese only), and water quality parameters. The sample obtained during April of 1999 was analyzed for the same parameters as the samples in 1998 with the addition of the VOCs; ethane, ethene, and methane (EPA Method 8015 modified). The only analytes tested for in the sample obtained in September of 1999 from MW-22 were TPH-E (EPA Method 8015 modified) and VOCs (EPA Method 8260). In November of 1999, the sample from MW-22 was analyzed for TPH-P (EPA Method 8015 modified), TPH-E (EPA Method 8015 modified), and VOCs (EPA Method 8260). Finally, the sample obtained from MW-22 in April of 2002 was analyzed for TPH-P (EPA Method 8015 modified), TPH-E (EPA Method 8015 modified), pesticides (EPA Methods 8081 and 8141), VOCs (EPA Method 8260), and total dissolved solids. Table 5-3 provides a summary of detected organics in groundwater, and Table 5-4 provides a summary of the detected metals in groundwater.

Samples were obtained from direct-push borings 12001 through 12003. The three samples obtained from these locations were analyzed for TPH-P (EPA Method 8015 modified), TPH-E (EPA Method 8015 modified), pesticides (EPA Methods 8081 and 8141), VOCs (EPA Method 8260), and total dissolved solids. Table 5-3 provides a summary of detected organics in groundwater, and Table 5-4 provides a summary of the detected metals in groundwater.

TPH-E was detected in 7 of the 10 groundwater samples collected from Site 12. The concentration of TPH-E ranged from 310 µg/L to 5,000 µg/L. The concentration of TPH-E in groundwater at the site was above the guidance concentration of 1,000 µg/L in two samples from the site. TPH-E was detected at a concentration of 5,000 µg/L in a sample obtained from MW-22 in August of 1991. During all subsequent sampling events at MW-22 when the TPH-E concentration was measured, the concentration of TPH-E was below the guidance concentration of 1,000 µg/L. TPH-E was also detected at a concentration of 1,100 µg/L in the groundwater sample obtained from boring 12001 in April of 2002, which is above the guidance concentration of 1,000 µg/L. Boring 12001 is just upgradient of the site. The analytical results are summarized in Table 5-3.

TPH-P was detected in 5 of the 10 groundwater samples collected from Site 12. The concentration of TPH-P ranged from 72 µg/L to 320 µg/L. The concentration of TPH-P in the samples obtained from the site were all below the guidance concentration of 1,000 µg/L. The analytical results for TPH-P are summarized on Table 5-3.

VOCs were detected in 16 of the 17 groundwater samples collected from Site 12. VOCs were detected in all samples except for the sample collected from MW-22 in March of 1995. A total of 21 VOCs were detected in one or more samples collected from Site 12. Of these, seven VOCs exceeded their respective state action levels in one or more groundwater samples collected at Site 12. The VOCs that exceeded state action levels are 1,2-dichloroethane, benzene, carbon tetrachloride, chloroform, chloromethane, methylene chloride, and naphthalene. 1,2-Dichloroethane was detected in 6 of the 17 samples ranging in concentration from 2.1 µg/L to 5.6 µg/L. It was detected in samples obtained from MW-22 and boring 12003. Only one sample, the sample obtained from MW-22 in April of 2002, exceeded the action level of 5 µg/L. Benzene was detected in 16 of the 17 samples analyzed for VOCs at concentrations ranging from 3.6 µg/L to 230 µg/L. Benzene was detected at concentrations above the state action level of 5 µg/L in 15 of the 16 samples in which it was detected. The state action level for benzene was exceeded at sampling locations MW-22, 12001, 12002, and 12003.

Carbon tetrachloride was detected in 12 of the 17 samples at concentrations ranging from 0.52 µg/L to 18 µg/L. The carbon tetrachloride concentrations exceeded the state action level of 5 µg/L in 10 of the 12 samples where the compound was detected, and at two sampling locations (MW-22 and 12002). Chloroform was detected in 13 of 17 samples at concentrations ranging

from 5 µg/L to 95 µg/L. The chloroform state action level of 6.2 µg/L was exceeded in 11 of the 13 samples where the compound was detected, and in samples obtained from all sampling locations (MW-22, 12001, 12002, and 12003). Chloromethane was detected in 2 of the 17 samples at concentrations of 6.4 and 8 µg/L, both of which exceed the state action level of 1.5 µg/L. The exceedances were both detected from samples obtained from MW-22. Methylene chloride was detected in 3 samples obtained from MW-22 at concentrations ranging from 5 µg/L to 5.5 µg/L, all of which are above the state action level of 4.3 µg/L. Naphthalene was detected in 7 of the 17 samples at concentrations ranging from 3 µg/L to 34 µg/L. Two of the samples were above the action level of 6.2 µg/L, and these samples were obtained from MW-22 and 12001.

Fourteen of the VOCs detected in groundwater at Site 12 were detected at concentrations less than their respective state action levels. 1,1,1-Trichloroethane and 1,1-dichloroethane were detected in the sample collected from MW-22 in August of 1991 at concentrations of 3 µg/L and 8 µg/L, respectively. Both of these concentrations are below their respective state action levels of 200 µg/L and 810 µg/L. 1,2,4-Trimethylbenzene, 1,3,5-trimethylbenzene, m,p-xylene, and p-xylene were detected in the sample collected from MW-22 in September of 1998 at concentrations of 11 µg/L, 4 µg/L, 39 µg/L, and 20 µg/L, respectively. All of these concentrations are below their respective state action levels (Table 5-4). 1,2-Dichlorobenzene was detected in 2 of the 17 samples. It was detected at a concentration of 35 µg/L in the sample obtained from MW-22 in September of 1995 and 0.92 µg/L in the sample obtained from boring 12003 in April of 2002. Both of these concentrations are below the state action level of 370 µg/L. Chlorobenzene was detected in one of 17 samples at a concentration of 50 µg/L, which is below the state action level of 100 µg/L. It was detected in a sample obtained from MW-22 in March of 1997.

Ethylbenzene was detected in one sample obtained from MW-22 in September of 1998. The detected concentration of 2 µg/L is below the state action level for ethylbenzene of 700 µg/L. Isopropylbenzene was detected in 6 of the 17 samples at concentrations ranging from 3 µg/L to 15 µg/L. This compound was detected in samples obtained from MW-22, 12002, and 12001. However, none of the detected concentrations were above the state action level of 660 µg/L. m-Xylene was detected in 2 samples obtained from MW-22 in April and September of 1999, both at a concentration of 0.4 µg/L. Neither sample exceeded the action level of 10,000 µg/L for total xylenes. o-Xylene was detected in 4 samples at concentrations ranging from 0.65 µg/L to 20 µg/L, which is below the state action level for total xylenes. This compound was detected in samples obtained from MW-22 and 12001. Total xylenes were detected in 2 samples obtained from MW-22 in April and August of 1991. The concentrations in the detected samples were 3 µg/L and 7 µg/L, both of which are below the state action level for total xylenes. Finally, toluene was detected in three of the 17 samples at concentrations ranging from 3 µg/L to

11 µg/L. These concentrations were detected in samples obtained from MW-22, and were all below the state action level of 1,000 µg/L.

SVOCs were detected in 2 of the 3 samples collected and analyzed for this range of organic compounds. A total of 5 SVOCs were detected in the groundwater samples collected at Site 12. The SVOCs that were detected at the site are 1,2-dichlorobenzene, 2,4,6-trichlorophenol, 2,4-dichlorophenol, 2-methylnaphthalene, and bis(2-ethylhexyl)phthalate. Of these SVOCs, 2,4-dichlorophenol was detected at concentrations above the state action level. 2,4-Dichlorophenol was detected in groundwater samples collected from MW-22 in April and August of 1991 at concentrations of 70 and 220 µg/L. The sample collected in August exceeded the action level of 110 µg/L. MW-22 was resampled in October of 1993, and 2,4-dichlorophenol was not detected in the sample during this sampling event. 2,4,6-Trichlorophenol was detected in the sample collected from MW-22 in April of 1991 at a concentration of 2 µg/L, which is below the state action level of 3.6 µg/L. 2-Methylnaphthalene was detected in two samples collected from MW-22 in April and August of 1991 at concentrations of 2 and 5 µg/L, respectively. Both of these concentrations are below the state action level for 2-methylnaphthalene of 6.2 µg/L. 1,2-Dichlorobenzene and bis(2-ethylhexyl)phthalate were detected in the sample collected from MW-22 in August of 1991 at a concentration of 6 µg/L and 4 µg/L, respectively, which are both below their respective action levels. In summary, the only SVOC detected above the action level was 2,4-dichlorophenol. However, in a subsequent sampling event this SVOC was not detected.

Pesticides were detected in 1 of the 7 samples collected from Site 12 and analyzed for pesticides. Lindane and alpha-BHC were detected in the sample collected from MW-22 in August of 1991. Lindane was detected at a concentration of 0.14 µg/L, which is less than the action level of 0.2 µg/L. Alpha-BHC was detected at a concentration of 0.16 µg/L, which is greater than the action level of 0.011 µg/L. Neither pesticide was detected in samples collected from MW-22 during subsequent sampling events, which occurred in October of 1993 and April of 2002. (Note: The detection limit for alpha-BHC during the October 1993 sampling event was 0.05 µg/L, which is above the action level, but the detection limit during the April 2002 sampling event was 0.01, which is right at the action level.) In addition, no pesticides were detected in samples collected from 12001, 12002, and 12003.

Two groundwater samples were analyzed for the full suite of metals. An additional 4 groundwater samples were analyzed for iron and manganese, only. Arsenic, boron, and molybdenum were detected in Site 12 groundwater at concentrations greater than the MCL or PRGs. Arsenic was detected at concentrations of 0.499 and 0.561 mg/L, which are both above the MCL of 0.050 mg/L. Boron was detected at concentrations of 21.9 and 66.1 µg/L, which are both above the PRG of 7.3 µg/L. Finally, molybdenum was detected at concentrations of 1.11 and 2.85 µg/L, which are both above the PRG of 0.18 µg/L. However, all metals were detected at concentrations consistent with naturally occurring background concentrations and are not

considered to be a result of Site 12 activities. TDS concentrations ranged from 21,300 to 49,200 mg/L, with an average of 39,500 mg/L. All samples collected at Site 12 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 12, only pesticide compounds were suspected contaminants at this site. Shallow soil sampling indicates, however, that site activities also resulted in releases of TPH-E to near-surface soil. The soil and groundwater sampling results indicate that pesticide compounds and TPH-E in soil beneath Site 12 are not currently migrating to groundwater. The arid climate at NAS Fallon minimizes the potential for these contaminants to migrate to groundwater in the future.

Pesticides were detected in soil samples from Site 12, but at concentrations below the state action levels. During sampling in 1991, one pesticide compound, alpha-BHC, was detected in one groundwater sample at a concentration greater than the state action level. During subsequent sampling events, this pesticide was not detected in any of the groundwater samples collected at Site 12.

Petroleum hydrocarbons (TPH-E) have been detected in soil at concentrations above the state action levels in two discrete depth intervals: near ground surface, and near the water table. TPH-E in near-surface soil is interpreted to be the result of activities at Site 12. TPH-E in soil near the water table is interpreted to be the result of TPH-E migration in groundwater from Site 14, which is located up gradient from Site 12.

Site 14 has been identified as a source of petroleum hydrocarbons and VOCs in groundwater, which have migrated up to 1,000 feet down gradient (southeast). Site 12 is located approximately 400 feet directly down gradient of Site 14, and both TPH-E and VOCs have been detected in groundwater beneath Site 12 at concentrations exceeding the state action levels. Because the groundwater surface elevation beneath Site 12 varies seasonally, TPH-E is interpreted to have adsorbed to soil during times of higher water levels, with residual TPH-E remaining in soil near the groundwater surface during times of lower water level. This effect is sometimes referred to as "smearing." Depth to water has fluctuated from 6.88 to 7.46 feet below top-of-casing in well MW-22 from September 1996 to November 2002.

A zone of soil that did not contain detectable TPH-E separates the contaminated soil near the groundwater surface from soil containing TPH-E near ground surface. The TPH-E detections in near-surface soil were no deeper than 1.25 feet bgs. This separation of zones with detectable TPH-E suggests that TPH-E in near-surface soil is not leaching to groundwater. Instead, the

TPH-E observed in soil near the groundwater surface is a result of smearing from groundwater migrating beneath Site 12 from Site 14. The lack of vertical migration of the TPH-E in near-surface soil since the time of release suggests that the potential for future leaching to the groundwater surface is low. The arid climate at NAS Fallon also minimizes the potential for downward migration of the TPH-E in near-surface soil.

5.7 BASIS FOR DECISION

The Navy has selected No Further Action as the preferred alternative for Site 12 for the following reasons:

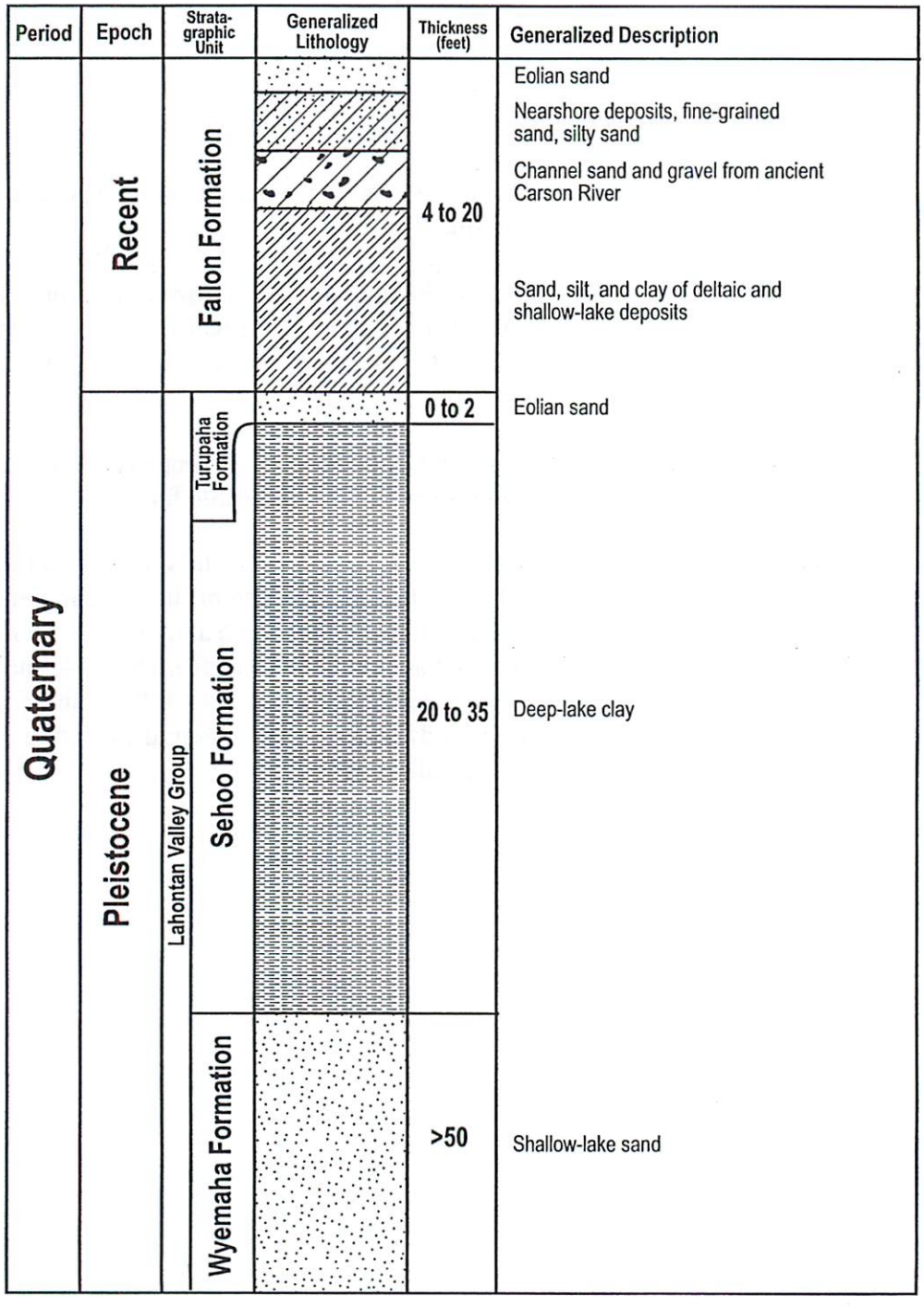
- Site 12 has no ongoing contaminant sources. Operations at the Pest Control Shop were terminated in September 1997, and all pesticides were subsequently removed from the site.
- Pesticide compounds, which are the contaminants of concern at this site, were not detected in soil at concentrations above the state action levels.
- Pesticide compounds have not been detected in groundwater since August of 1991.
- Although TPH was detected in soil and groundwater at concentrations above the state action level or guidance concentration and 1,2-dichloroethane, benzene, chloroform, methylene chloride, and naphthalene were detected at concentrations above the state action levels in groundwater, these compounds are associated with releases at Site 14 and will therefore be addressed as part of the planned remedial actions for Site 14.
- Although chloromethane, 2,4-dichlorophenol, and alpha-BHC were detected in groundwater samples collected in the early 1990s at concentrations exceeding the state action levels, these chemicals were not detected in subsequent samples collected on multiple dates.
- Chloromethane, 2,4-dichlorophenol, and alpha-BHC were not detected in soil samples collected from the site at concentrations above the reporting limits.
- Although carbon tetrachloride was detected in groundwater beneath Site 12 and not Site 14, the presence of breakdown compounds of carbon tetrachloride in groundwater beneath Site 14 indicates that Site 14 is the source of the carbon tetrachloride beneath Site 12.

- Carbon tetrachloride was not detected at concentrations above the reporting limits in soil samples collected from the site.

- The plume of chlorinated VOCs and TPH migrating in groundwater from Site 14 to Site 12 will be addressed through Site 14 actions. The presence of both chlorinated VOCs and TPH in this plume is expected to enhance biodegradation of these contaminants.

- The site is currently vacant land and the Navy does not expect any change in the use of Site 12, 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. Contaminants present in vadose-zone soil near the groundwater surface and groundwater at concentrations above the state action levels are associated with releases from Site 14, and will therefore be addressed as part of the planned remedial actions for Site 14. TPH contamination in near-surface soil at Site 12 has not migrated to groundwater, and the potential for future migration is minimized by the arid climate at NAS Fallon.



U.S. NAVY

Figure 5-1
Generalized Stratigraphy of NAS Fallon

Delivery Order 0029
NAS Fallon
DECISION DOCUMENT
SITE 12

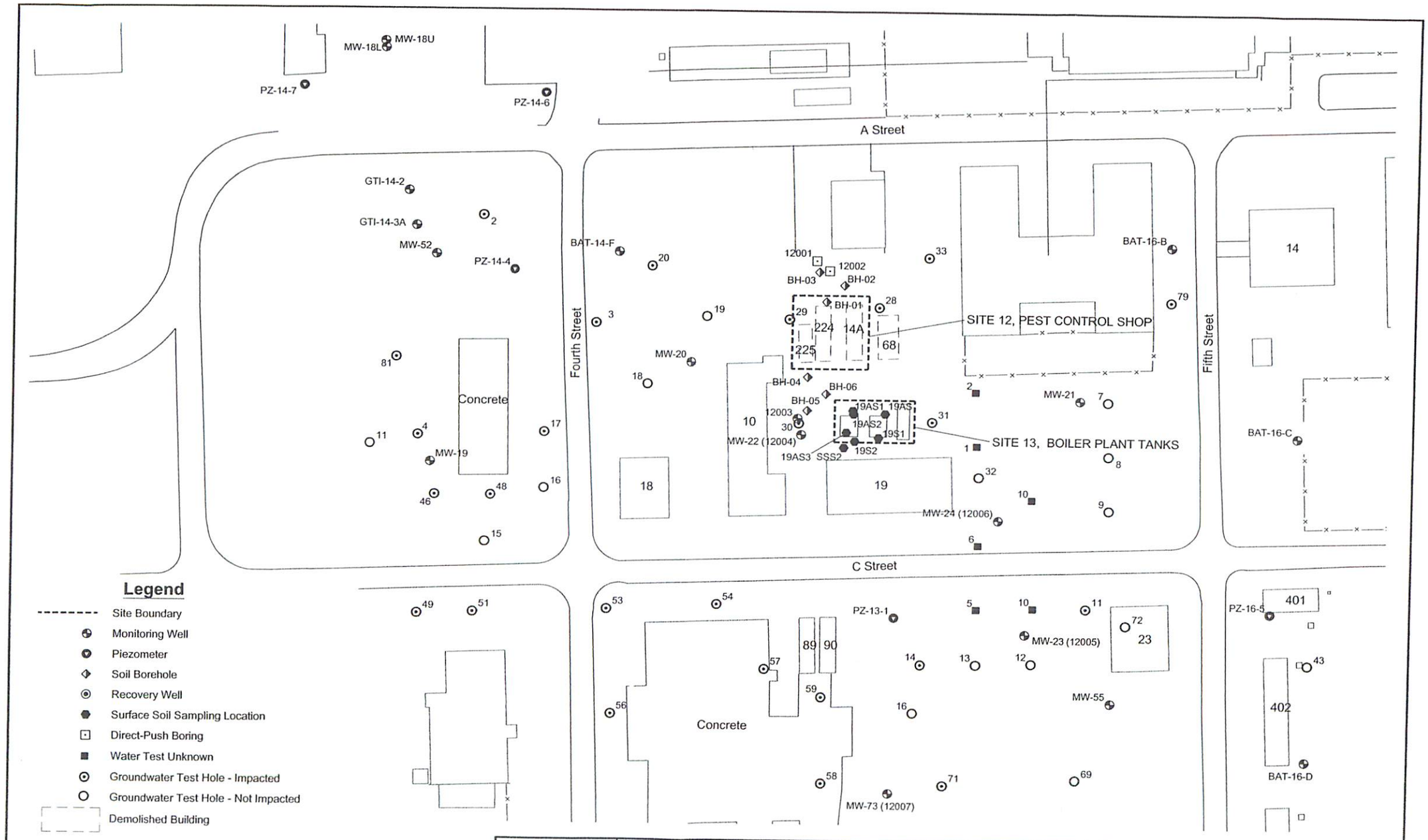
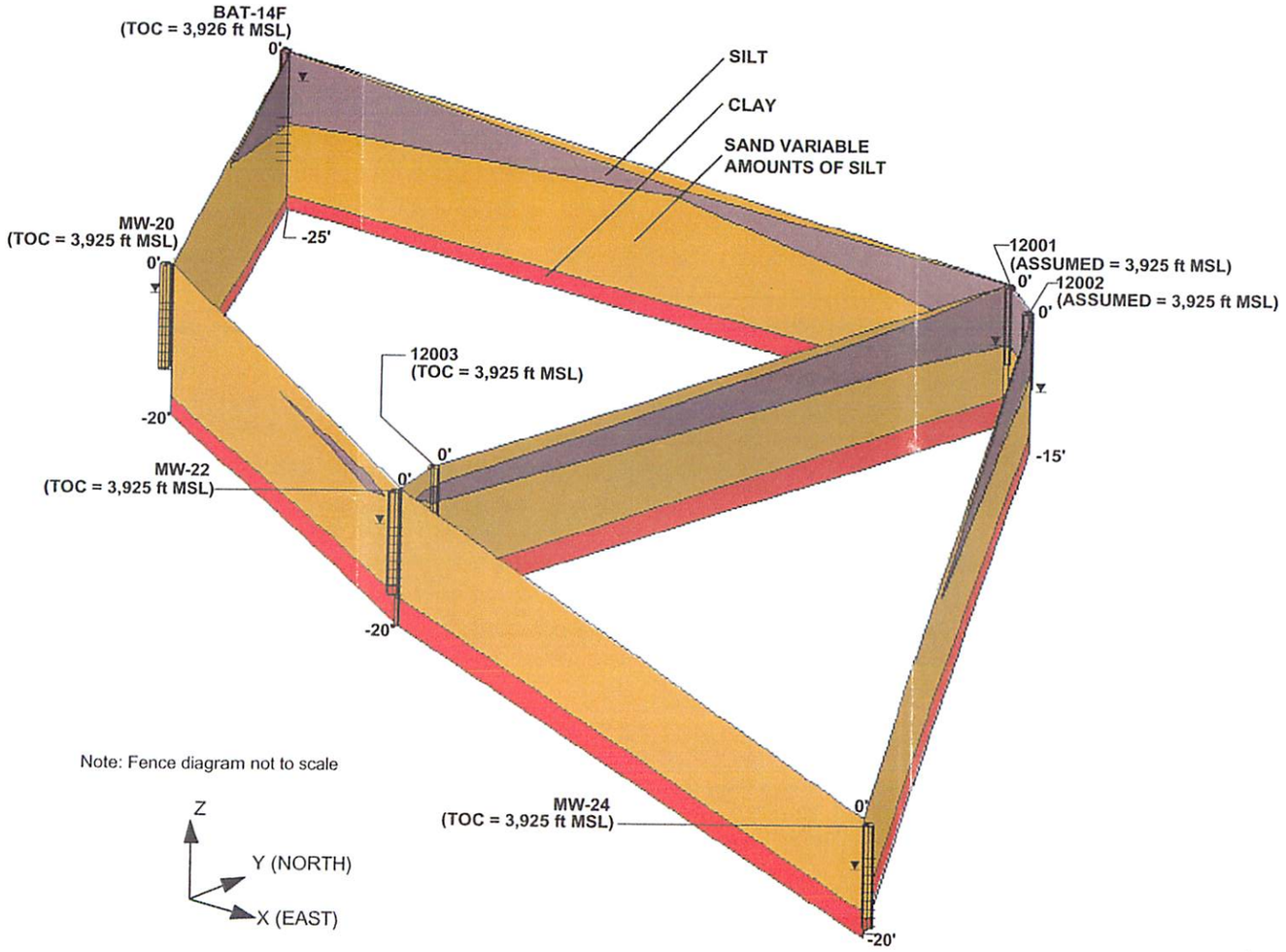
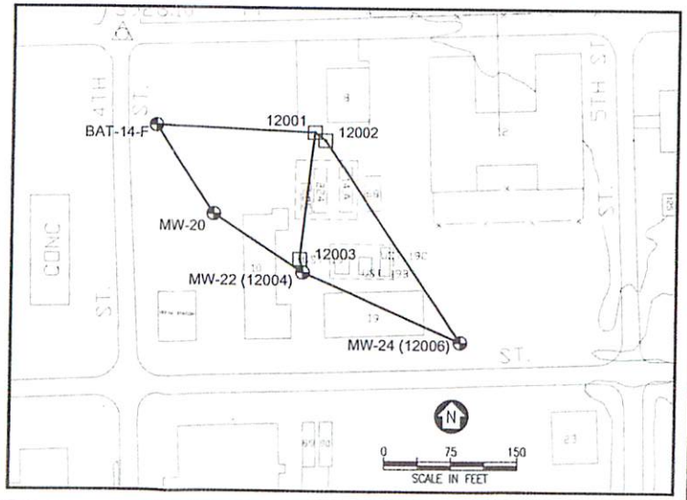


Figure 5-2
Sampling Locations at Site 12, Pest Control Shop



Fence Diagram Location Map View



Legend

- Monitoring Well
- Direct-Push Boring
- ft MSL — Feet Mean Sea Level
- Screen Interval
- Depth to Water Measured in Direct-Push Rod (April 2002) or Well (November 2002)
- TOC — Top of Casing

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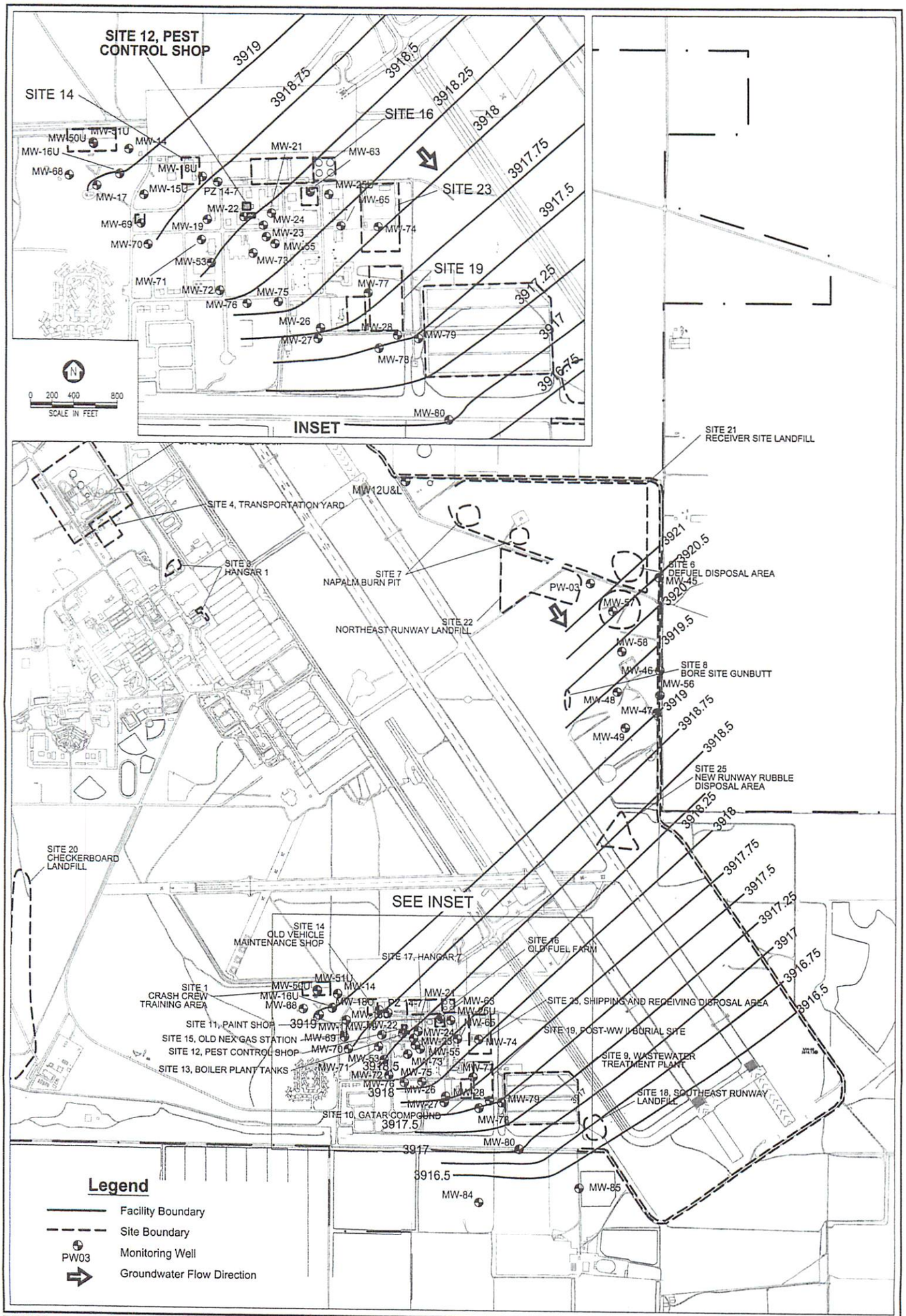
U.S. NAVY	Delivery Order 0029 NAS Fallon DECISION DOCUMENT Site 12	Scale as Shown	**Figure 5-3** **Generalized Fence Diagram** **Site 12**



U.S. NAVY	0 350 700 1400 SCALE IN FEET	Figure 5-4 Groundwater Surface Elevation Contours, November 2002, NAS Fallon	Delivery Order 0029 NAS Fallon DECISION DOCUMENT SITE 12

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Table 5-1
Summary of Detected Organics in Soil Samples From Site 12, 1991 Through 2002

Analyte	Units	No. of Samples Tested	No. of Detections	Minimum Concentration	Average Concentration	Maximum Concentration	Action Level	No. of Detections Greater Than Action Level	Locations With Detections Greater Than Action Level
Petroleum Hydrocarbons									
TPH-extractable	mg/kg	17	7	71	317	1,200	100[a]	5	12001, 12003
TPH-purgeable	mg/kg	17	2	8.2	15.6	23	100[a]	0	None
Volatile Organic Compounds[c]									
Acetone	mg/kg	17	1	0.086	0.086	0.086	1,600[b]	0	None
Naphthalene	mg/kg	17	2	0.032	0.044	0.056	56[b]	0	None
o-Xylene	mg/kg	17	2	0.0076	0.00825	0.0089	270[b]	0	None
Semivolatile Organic Compounds									
Bis(2-ethylhexyl)phthalate	mg/kg	1	1	0.06	0.06	0.06	35[b]	0	None
Organochlorine Pesticides									
4,4-DDD	mg/kg	30	5	0.0036	0.113	0.37	2.4[b]	0	None
4,4-DDE	mg/kg	30	9	0.003	0.166	1	1.7[b]	0	None
4,4-DDT	mg/kg	30	11	0.014	0.280	1.1	1.7[b]	0	None
alpha-Chlordane	mg/kg	30	1	0.032	0.032	0.032	1.6[b]	0	None
beta-BHC	mg/kg	30	1	0.0091	0.0091	0.0091	0.32[b]	0	None
Endosulfan sulfate	mg/kg	30	1	0.029	0.029	0.029	370[b]	0	None
gamma-Chlordane	mg/kg	30	1	0.037	0.037	0.037	1.6[b]	0	None

[a]Nevada Administrative Code
[b]EPA Region 9 Preliminary Remedial Goals – residential soil
[c]Methylene chloride was detected in one sample obtained during the remedial investigation. The result is not reported here because it is a suspected laboratory contaminant.

Notes:
BHC - benzene hexachloride
DDD - dichlorodiphenyldichloroethane
DDE - dichlorodiphenyldichloroethene
DDT - dichlorodiphenyltrichloroethane
mg/kg - milligram per kilogram
TPH - total petroleum hydrocarbon

Table 5-2
Summary of Detected Total Metals in Soil at Site 12, 1991 Through 2002

Chemical	Units	No. of Tests	No. of Detections	Detection Frequency	Minimum Detection	Average Detection	Maximum Detection	Location With Maximum Detection	PRG	Naturally Occurring Background	No. of Detections Greater Than PRG	Locations with Detections Greater Than Action Level
Arsenic	mg/kg	10	10	100%	3.7	10.4	19.2	12003	0.39 [a]	1.1 to 64.2	10	12002, 12003
Barium	mg/kg	10	10	100%	89.7	195	387	12003	5,400 [a]	0.13 to 387	0	None
Chromium	mg/kg	10	10	100%	8.1	15.6	23.4	12003	210 [a,b]	0.014 to 64	0	None
Lead	mg/kg	10	1	10%	27	27	27	12002	400 [a]	0.019 to 55	0	None
Mercury	mg/kg	10	7	70%	0.02	0.0514	0.08	12002	0 [c]	0.02 to 1	7	12002, 12003

[a]EPA Region 9 Preliminary Remedial Goals - residential soil
[b]Assumes total chromium
[c]Assumes elemental mercury

Notes:
mg/kg - milligram per kilogram

Table 5-3
Summary of Detected Organics in Groundwater Samples From Site 12, 1991 Through 2002

Parameter	Units	No. of Samples Tested	No. of Detections	Minimum Concentration	Average Concentration	Maximum Concentration	Action Level	No. of Detections Greater Than Action Level	Locations With Detections Greater Than Action Level
Petroleum Hydrocarbons									
TPH-extractable	µg/L	10	7	310	1296	5000	1,000[a]	2	12001, MW-22
TPH-purgeable	µg/L	10	5	72	216	320	1,000[a]	0	None
Volatile Organic Compounds									
1,1,1-Trichloroethane	µg/L	17	1	3	3	3	200[b]	0	None
1,1-Dichloroethane	µg/L	17	1	8	8	8	810[c]	0	None
1,2,4-Trimethylbenzene	µg/L	17	1	11	11	11	12[c]	0	None
1,2-Dichlorobenzene	µg/L	17	2	0.92	18	35	370[c]	0	None
1,2-Dichloroethane	µg/L	17	6	2.1	3.6	5.6	5[b]	1	MW-22
1,3,5-Trimethylbenzene	µg/L	17	1	4	4	4	12[c]	0	None
Benzene	µg/L	17	16	3.6	109	230	5[b]	15	12001, 12002, 12003, MW-22
Carbon tetrachloride	µg/L	17	12	0.52	9.03	18	5[b]	10	12002, MW-22
Chlorobenzene	µg/L	17	1	50	50	50	100[b]	0	None
Chloroform	µg/L	17	13	5	61.1	95	6.2[c]	11	12001, 12002, 12003, MW-22
Chloromethane	µg/L	17	2	6.4	7.2	8	1.5[c]	2	MW-22
Ethylbenzene	µg/L	17	1	2	2	2	700[b]	0	None
Isopropylbenzene	µg/L	17	6	3	6	15	660[c]	0	None
Methylene chloride	µg/L	17	3	5	5.2	5.5	4.3[c]	3	MW-22

Table 5-3 (Continued)
Summary of Detected Organics in Groundwater Samples From Site 12,
1991 Through 2002

Parameter	Units	No. of Samples Tested	No. of Detections	Minimum Concentration	Average Concentration	Maximum Concentration	Action Level	No. of Detections Greater Than Action Level	Locations With Detections Greater Than Action Level
Naphthalene	µg/L	17	7	3	12.3	34	6.2[c]	2	12001, MW-22
m,p-Xylene	µg/L	17	1	39	39	39	10,000[c]	0	None
Volatile Organic Compounds (Continued)									
m-Xylene	µg/L	17	2	0.4	0.4	0.4	10,000[c]	0	None
o-Xylene	µg/L	17	4	0.65	5.5	20	10,000[c]	0	None
p-Xylene	µg/L	17	1	20	20	20	10,000[c]	0	None
Xylenes	µg/L	17	2	3	5	7	10,000[c]	0	None
Toluene	µg/L	17	3	0.55	4	11	1000[b]	0	None
Semivolatile Organic Compounds									
1,2-Dichlorobenzene	µg/L	3	1	6	6	6	75[b]	0	None
2,4,6-Trichlorophenol	µg/L	3	1	2	2	2	3.6[c]	0	None
2,4-Dichlorophenol	µg/L	3	2	70	145	220	110[c]	1	MW-22
2-Methylnaphthalene	µg/L	3	2	2	3.5	5	6.2[c,d]	0	None
Bis-(2-Ethylhexyl)phthalate	µg/L	3	1	4	4	4	4.8[c]	0	None
Organochlorine Pesticides									
Lindane	µg/L	7	1	0.14	0.14	0.14	0.2[b]	0	None
Alpha-BHC	µg/L	7	1	0.16	0.16	0.16	0.011[c]	1	MW-22

Table 5-3 (Continued)
Summary of Detected Organics in Groundwater Samples From Site 12, 1991 Through 2002

[a]Nevada Department of Environmental Protection guidance concentration
[b]Maximum contaminant level
[c]EPA Region 9 Preliminary Remedial Goals – tap water
[d]EPA Region 9 PRG for naphthalene used as a surrogate for 2-methylnaphthalene

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

Table 5-4
Summary of Detected Metals in Groundwater Samples From Site 12, 1991 Through 2002

Parameter	Units	No. of Samples Tested	No. of Detections	Minimum Concentration	Average Concentration	Maximum Concentration	PRG/MCL	Naturally Occurring Background	No. of Detections Greater Than PRG/MCL	Locations With Detections Greater Than Action Level
Metals										
Aluminum	mg/L	2	2	0.0439	0.051	0.0578	36[a]	0.041 to 1.46	0	None
Arsenic	mg/L	2	2	0.499	0.530	0.561	0.050[b]	0.006 to 21	2	MW-22
Barium	mg/L	2	5	0.0201	0.023	0.0249	2[b]	0.0068 to 0.66	0	None
Boron	mg/L	2	2	21.9	44	66.1	7.3[a]	0.57 to 240	2	MW-22
Calcium	mg/L	2	2	45	45.8	46.6	NE	1.33 to 616	NA	NA
Cobalt	mg/L	2	1	0.0551	0.0551	0.0551	7.3[a]	55.1 to 72	0	None
Copper	mg/L	2	2	0.0405	0.058	0.076	1.3[c]	0.1 to 0.333	0	None
Iron	mg/L	6	2	0.0128	0.028	0.0426	11[a]	0.011 to 3.04	0	None
Lithium	mg/L	2	2	0.207	0.380	0.553	0.73[a]	0.028 to 0.875	0	None
Magnesium	mg/L	2	2	85.7	122.35	159	NE	0.97 to 812	NA	NA
Manganese	mg/L	6	6	0.059	0.111	0.168	0.88[a]	0.002 to 8.95	0	None
Molybdenum	mg/L	2	2	1.11	1.98	2.85	0.18[a]	0.023 to 5.2	2	MW-22
Potassium	mg/L	2	2	118	228	338	NE	5.63 to 487	NA	NA
Silver	mg/L	2	1	0.0081	0.0081	0.0081	0.18[a]	0.002 to 0.22	0	None
Sodium	mg/L	2	2	5,940	11,270	16,600	NE	128 to 22,500	NA	NA
Vanadium	mg/L	2	2	0.129	0.169	0.209	0.26[a]	0.007 to 2.6	0	None
Zinc	mg/L	2	2	0.0061	0.06	0.113	11[a]	0.006 to 0.338	0	None
Water Quality										
Total dissolved solids	mg/L	4	4	21,300	39,500	49,200	10,000[d]	NA	4	12001, 12002, 12003, MW-22

Table 5-4 (Continued)
Summary of Detected Metals in Groundwater Samples From Site 12,
1991 Through 2002

[a]U.S. Environmental Protection Agency (EPA) Region 9 Preliminary Remedial Goals – tap water
[b]Maximum contaminant level
[c]EPA action level
[d]Nevada Administrative Code

MCL - Maximum Contaminant Level
mg/L - milligram per liter
NA - not applicable
NE - not established
PRG - EPA Region 9 Preliminary Remedial Goal

Notes:

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 Pest Control Shop were terminated in September 1997, and all pesticides were subsequently removed from the site. Building 224 was demolished shortly thereafter and Site 12 is currently vacant land. Therefore, NAS Fallon is not currently using this land for pest control operations or any other uses. NAS Fallon does not expect any change in the use of this land or that of the surrounding sites in the foreseeable future.

The Master 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 12 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, Fire Department, 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.

7.0 SUMMARY OF SITE RISKS

The analytical results from sampling have confirmed the presence of one contaminant, TPH, above the state action level in soil at Site 12. TPH associated with Site 12 activities is located in the upper 2 feet of soil at the site, and is not migrating to groundwater. TPH is also present in soil near the groundwater surface beneath Site 12, as the result of migration of TPH in groundwater from Site 14. The contaminant plume from Site 14 also results in the presence of VOCs and TPH in groundwater beneath Site 12 at concentrations above state action levels. Contaminants from Site 14 that are present beneath Site 12 will be addressed through actions at Site 14.

Pesticides (4,4-DDD, 4,4-DDE, and 4,4-DDT) were detected in soil during the sampling performed as part of the RI. A baseline risk assessment was performed for Site 12 soils due to the presence of the pesticides. Risks to human and ecological receptors were found to be acceptable in the baseline risk assessment. During the 2002 sampling event, 4,4-DDD, 4,4-DDE, and 4,4-DDT were detected at concentrations higher than those detected during the RI. However, the detected concentrations were below the state action levels. In addition, the pesticides alpha-chlordane, beta-BHC, endosulfan sulfate, and gamma-chlordane were detected in the samples collected in 2002. All of these concentrations were below their respective state action levels. VOCs and SVOCs were also detected in samples collected in 2002. However, the detected concentrations were very low, much lower than the state action levels.

The only contaminant attributable to Site 12 activities detected in soil above state action levels is TPH. This TPH is present in the upper 2 feet of soil beneath the site. Ground surface at the site is mostly gravel with some areas of concrete. The site is vacant land, where base personnel occasionally drive through or park. The only route of exposure to soil containing TPH is through excavation. As discussed in Section 6.0, exposure to these soils through excavation is controlled by the Master Plan review process for all construction projects at NAS Fallon.

A baseline risk assessment was performed for the groundwater at the Group IV sites. However, the maximum detected concentration was used for each chemical detected at the Group IV sites. Since the maximum detected concentration did not occur at Site 12 for most chemicals detected at the Group IV sites, the risk calculated for the Group IV sites is not representative of the risk at Site 12. 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, carbon tetrachloride, chloroform, chloromethane, methylene chloride, naphthalene, 2,4-dichlorophenol, and alpha-BHC were the compounds detected in groundwater above the state action levels at Site 12. Since the concentrations for these

compounds exceeds 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 source of this contamination is Site 14. Therefore, the exceedances of these chemicals in groundwater at Site 12 will be addressed through planned remedial actions for the upgradient Site 14. Chloromethane, 2,4-dichlorophenol, and alpha-BHC were not detected in the most recent sampling event(s). Since these chemicals have not been detected in the most recent sampling event, no exposure to these chemicals is expected, and therefore risks should be acceptable.

In summary, there is no risk to human health and the environment associated with any of the chemicals potentially attributable to releases at Site 12. Therefore, the preferred alternative for Site 12 is No Further Action.

8.0 STATUTORY AUTHORITY FINDING

TPH-E was detected in soil and groundwater at concentrations above the state action level. TPH-E in soil was found in two discrete intervals: near-surface soil and vadose-zone soil near the groundwater surface. In addition, carbon tetrachloride 1,2-dichloroethane, benzene, chloroform, methylene chloride, and naphthalene were detected at concentrations above the state action levels in groundwater. Contaminants in groundwater and vadose-zone soil near the groundwater surface are the result of releases from Site 14 and they will be addressed as part of the planned remedial actions for Site 14. TPH-E in near-surface soil is interpreted to be the result of activities at Site 12, but has not migrated to groundwater. The potential for soil contaminants to migrate to groundwater is minimized by the arid climate of NAS Fallon.

Chloromethane, 2,4-dichlorophenol, and alpha-BHC were also initially detected in groundwater at concentrations exceeding the action levels. However, these chemicals were not detected in subsequent groundwater sampling rounds.

Based on these observations and conditions, current or potential future site conditions pose no unacceptable risk to human health or the environment. Accordingly, no further action is required at this site.

9.0 DOCUMENTATION OF SIGNIFICANT CHANGES

United States Fish and Wildlife comments to the Draft Decision Document were received by the Navy. Responses to these comments are provided in Appendix A (Responsiveness Summary). The comments and responses resulted in no significant change to the Declaration of the Decision or the Decision Summary.

10.0 BIBLIOGRAPHY

This document was prepared with the use of information contained in the Administrative Record for Site 12, Pest Control Shop, NAS Fallon, Nevada. The Administrative Record is available at the Churchill County Public Library in Fallon, Nevada; at the University of Nevada Reno Library in Reno, Nevada; at NAS Fallon; and at Engineering Field Activity, Northwest, Offices in Poulsbo, Washington. The primary documents used as sources of the information contained in this decision document are listed below.

Naval Energy and Environmental Support Activity (NEESA). 1988. *Preliminary Assessment/ Site Inspection, Naval Air Station Fallon, Fallon, Nevada.* April 1988.

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Oak Ridge National Laboratory (ORNL). 1994. *Naval Air Station Fallon, Remedial Investigation, Remedial Investigation Report, Final.* September 1994.

———. 1992. *Preliminary Site Characterization Summary, Installation Restoration Program, Naval Air Station Fallon, Fallon, Nevada.* January 1992.

———. 1989. *Draft Project Work Plan (WP); Work Plan, Health and Safety Plan (HASP), Community Relations Plan (CRP); for the Evaluation of Potential Environmental Contamination.* January 1, 1989.

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———. 1989. *Volume III—Sampling and Analysis Plan (SAP) for the Remedial Investigation/ Feasibility Study (RI/FS).* August 1, 1989.

———. 1989. *Volume IV—Community Relations Plan (CRP) for the Remedial Investigation/Feasibility Study (RI/FS).* August 1, 1989.

U.S. Navy. 2001. *Response to NDEP Comments on Draft Final Decision Document, Site 7, Napalm Burn Pit, NAS Fallon, Nevada.* April 30, 2001.

———. 1999. *Draft Final Decision Document, Site 17, Hangar 5, Naval Air Station Fallon.* August 27, 1999.

———. 1998. *Draft Record of Decision, Sites 4, 5, 7, 8, 9, 10, 11, 12, 15, 17, 18, 19, 23, 24, 25, 26, & 27.* June 5, 1998.

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Notice of the public comment period was published in the *Lahontan Valley News* on October 3, 2003. The public comment period extended from October 8 through November 7, 2003. The public meeting presenting the Proposed Plan was held at the Fallon Convention Center in Fallon, Nevada, on October 15, 2003. As of November 7, 2003, the Navy had public comments from United States Fish and Wildlife. The comments from the letter are summarized below followed by the Navy's responses. A copy of the letter from USFW dated October 29, 2003 is provided at the end of this section along with USFW concurrence to the responses provided.

RESPONSES TO UNITED STATES FISH AND WILDLIFE COMMENTS

General Comments

Diagonal drain flows along the southern boundary of NAS Fallon and eventually terminates at the Stillwater National Wildlife Refuge, an area of considerable importance to migratory birds in Nevada. Several of the sites proposed for no further action appear to be within one-half mile of Diagonal Drain, with portions of Site 24 paralleling the drain. The groundwater gradient on NAS Fallon flows toward Diagonal Drain. Due to the risks of contamination of Diagonal Drain from various contaminated sites, including infiltration into the drain from contamination of the shallow ground water table, it is essentially important to continue monitoring for various contaminants in groundwater on NAS Fallon for the long term, with emphasis on sampling of groundwater wells near the drain. This type of monitoring would hopefully allow for identification and remediation of contaminant issues in the drain before they affect trust resources. We ask that you inform us and Stillwater National Wildlife Refuge if contaminated groundwater is found in the wells closest to the drain so that we can meet and discuss the possible need for additional sampling, which may include sampling of surface water in the Diagonal Drain.

Response

The Navy appreciates and shares the U.S. Fish and Wildlife's concern regarding the sensitivity of the trust resources downgradient of NAS Fallon. The Navy has a groundwater and surface water monitoring program in place at NAS Fallon and is providing results of the most recent events for U.S. Fish and Wildlife review. The Navy welcomes comments on the current monitoring programs at NAS Fallon and looks forward to working with U.S. Fish and Wildlife to insure that the NAS Fallon monitoring programs are protective of all resources.

Site 9, Wastewater Treatment Plant

We have no concerns specific to this site.

Site 12, Pest Control Shop

We noted that pesticides, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) were present in some groundwater samples. The presence of solvent-like compounds with pesticides could result in increased risk of movement of pesticides in the groundwater. Groundwater sampling in the downgradient monitoring wells is needed in the future to determine if this is occurring.

Response

VOCs and SVOCs were detected in groundwater samples collected from monitoring wells and other sampling points at Site 12. However, soil samples collected from Site 12 indicate that Site 12 is not the source of these contaminants in groundwater. Soil and groundwater sampling conducted at Site 14, located directly upgradient of Site 12, indicates that Site 14 is the source of these contaminants in groundwater. Groundwater sampling is being conducted on an annual basis to monitor conditions relative to Site 14. The Navy is currently evaluating cleanup alternatives for Site 14, which would include remediation of groundwater beneath Site 12.

The pesticides lindane and alpha-BHC were detected in the groundwater sample collected from well MW-22 in 1991. These concentrations were below the EPA Region 9 Preliminary Remedial Goals (PRGs) for tap water. Subsequent groundwater samples from well MW-22 collected in 1993 and 2002 did not contain any pesticide compounds at concentrations greater than reporting limits. In addition a groundwater sample collected from well MW-24 in 2002 did not contain pesticides at concentrations above reporting limits. Well MW-24 is located approximately 190 feet downgradient of well MW-22. The relationship between wells MW-22 and MW-24 is shown on Figure 5-2 of the draft decision document. Soil samples collected from Site 12 at depths of 2 feet or less did contain pesticides at concentrations below PRGs. Soil samples collected below 2 feet did not contain pesticides at concentrations above reporting limits. Based on these results, the Navy is confident that Site 12 does not pose a threat to human health or the environment relative to pesticides.

Site 17, Hangar 7

The information provided for this site mentions a drainage swale leading from the site to an unnamed drainage ditch east of Site 16. We recommend the collection and analysis of surface water samples from such ditches on NAS Fallon following major precipitation events when water is present in them. We are concerned about the possible transport of contaminants from various sites to the Diagonal Drain and eventually to Stillwater National Wildlife Refuge. If past sampling of surface water from such sites has occurred, we would appreciate a copy of the results.

Response

The Navy has a surface water monitoring program in place at NAS Fallon. One of the sampling locations is positioned just downgradient of the intersection of the unnammed drain and the east-west trending section of the southernmost drain at the station. The Navy is providing results of the most recent events for U.S. Fish and Wildlife review. The Navy welcomes comments on the

current monitoring programs at NAS Fallon and looks forward to working with U.S. Fish and Wildlife to insure that the NAS Fallon monitoring programs are protective of all resources.

Site 23, Shipping and Receiving Disposal Area

We have no concerns specific to this site.

Site 24, Road Oiling Area

A significant portion of this area is immediately adjacent to Diagonal Drain, thereby increasing risks for contamination of the Drain. Aroclor 1254, a class of polychlorinated biphenyls (PCBs), was detected in soil at one site (i.e., 24000) immediately adjacent to Diagonal Drain. No groundwater sampling was conducted near this site. Therefore, we recommend that additional soil samples (minimum of five locations at more than one depth) be collected along the road where it parallels Diagonal Drain. Furthermore, groundwater sampling should be initially conducted adjacent to site 24000 and at additional sites if PCB contamination is found in soil at additional sites. Future samples should also be analyzed for VOCs and petroleum hydrocarbons due to their presence in some past samples.

Response

Aroclor 1254 was detected in the soil sample from 0.5 feet bgs, at location 24000, at a concentration of 0.96 mg/kg, which is greater than the EPA Region 9 Preliminary Remedial Goal (PRG) for residential soil of 0.22 mg/kg. The soil samples collected from this location at depths of 1 and 2 feet did not contain Aroclor 1254 or any other PCBs at concentrations above the PRG for residential soil. Soil samples collected from the other four sampling locations at the same depths did not contain PCBs at concentrations above reporting limits. The soil PRG takes into account potential risks to groundwater. In addition, PCBs are particularly resistant to mobilization with a strong tendency to remain adsorbed to soil particles.

The Navy appreciates U.S Fish and Wildlife's concern regarding Site 24, however based on the current data, there is no threat to human health or the environment. The Navy will discuss options for surface water monitoring adjacent to location 24000 as part of the station-wide surface water monitoring program. As stated in the Declaration of the Decision for Site 24 (page 1), 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 (Navy) and the Nevada Division of Environmental Protection (NDEP) to determine that the remedy may not be protective of human health and the environment.

Summary

We concur with plans for No Further action at each of the sites listed above, with the exception of Site 24, where additional sampling is needed prior to closure. We also strongly recommend the additional monitoring of ground and surface water as outlined above as provided under our discussion of Sites 12 and 17.

Response

PCBs detected in soil samples collected from location 24000 at Site 24 do not extend beyond 0.5 feet below ground surface at concentrations above PRGs for residential soil. The soil PRG for Aroclor 1254 takes into account potential risks to groundwater. Based on station-wide data, groundwater is expected to be at approximately 5 to 7 feet deep in this area of the station. In addition, PCBs are particularly resistant to mobilization with a strong tendency to remain adsorbed to soil particles. Based on these data, Site 24 does not pose a threat to human health or the environment. The Navy will discuss options for surface water monitoring adjacent to location 24000 as part of the station-wide surface water monitoring program. If the surface water monitoring program suggests that PCBs are leaching into the drain, the site will be reopened for further evaluation and, if necessary, cleanup.

With respect to Sites 12 and 17, regular groundwater and surface water monitoring is being conducted on a station-wide basis. Results of the most recent groundwater and surface monitoring events are being provided to U.S. Fish and Wildlife for review.

UNITED STATES DEPARTMENT of the INTERIOR

TAKE PRIDE IN AMERICA

FISH AND WILDLIFE SERVICE
Nevada Fish and Wildlife Office
1340 Financial Boulevard, Suite 234
Reno, Nevada 89502-7147
(775) 861-6300 ~ Fax: (775) 861-6301

October 29, 2003
File No. EC 14.5

File
copy - Joe Farry
Chuck
Roy
Captain G.

Joe Farry, Environmental Protection Specialist
Naval Air Station Fallon
Environmental Department (Code N45F)
4755 Pasture Road, Building 307, 3rd Deck
Fallon, Nevada 89496-5000

Dear Mr. Farry:

We have reviewed information on the proposed plans for No Further Action at Installation Restoration Program Sites at Naval Air Station (NAS) Fallon that was provided at the public meeting on October 15, 2003. We have the following general and specific comments and recommendations in relation to the proposed actions.

General Comments

Diagonal Drain flows along the southern boundary of NAS Fallon and eventually terminates at Stillwater National Wildlife Refuge, an area of considerable importance to migratory birds in Nevada. Several of the sites proposed for no further action appear to be within one-half mile of Diagonal Drain, with portions of Site 24 paralleling the drain. The groundwater gradient on NAS Fallon flows toward Diagonal Drain. Due to the risks of contamination of Diagonal Drain from various contaminated sites, including infiltration into the drain from contamination of the shallow ground water table, it is especially important to continue monitoring for various contaminants in groundwater on NAS Fallon for the long term, with emphasis on sampling of groundwater wells near the drain. This type of monitoring would hopefully allow identification and remediation of contaminant issues in the drain before they affect trust resources. We ask that you inform us and Stillwater National Wildlife Refuge if contaminated groundwater is found in the wells closest to the drain so that we can meet and discuss the possible need for additional sampling, which may include sampling of surface water in the Diagonal Drain.

Specific Comments

Site 9, Wastewater Treatment Plant

We have no concerns specific to this site.

Site 12, Pest Control Shop

We noted that pesticides, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) were present in some groundwater samples. The presence of solvent-like compounds with pesticides could result in the increased risk of movement of pesticides in the groundwater. Groundwater sampling in down-gradient monitoring wells is needed in the future to determine if this is occurring.

Site 17, Hanger 7

The information provided for this site mentions a drainage swale leading from the site to an unnamed drainage ditch east of Site 16. We recommend the collection and analysis of surface water samples from such ditches on NAS Fallon following major precipitation events when water is present in them. We are concerned about the possible transport of contaminants from various sites to Diagonal Drain and eventually to Stillwater National Wildlife Refuge. If past sampling of surface water from such sites has occurred, we would appreciate a copy of the results.

Site 23, Shipping and Receiving Disposal Area

We have no concerns specific to this site.

Site 24, Road Oiling Area

A significant portion of this area is immediately adjacent to Diagonal Drain, thereby increasing risks for contamination of the Drain. Aroclor 1254, a class of polychlorinated biphenyls (PCBs), was detected in soil at one site (i.e., 24000) immediately adjacent to Diagonal Drain. No groundwater sampling was conducted near this site. Therefore, we recommend that additional soil samples (minimum of five locations at more than one depth) be collected along the road where it parallels Diagonal Drain. Furthermore, groundwater sampling should be initially conducted adjacent to site 24000 and at additional sites if PCB contamination is found in soil at additional sites. Future samples should also be analyzed for VOCs and petroleum hydrocarbons due to their presence in some past samples.

Summary

We concur with plans for No Further Action at each of the sites listed above, with the exception of Site 24, where additional sampling is needed prior to closure. We also strongly recommend the additional monitoring of ground and surface water as outlined above as provided under our discussion of Sites 12 and 17.

We appreciate the opportunity to comment on the proposed plans. Please contact me or Stanley Wiemeyer at (775) 861-6300 if you have any questions or would like to meet with us.

Sincerely,

for Robert D. Williams
Field Supervisor

cc:
Nevada Division of Environmental Protection, Bureau of Federal Facilities, Carson City, Nevada
(Attn: Ramon Naranjo)
Project Leader, Stillwater National Wildlife Refuge, Fish and Wildlife Service, Fallon, Nevada

Farry, Joseph A (NASF N45F)
From: Farry, Joseph A (NASF N45F)
Sent: Thursday, November 20, 2003 7:29
To: 'Laurie_Sada@r1.fws.gov'
Cc: Said Seddiki (EFANW) (E-mail); Richard Powell (E-mail); Deverin, Chuck CIV (NASF N45F)
Subject: RE: Draft Decision Documents, Site 24- NAS Fallon Response to FWS Comments

Ms. Laurie Sada and Mr. Damian K. Higgins - USFW

The Navy appreciates you expedited review and attention to our responses and additional documentation. Per Mr. Higgin's response below, the Navy agrees to conduct the additional surface water sampling for PCBs during our annual surface water sampling effort. The Navy will include your office in review of the work plan to ensure that USFW's concerns are addressed.

Joseph A. Farry, PE-IRP Team Leader
NAS Fallon - Environmental Department (N45F)
4755 Pasture Road
Fallon, NV 89496
Phone: 775-426-2772
FAX: 775 - 426-2663
Email: joseph.farry@navy.mil

-----Original Message-----

From: Laurie_Sada@r1.fws.gov [mailto:Laurie_Sada@r1.fws.gov]
Sent: Wednesday, November 19, 2003 14:34
To: Damian_Higgins@r1.fws.gov; Farry, Joseph A (NASF N45F)
Subject: Draft Decision Documents, Site 24- NAS Fallon Response to FWS Comments

<< File: pic26500.gif >>

Joseph - I concur with Damian's recommendations outlined below. I understand that he spoke with you today and that you are willing to work with us to modify your surface water monitoring program to meet our request. Please accept this email as formal notification that you have satisfied our concerns regarding the No Further Action Decision. If you have further questions, please contact me or Damian Higgins of our staff.

Sincerely,

Laurie Sada
Assistant Field Supervisor
Nevada Fish and Wildlife Office
1340 Financial Blvd., Suite 234
Reno, Nevada 89509
Phone: (775) 861-6300
Fax: (775) 861-6301
----- Forwarded by Laurie Sada/RENO/R1/FWS/DOI on 11/19/2003 01:39 PM -----

Damian Higgins

11/19/2003 12:04 PM

To: Laurie Sada/RENO/R1/FWS/DOI@FWS
cc: Stanley Wiemeyer/RENO/R1/FWS/DOI@FWS
Subject: Draft Decision Documents, Site 24- NAS Fallon Response to FWS Comments

Laurie:

I have reviewed the letter from NAS Fallon dated November 13, 2003, that provides responses to our October 29, 2003, comments regarding the No Further Action decision for Sites 9, 12, 17, 23, and 24. In our letter, we concurred with those plans for no further action with the exception of Site 24. We did not concur with the action for site 24 due to concerns regarding the detection of PCB at one location (i.e, 24000) and the potential for adverse impacts to Diagonal Drain and our trust resources down-gradient. Upon reviewing our historical files, associated sampling that has been conducted previously at this site, and the additional monitoring information that you provided on November 17, 2003, it is my recommendation that we concur with no further action at Site 24. My recommendation for this is based upon the following:

1) Recent soil samples at different depths at four other locations at Site 24 did not detect PCB exceeding 0.22mg/kg (EPA Preliminary Remedial Goal);

2) Sampling conducted in 1991 for PCB's and VOC's at Site 24 did not detect these contaminants (Oak Ridge National Laboratory's Preliminary Site Characterization Summary for NAS Fallon Installation Restoration Program, January 1992); and

3) PCB detections in soil at location 24000 appears to be strongly absorbed to soil particles and is not expressed beyond 0.5 feet bgs.

However, as a condition to our concurrence for no further action on Site 24, I recommend that an analysis of surface water in Diagonal Drain be conducted for total PCB's furthest downgradient on NAS Fallon property during the period at which groundwater contributes to surface water flow. This should be done on an annual basis and if PCB is not detected, the sampling can be terminated. Hopefully this sampling may be achieved through their existing surface water monitoring program.

Sincerely,
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Damian K. Higgins
Environmental Contaminants Biologist

U.S. Fish & Wildlife Service
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