# Decision Document
## for
# Site 19, Post–World War II Burial Site

Naval Air Station Fallon
Fallon, Nevada

Delivery Order 0013

March 2002

ARCHITECT-ENGINEERING SERVICES
**ENVIRONMENTAL RESTORATION PROJECTS**

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

**THE URS TEAM**

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# DECLARATION OF THE DECISION

## SITE NAME AND LOCATION

Site 19, Post–World War II Burial Site
Naval Air Station Fallon
Fallon, Nevada

CERCLIS Identification Number
NV9170022173

## STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for Site 19, the Post–World War II Burial Site, 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 Post–World War II Burial Site (Installation Restoration [IR] Site 19), NAS Fallon, Nevada. Data collected within, adjacent to, and downgradient of Site 19, do not indicate the presence of contaminants that would be associated with the types of activities conducted at the site. The types of contaminants expected at the site have not migrated off site as evidenced by the results of downgradient monitoring. Some petroleum hydrocarbon contamination has been observed in groundwater beneath the site. All available data indicate that this contamination is attributable to petroleum hydrocarbon release(s) at IR Site 16, the Old Fuel Farm, which is located upgradient (north-northwest) of Site 19. This contamination will be addressed as part of cleanup efforts related to Site 16.

## STATUTORY DETERMINATIONS

The selected remedy for Site 19 is protective of human health and the environment and in compliance with federal and state applicable or relevant and appropriate requirements (ARARs). Although the groundwater beneath Site 19 is affected by petroleum hydrocarbons, the contamination is attributed to Site 16. Cleanup of hydrocarbons in groundwater under Site 19 will be addressed under future cleanup measures proposed for Site 16. Because Site 19 is a landfilled area, land use restrictions will apply. The site may be reopened for further evaluation and if necessary cleanup, based on newly discovered information that leads the Navy and the NDEP to determine that the remedy may not be protective of human health and the environment.

Captain Brad T. Goetsch
Commanding Officer
Naval Air Station Fallon

17 MAY 2002
Date

Paul J. Liebendorfer
Bureau Chief, Federal Facilities
Nevada Division of Environmental Protection

4 June 2002
Date

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### TABLES

# 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 |
| CFR | Code of Federal Regulations |
| cm/sec | centimeter per second |
| CRP | community relations plan |
| DCA | dichloroethane |
| EPA | U.S. Environmental Protection Agency |
| ER, N | Environmental Restoration, Navy |
| FS | feasibility study |
| GC | gas chromatograph |
| HBP PHC | high-boiling-point petroleum hydrocarbons |
| 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 |
| PAH | polycyclic aromatic hydrocarbon |
| PID | photoionization detector |
| RAB | Restoration Advisory Board |
| RI | remedial investigation |
| SI | site inspection |

## ABBREVIATIONS AND ACRONYMS (Continued)

| | |
|---|---|
| SVOC | semivolatile organic compound |
| TCE | trichloroethene |
| TCLP | toxicity characteristics leaching procedure |
| TPH | total petroleum hydrocarbons |
| TPH-D | total petroleum hydrocarbons in the diesel range |
| TPH-E | total petroleum hydrocarbons—extractable |
| TPH-G | total petroleum hydrocarbons in the gasoline range |
| TPH-P | total petroleum hydrocarbons—purgeable |
| TRA | Technical Review Committee |
| VOC | volatile organic compound |
| WET | Waste Extraction Test |

# DECISION SUMMARY

## 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 19, the Post–World War II Burial Site, at Naval Air Station (NAS) Fallon, in Fallon, Nevada. The decision summary includes information regarding site background, the nature and extent of contamination, current and potential site and resource uses, and the assessment of human health and environmental risks. It also describes the involvement of the public throughout the process.

This decision document supersedes and replaces the *Draft Final Decision Document, Site 19, Post–World War II Burial Site*, dated August 27, 1999. Documents supporting the decision are included in the Administrative Record for the site. Key documents are identified in Section 10.

This 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. The content of 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 contamination 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 19 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 19

- **Section 5—Site Characteristics.** Summarizes the regional, facility, and site-specific characteristics and conditions, including concentrations and distribution of contaminants

- **Section 6—Current and Potential Site and Resource Uses.** Discusses the current and potential future uses of the land and resources and summarizes the land use controls applying to the site

- **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 19

- **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.** Provides a list of references used in the decision document

# 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 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 as it has for the past 50 years.

## 2.1 SITE DESCRIPTION

Site 19, the Post–World War II Burial Site, is in the southeastern portion of NAS Fallon (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 NDEP serves as the lead regulatory agency. Funding for all activities related to this site was obtained under the Environmental Restoration, Navy (ER,N) account.

Site 19 is an open area of level ground located west of the Wastewater Treatment Plant (Site 9) and north of "F" Street (Figure 2-2). The area remains unused, with the exception of a 70-foot-wide by 100-foot-long by 6-inch-thick concrete pad at the southeast corner of Site 19. NAS Fallon does not expect any change in the use of this land or that of the surrounding sites in the near future.

According to information obtained during interviews conducted in 1988 as part of a preliminary assessment/site inspection (PA/SI), Site 19 reportedly received trash and refuse generated during facility decommissioning activities between 1946 and 1949. The waste was buried in trenches, which were likely excavated by bulldozer to a depth of less than 8 feet. The waste deposited in these trenches reportedly included trash, vehicles, wood, paints, thinners, and solvents. The site surface, with the exception of the concrete pad at the southeast corner of Site 19, currently consists of gravel or vegetative cover, which grew after landfilling activities were discontinued. The Site 19 landfill was closed prior to the Federal Facility Compliance Act. No closure standards had been promulgated when this landfill was closed (1949). No landfilling has occurred at the site since 1949.

## 2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The purpose of the U.S. Navy's (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:

- The PA/SI constituted Phase I of three investigation/assessment activities conducted at the site. During Phase I, information was gathered by means of employee interviews, site inspections, record searches, and laboratory analysis of a limited number of samples. It was reported during the interviews that waste was buried in trenches, which were likely excavated by bulldozer to a depth of less than 8 feet. The waste deposited in these trenches reportedly included trash, vehicles, wood, paints, thinners, and solvents.

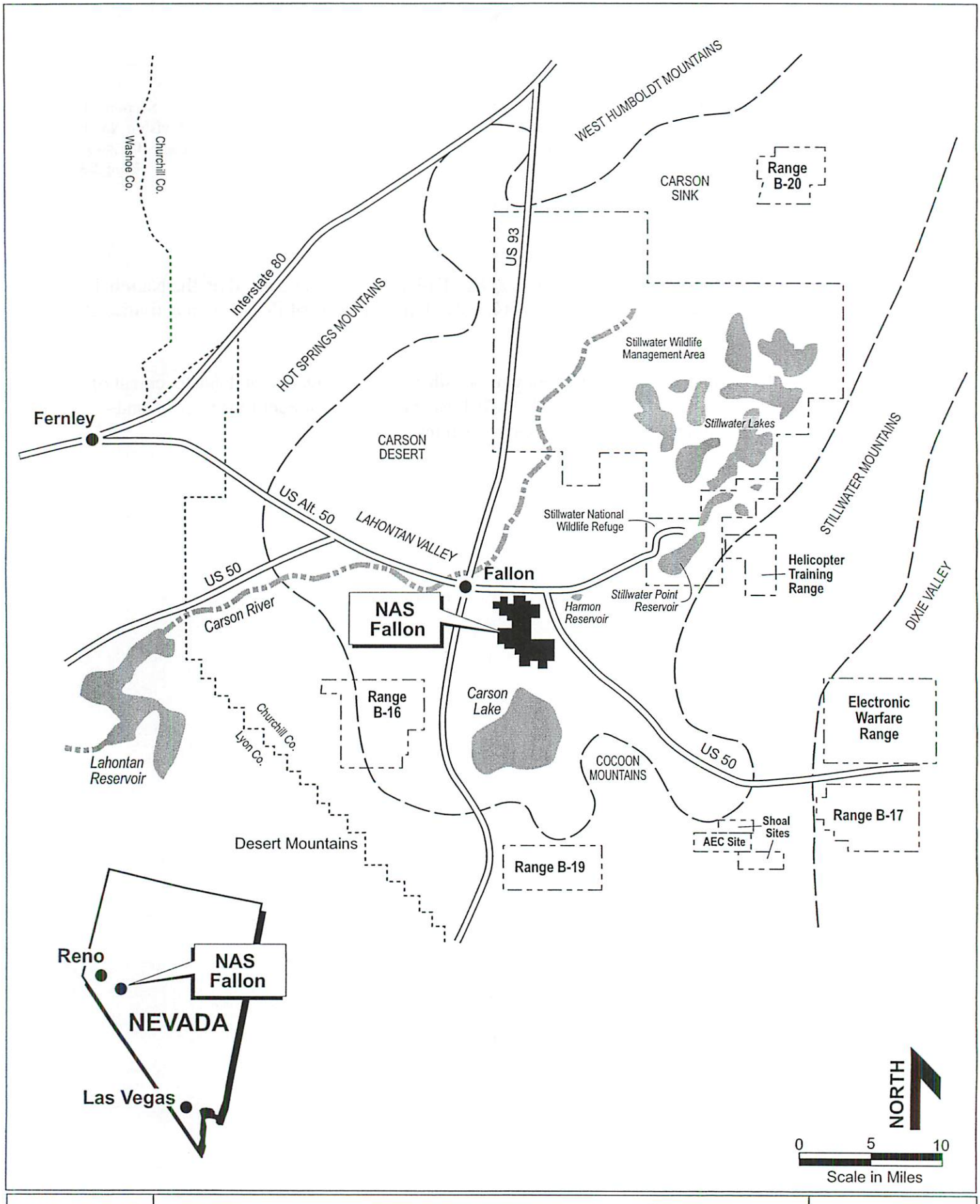
- Phase II consisted of a remedial investigation (RI) that included a baseline risk assessment conducted in 1994. The RI concluded there was no threat to human health or the environment; therefore, the recommendation was No Further Action.

- Phase III was conducted to collected additional site characterization data. Additional data were collected from nine groundwater monitoring wells drilled or otherwise installed within the boundaries of or immediately outside the boundaries of Site 19. All sampling locations relevant to Site 19 are shown and discussed in Section 5. Most of the post-RI data were generated for intrinsic remediation studies and groundwater monitoring related to adjacent active sites. Monitoring results are presented in various progress reports included in the Administrative Record and discussed herein.

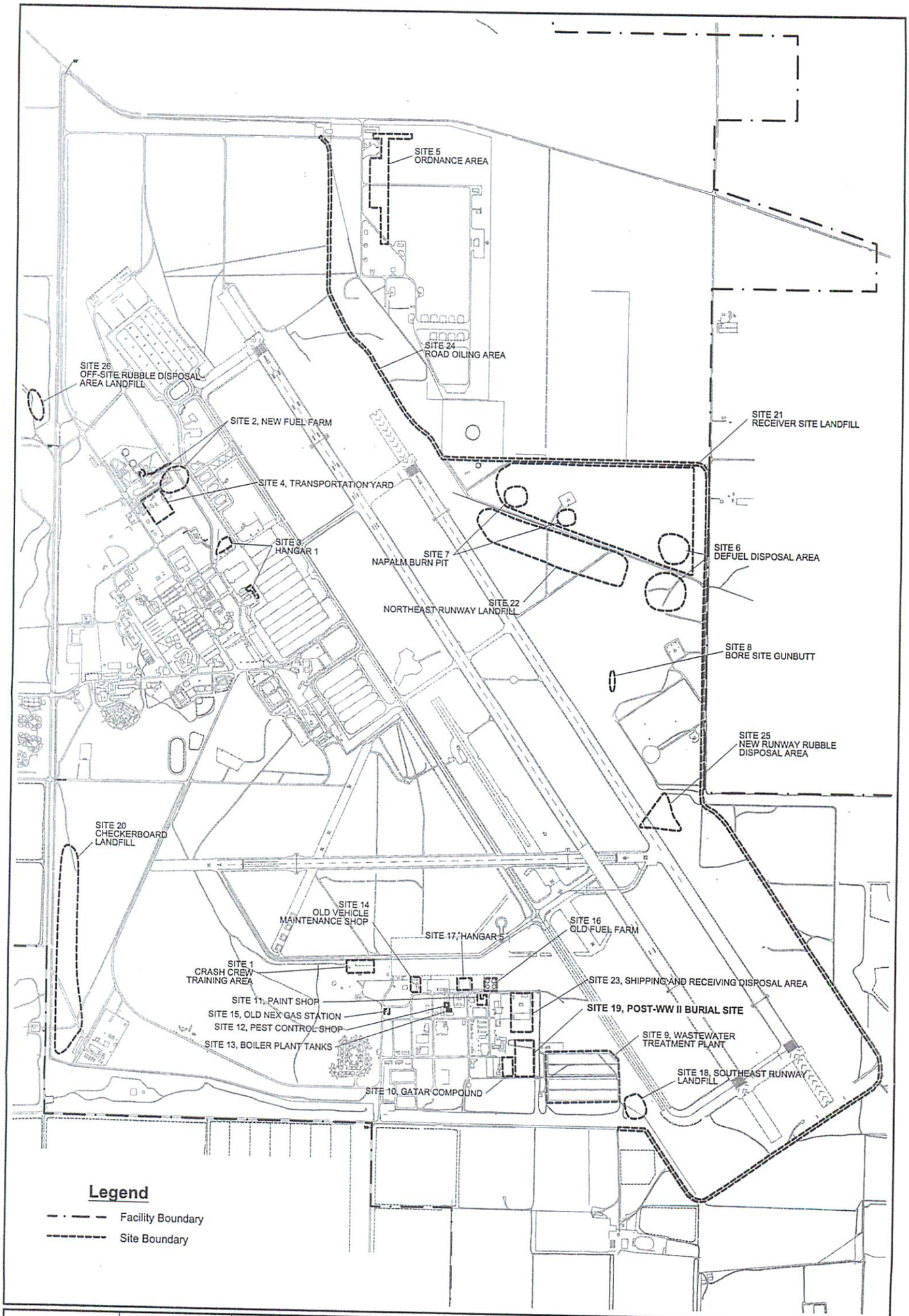
After the RI was published, the Navy prepared a draft decision document for Site 19 presenting a decision of No Further Action. The NDEP provided comments on the draft decision document. A draft final decision document for Site 19 was prepared, and the NDEP provided comments on the draft final document. 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 19. This version, therefore, supersedes and replaces all previous versions.

In February 12, 1996, the EPA determined that NAS Fallon should not be listed on the National Priorities List (NPL); therefore, the EPA is not involved in the review of IR Program activities at NAS Fallon.

The NDEP is the state lead regulatory agency responsible for the protection and enhancement of the environment of the State of Nevada. The NDEP Bureau of Federal Facilities reviews and comments on NAS Fallon's IR Program response actions.




| U.S. NAVY | Figure 2-1<br>Location Map, NAS Fallon | Delivery Order 0013<br>NAS Fallon<br>DECISION DOCUMENT<br>SITE 19 |
|---|---|---|




U.S. NAVY

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**Figure 2-2**
**NAS Fallon Facility Map**

Delivery Order 0013
NAS Fallon
DECISION DOCUMENT
SITE 19

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# 3.0 COMMUNITY PARTICIPATION

Community participation is being carried out 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 in 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 19, 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/Fallon Eagle Standard* on February 12 and 13, 2002. Notices were also sent to individuals on the RAB mailing list. A public comment period was held from February 16 to March 18, 2002. In addition, a public meeting was held on February 21, 2002, to present the Proposed Plan to a community audience that was broader than that which had already been involved at the site. At this meeting, representatives from NAS Fallon and the NDEP presented the Proposed Plan. The plan for No Further Action was not altered as a result of public comments.

# 4.0 SCOPE AND ROLE OF SITE

As indicated in various previous documents, which are available in the Administrative Record, Site 19 is grouped with eight other sites due to their proximity to one another and the potential for commingled contaminated areas. The sites, referred to as "Group IV Sites," are IR 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 16 (Old Fuel Farm), Site 17 (Hangar 5), and Site 23 (Shipping and Receiving Disposal Area). They are shown in Figure 2.2. Site 19 is the southeasternmost of the Group IV sites. The sampling results associated with some of the surrounding sites are also relevant to Site 19.

The sampling locations used to evaluate Site 19 are as follows:

- Twenty-two auger-boring sampling locations along the perimeter of Site 19 from which groundwater samples were collected for qualitative analysis (these locations are sometimes referred to as "groundwater test holes")
- Thirteen permanent monitoring wells located within or immediately outside the boundaries of Site 19
- Four sediment sampling locations in the unnamed drain that flows from north to south along the eastern boundary of the site

For clarity, the sampling locations used as a basis for the decision for Site 19 are summarized in Table 4-1, along with the gradient relationships to Site 19 and the uses of data from each location. Table 4-2 provides a chronological summary of quantitative sampling activities at each permanent monitoring well location.

Twenty test holes were initially completed specifically to qualitatively evaluate potential contamination related to Site 19. The permanent groundwater monitoring wells were installed to evaluate the lateral extent of contamination related to Site 16. The BAT series of wells was installed specifically to evaluate intrinsic remediation for Site 16. The sediment and surface water samples from the unnamed drain were also collected for the evaluation of a petroleum hydrocarbon release that occurred at Site 16. However, the monitoring wells are sufficiently positioned to evaluate contamination related to Site 19 and support a decision.

NAS Fallon has selected No Further Action as the preferred alternative for Site 19 for the following reasons:

- The human health baseline risk assessment conducted as part of the RI assumed no current exposure to contaminated groundwater.
- Site 19 has no ongoing contaminant sources.
- On the basis of past practices at Site 19, one would expect possible contaminants to be volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals. None of these contaminants has been detected at Site 19.
- Data collected within, adjacent to, and downgradient of Site 19 do not indicate the presence of contaminants that would be associated with the types of activities conducted at the site. Sampling has confirmed that at the Site 19 location there are no potential contaminants of concern (these are identified in Section 5) at concentrations greater than regulatory action levels.
- Groundwater beneath the site is contaminated by petroleum hydrocarbons. All available data indicate that this contamination is attributable to petroleum hydrocarbon release(s) at Site 16, which is located upgradient of Site 19. That contamination will be addressed as part of the ongoing cleanup efforts related to Site 16.

Because there is no source of contamination at Site 19, there is no risk to human health or the environment posed by this site. Contaminated groundwater underlying Site 19 will be addressed through future activities related to Site 16. Therefore, No Further Action is proposed for the site.

## Table 4-1
## Summary of Data From Sampling Locations Used as Basis of Decision for Site 19, Post–World War II Burial Site

| Sampling Location | Data Type | Data Uses |
|---|---|---|
| **Locations Within Site 19** | | |
| Groundwater test holes 56, 57, 61, and 62 | 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. |
| Wells BAT-16MU, BAT-16ML, MW-29U, MW-29L, MW-30, and BAT-16O | Quantitative | Quantitative assessment of presence or absence of potential contaminants in groundwater related to Site 19. |
| **Locations Upgradient of Site 19** | | |
| Groundwater test holes 17, 18, 19, 20, and 63 | 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. |
| Wells GTI16-1, MW-66, and MW-77 | Quantitative | Quantitative assessment of contaminants migrating on to Site 19. |
| **Locations Crossgradient of Site 19** | | |
| Groundwater test holes 33, 34, S19GW6, and S19GW10 | 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. |
| **Locations Downgradient of Site 19** | | |
| Groundwater test holes 35, 36, S19GW8, S19GW9, S19GW14, S19GW15, S19GW16, S19GW17, and S19GW18 | 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. |
| Wells MW-28, MW-78, MW-79, and BAT-16N | Quantitative | Quantitative assessment of potential contaminants migrating from Site 19. |
| SF01, SF02, SD01, SD02 | Sediment samples | Quantitative assessment of potential contaminants migrating from Site 19. |

Note:
LNAPL - light nonaqueous-phase liquid

## Table 4-2
## Chronological Quantitative Sampling Summary

| Sampling Location | Matrix | Sampling Dates | Range of Analyses[a] |
|---|---|---|---|
| MW-28 | Soil | 3/91 | Petroleum hydrocarbons, VOCs, and SVOCs |
| MW-28 | Groundwater | 4/91, 8/91, 10/93, 3/95, 9/95, 9/96, 3/97, 9/97, 4/98, 4/99, and 11/99 | Petroleum hydrocarbons, VOCs, and metals |
| MW-29L | Soil | 3/91 | Petroleum hydrocarbons, VOCs, and SVOCs |
| MW-29U | Groundwater | 4/91, 8/91, 10/93, 3/95, 9/95, 9/96, 3/97, 3/98, 4/99, 4/99, and 11/99 | Petroleum hydrocarbons, VOCs, and metals |
| MW-29L | Groundwater | 4/91, 8/91, and 9/98 | Petroleum hydrocarbons and VOCs |
| MW-30 | Soil | 3/91 | Petroleum hydrocarbons, VOCs, and SVOCs |
| MW-30 | Groundwater | 4/91, 9/91, 9/96, 9/97, and 11/99 | Petroleum hydrocarbons |
| MW-66 | Groundwater | 12/91, 4/92, 10/93, 3/95, 3/97, 9/97, 3/98, 9/98, 4/99, 9/99, and 11/99 | Petroleum hydrocarbons, VOCs, SVOCs, and metals |
| MW-77 | Groundwater | 9/96, 3/97, 9/97, 3/98, 9/98, 4/99, 9/99, and 11/99 | Petroleum hydrocarbons, VOCs, SVOCs, and metals |
| MW-78 | Groundwater | 9/96, 3/97, 9/97, and 11/99 | Petroleum hydrocarbons, VOCs, and metals |
| MW-79 | Groundwater | 9/96, 9/97, and 11/99 | Petroleum hydrocarbons and VOCs |
| BAT16-MU | Groundwater | 9/97, 3/98, 9/98, 4/99, 9/99, and 11/99 | Petroleum hydrocarbons |
| BAT16-ML | Groundwater | 9/97 and 11/99 | Petroleum hydrocarbons, VOCs, and SVOCs |
| BAT-16N | Groundwater | 9/97, 4/98, 9/99, and 11/99 | Petroleum hydrocarbons, VOCs, and SVOCs |
| BAT-16O | Groundwater | 9/97 | Petroleum hydrocarbons, VOCs, and SVOCs |
| GTI16-1 | Groundwater | 9/96, 9/97, and 11/99 | Petroleum hydrocarbons and VOCs |
| SD01, SD01, SF01, SF02 | Sediment | 12/91 | Petroleum hydrocarbons, VOCs, and SVOCs |

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

Notes:
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 accept discharge of 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 19 Physical Setting

Site 19 is an open area of unpaved, fairly level ground (with the exception of shallow drainage ditches) located west of the Wastewater Treatment Plant (Site 9) and north of "F" Street (Figure 5-1). Site 19 encompasses approximately 4 acres, extending approximately 570 feet north to south and 300 feet from east to west. The area remains unused, with the exception of a 70-foot-wide by 100-foot-long by 6-inch-thick concrete pad at the southeast corner of Site 19. Native vegetation has grown in the area since landfilling activities were discontinued in 1949. NAS Fallon does not expect any change in the use of this land, or that of the surrounding sites in the near future. There are no areas of archaeological or historical importance at Site 19.

## 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, pickleweed, halogeton, greasewood, milkweed, poverty weed, alkali goldenbush, rabbitbrush, saltgrass, and sorghum.

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 coyote, black-tailed hare, jackrabbit, deer mouse, antelope, 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, bullhead, catfish, and sunfish.

### 5.2.5 Endangered Animal Species

Federally listed endangered and threatened animal species that may utilize the NAS Fallon and range areas include the peregrine falcon and the southern 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 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 cross section showing the stratigraphy beneath NAS Fallon is provided in Figure 5-2.

### 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 Study*. 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 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 northeast corner of the facility. However, NAS Fallon derives all of its domestic water from this aquifer utilizing deep wells northeast 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 19 Geology and Hydrogeology

The geologic information for the Group IV sites (including Site 19) was obtained by soil sampling or cone penetrometer investigation during the installation of monitoring wells GTI16-1, MW-28, MW-29, MW-30, MW-66, MW-77, MW-78, MW-79, BAT16-MU, BAT16-ML, BAT-16N, and BAT-16O. 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. Wells

MW-29, MW-30, BAT-16MU, and BAT-16ML are located within the site boundaries. Wells MW-77 and BAT-16O are located immediately outside the site boundaries. Wells GTI16-1 and MW-66 are located upgradient of the site. Wells MW-28, MW-78, MW-79, and BAT-16N are located downgradient of the site.

The monitoring wells listed in the previous paragraph typically penetrated the entire Fallon Formation and from 3 to 5 feet of the Sehoo Formation (see Figure 5-2 for the generalized stratigraphy in the area of NAS Fallon). Borings for these wells were completed to depths between 20 and 25 feet. Sand was generally encountered above the silt-to-clay aquitard. The aquitard was generally observed at depths ranging from 15 to 21 feet bgs. Silt content in the sand increased gradationally near the center of the landfilled area of Site 19. Silty sand to sandy silt was observed from the ground surface or near ground surface to depths up to 4 feet bgs at locations MW-66 and MW-77. Soil at locations BAT-16MU, BAT-16ML, BAT-16N, and BAT-16O was described by means of cone penetrometer methods rather than split-spoon sampling methods. Cone penetrometer methods are interpretive methods that describe soil without direct sampling and visual inspection of the soil. Split-spoon methods physically collect a soil sample for visual inspection. Soils described at the BAT series locations generally show increased silt content relative to the MW and GTI series wells. The BAT series wells are positioned along the western boundary (BAT-16MU and BAT-16ML), along the eastern boundary (BAT-16O), and downgradient (BAT-16N) of Site 19.

Groundwater surface elevation contours indicate a gradient and flow direction at Site 19 that are consistent with the regional flow direction, which is to the southeast. Depth to groundwater in wells used to evaluate conditions at Site 19 varies seasonally and ranges from 5.6 to 7.5 feet bgs. The average hydraulic gradient across the site was approximately 0.002 in April 1992 and 0.0011 in September 1997. Groundwater surface elevation contours for data collected in April 1992 and September 1997 are shown in Figures 5-3 and 5-4, respectively. These figures show a consistent groundwater flow pattern and gradient across the site over time.

Bail tests were conducted on selected wells at the site in April 1991 and June 1992. Wells MW-28, MW-29U, MW-29L, and MW-30 were bail tested in April 1991. Well MW-66 was bail tested in June 1992. Multiple bail tests were conducted at each location. The highest calculated hydraulic conductivity for each well location follows:

- MW-28: 0.28 feet/day, or $9.9 \times 10^{-5}$ cm/sec
- MW-29U: 1.58 feet/day, or $5.6^{-4}$ cm/sec
- MW-29L: 2.45 feet/day, or $8.6^{-4}$ cm/sec
- MW-30: 1.16 feet/day, or $4.1 \times 10^{-4}$ cm/sec
- MW-66: 2.6 feet/day, or $9.2 \times 10^{-4}$ cm/sec

The highest bail test-derived hydraulic conductivity was observed at the upgradient well (MW-66), and the lowest hydraulic conductivity was observed at the downgradient well (MW-28). Assuming a porosity of 33 percent, the range of groundwater velocities across the site is 0.6 to 5.8 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 19. Pumping test-derived hydraulic conductivities were estimated at 38.9 to 61.6 feet per day. These estimates are 15 to 24 times higher than the highest bail test-based estimate of 2.6 feet per day at Site 19, suggesting that groundwater velocity across the site could be as high as 140 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 can range from 1/2 to 1/10 as fast as that of groundwater.

## 5.4 NATURE AND EXTENT OF CONTAMINATION

This section first discusses numerical values appropriate for comparison to measured concentrations of contaminants in soil and groundwater and then discusses the results of the investigations conducted in the vicinity of Site 19. The data are summarized below and discussed in detail in the following subsections.

Contaminant concentrations in groundwater have exceeded the action levels (for petroleum hydrocarbons) or maximum contaminant levels (MCLs) (for VOCs, SVOCs, and metals) only in samples collected from upgradient wells. BAT-16MU is the only exception to this observation: one of the four samples collected from this well between September 1997 and April 1999 contained total petroleum hydrocarbons in the diesel range (TPH-D) at a concentration of 1.3 mg/L (September 1997 sample). However, in all cases, the maximum detected petroleum hydrocarbon concentration, regardless of the analytical method, has come from upgradient wells. Concentrations of VOCs and SVOCs above the MCLs were also detected only in groundwater samples collected from upgradient wells. These observations show that the limited groundwater contamination observed at Site 19 is a result of contaminant migration to Site 19 from an upgradient source.

Total metals concentrations observed in groundwater at Site 19 fall within the range of total metals concentrations observed across the facility at NAS Fallon and are not considered to be a result of activities at Site 19.

### 5.4.1 Numerical Values for Comparison to Contaminant Concentrations

Potential contaminants that could have been released as a result of activities at Site 19 include petroleum hydrocarbons, VOCs, SVOCs, and metals. Comparative numerical values for action decisions are provided in NDEP guidance, which states the following:

- For contaminants in groundwater, compare the MCLs listed in the EPA Drinking Water Regulations and Health Advisories to contaminant concentrations analyzed during investigation and/or remedial activities.

- For contaminants in soil, compare the toxicity characteristics leaching procedure (TCLP) allowable levels listed in 40 Code of Federal Regulations (CFR) Part 261.24 and the state action level pursuant to Nevada Administrative Code (NAC) 445A.2272 to contaminant concentrations analyzed during investigation and/or remedial activities.

- If contaminated soil is to be left in place, provide an A through K analysis pursuant to NAC 445A.227.

The PA/SI identified material that was or could have been disposed of at the landfill at Site 19 as trash, vehicles, wood, solvents, possible paints, and thinners. These types of sources generally result in impacts on the subsurface due to petroleum hydrocarbons, VOCs, SVOCs, and metals.

The "soil action level" established by NAC 445A.2272 is 100 mg/kg for petroleum substances (typically referred to as total petroleum hydrocarbons [TPH]). The action level recommended by the NDEP for TPH in groundwater at NAS Fallon is 1.0 mg/L. This action level is considered by NAS Fallon to be provisional. For the petroleum constituents benzene, toluene, ethylbenzene, and total xylenes (BTEX), the MCLs for groundwater established by the EPA are 0.005 mg/L, 1.0 mg/L, 0.70 mg/L, and 10.0 mg/L, respectively. The MCLs for other VOCs, SVOCs, and metals are discussed in the following subsections.

The NDEP policy for soil contaminants other than petroleum hydrocarbons is based on the California Waste Extraction Test (WET), which is a TCLP-based contaminant evaluation.

### 5.4.2 Qualitative Data From Groundwater Test Holes

As discussed in Section 4, 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 19. 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.

The groundwater test hole data relevant to Site 19 are shown in Figure 5-1, which indicates by symbol type at each groundwater test hole location whether volatile contaminants were present or absent during sampling. The groundwater test holes provided screening-level data to assess the presence or absence of volatile contaminants that could be related to Site 19 or migrating onto and across Site 19 from upgradient sources.

Twenty-two groundwater test holes are positioned near Site 19. Results from the groundwater test holes were typically used as yes or no responses to the question "is contamination present or absent?" Contamination was present in 16 of the 22 groundwater test holes near the outside boundaries to or within the boundaries of Site 19 (Figure 5-1). Test holes upgradient, along the western boundary, along the southern boundary, and in the southeastern corner of Site 19 displayed contamination. Test holes in the northeastern portion of the site and farther downgradient of the site did not display contamination.

### 5.4.3 Quantitative Soil Data

There are limited quantitative analytical data for soil at Site 19. Soil contamination was not aggressively evaluated because landfilling activities at Site 19 were discontinued over 50 years ago. Furthermore, contaminants have not been detected in groundwater samples collected from downgradient wells, which have been monitored over the last 5 to 9 years (wells MW-77, MW-78, and MW-28).

In 1991, soil samples were collected from wells MW-28 (at 7 to 9 feet bgs), MW-29 (at 7 to 9 feet bgs), and MW-30 (at 5 to 7 feet bgs). Samples from wells MW-28 and MW-29 were saturated samples. The sample from well MW-30 was not saturated. All three of these samples were analyzed for total high-boiling-point petroleum hydrocarbons (HBP PHC) (EPA Method 8015 Modified), total low-boiling-point petroleum hydrocarbons (LBP PHC) (EPA Method

8015/8020), VOCs (EPA Method 8260), and SVOCs (EPA Method 8270). The analytical results are summarized in Table 5-1.

Total HBP PHC was not detected at concentrations above 10 mg/kg in any of the three samples. Total LBP PHC was not detected at concentrations above 5 mg/kg in samples from wells MW-28 and MW-30. Total LBP PHC was detected in the sample from MW-29 at a concentration of 8 mg/kg, which is below the 100 mg/kg action level for TPH in soil. The compound bis(2-ethylhexyl)phthalate was detected at estimated concentrations of 50 and 68 µg/kg in the samples from MW-29 and MW-30, respectively. Carbon disulfide was detected at estimated concentrations of 6 µg/kg and 2 µg/kg in samples from MW-29 and MW-30, respectively. Methylene chloride was detected in soil samples at concentrations of 11 µg/kg at MW-28, 12 µg/kg at MW-29, and 7 µg/kg at MW-30. Acetone was detected at an estimated concentration at 6 µg/kg in the soil sample from MW-29. No other VOCs or SVOCs were detected in these soil samples.

Out of 19 soil samples collected at the Group IV sites, 14 of them contained bis(2-ethylhexyl)phthalate, carbon disulfide, and methyl chloride, at similarly low concentrations. These analytes are also common laboratory chemicals. Given the ubiquitous detection frequencies in the Group IV samples and the low concentrations, these detections are considered to be laboratory contaminants.

BTEX compounds and polycyclic aromatic hydrocarbons (PAHs) were not detected in these soil samples at concentrations above the laboratory reporting limits or the action levels for soil.

The absence of soil contamination at Site 19 that could potentially contaminate groundwater is inferred on the basis of these data and up to 9 years of groundwater monitoring data from downgradient monitoring wells (see Section 5.4.5).

### 5.4.4 Surface Sediment Sampling

Four sediment samples (SD01, SD02, SF01, SF01) were collected from the unnamed drain in the extreme southeastern corner of Site 19, where a hydrocarbon seep was reported to have been observed (Figure 5-1). The analytical results are summarized in Table 5-1. Petroleum hydrocarbons were detected in only one of the four samples. Total HBP PHC as diesel was reported at 270 mg/kg and total LBP PHC as gasoline was reported at 131 mg/kg. Both of these detections are above the 100 mg/kg action level for soil. However, these detections are considered to be part of an upgradient release, which is discussed in detail in Section 5.4.5. Laboratory contaminant bis(2-ethylhexyl)phthalate was also detected in four of these samples; ethylene chloride was detected in three of these samples.

The petroleum hydrocarbons detected in sediment samples collected from the drain at the eastern perimeter of Site 19 are not the result of any source of contamination at Site 19, based on the results of groundwater samples collected from wells MW-30 and MW-29U. Near-surface soils and sediment within the drain are more likely to contain contaminants as a result of surface water and sediment transport within the drain. Such contaminants could ultimately have originated from Site 16 or from small historical discharges of petroleum contaminants to the drain system from stormwater originating at sites other than Site 19.

### 5.4.5 Groundwater Monitoring

Groundwater in the shallow alluvial aquifer at and near Site 19 is monitored by sampling 11 permanent groundwater monitoring wells. Well positions on or near Site 19 and associated sampling dates are indicated in Table 4-1, under the category "Location Within Site 12." As discussed in Section 5.3.3, groundwater flow in the shallow alluvial aquifer is to the southeast. Analytical results for groundwater samples are summarized in the following subsections by chemical group.

***Petroleum Hydrocarbons***

Petroleum hydrocarbon detections in groundwater are summarized in Table 5-2. Benzene was detected in 32 of 91 analyzed samples, at concentrations ranging from 0.2 to 43 µg/L. The average benzene detection was 5.9 µg/L. Twenty-four samples contained benzene at concentrations greater than the MCL (5 µg/L). All 24 of these samples came from either well MW-66 or well GTI16-1, both of which are located upgradient of Site 19 (Figure 5-1). The maximum concentration was detected in the sample from well GTI16-1 collected in September 1998.

Ethylbenzene was detected in 13 of 90 analyzed samples. Toluene was detected in 6 of 90 analyzed samples. Total xylenes were detected in 8 of 40 analyzed samples. None of the detections for these three compounds exceeded the respective MCL. The maximum ethylbenzene concentration (8.3 µg/L) and the maximum total xylenes concentration (78 µg/L) were detected in samples collected from well MW-77 at different times. The maximum toluene concentration (5 µg/L) was detected in a sample from well MW-66.

TPH-D was detected in 27 of the 30 analyzed samples, at concentrations ranging from 0.05 to 29.32 mg/L. The average TPH-D detection was 6.66 mg/L. Fourteen of these samples contained TPH-D at concentrations greater than the MCL of 1 mg/L. All samples containing TPH-D at concentrations greater than 1 mg/L came from upgradient wells GTI16-1, MW-66, and MW-77, or the on-site well BAT16-MU. The highest TPH-D concentration was detected in the sample

from well MW-66 in April 1999. Five samples were collected and analyzed from well BAT16-MU from September 1997 to April 1999. Only one sample, a field duplicate sample collected in March 1998, contained TPH-D at a concentration greater than 1 mg/L.

TPH in the gasoline range (TPH-G) was detected in 9 of 14 analyzed samples at concentrations ranging from 0.05 to 1.1 mg/L. The average TPH-G detection was 0.3 mg/L. Only one sample contained TPH-G at a concentration above the MCL of 1 mg/L; it had a concentration of 1.1 mg/L and was collected from the upgradient well MW-77 in September 1998.

TPH—extractable (TPH-E) was detected in 13 of the 40 analyzed samples, at concentrations ranging from 0.07 to 26 mg/L. The average TPH-E detection was 1.32 mg/L. Ten of these samples had TPH-E concentrations greater than the MCL of 1 mg/L. All samples containing TPH-E greater than 1 mg/L came from upgradient wells GTI16-1, MW-66, and MW-77. The maximum TPH-E concentration was detected in the sample from well MW-77 collected in September 1996.

TPH—purgeable (TPH-P) was detected in two of the five analyzed samples, at concentrations ranging from 0.16 to 0.22. TPH-P was not detected at concentrations greater than the MCL of 1 mg/L. The highest TPH-P concentration was detected in the sample from the upgradient well MW-66 in September 1991.

None of the downgradient wells (MW-28, MW-77, MW-78, and BAT-16N) or on-site wells located in the downgradient portions of Site 19 (MW-29U and MW-30) contained petroleum hydrocarbon compounds at concentrations above the MCLs or state action levels.

***Volatile Organic Compounds***

Up to 48 groundwater samples collected from wells at and near Site 19 have been analyzed for VOCs from March 1997 to September 1999. A summary of VOC detections is presented in Table 5-3. These samples were analyzed in accordance with EPA Method 8260. Fourteen of the EPA Method 8260 compounds have established MCLs. Twenty of the EPA Method 8260 compounds that do not have established MCLs were detected in these samples. In all but three cases, the maximum concentration for the compounds without MCLs was detected in samples from wells upgradient of Site 19 (see Table 5-3). BAT-16MU is the only on-site well from which samples displayed the maximum detection for a Method 8260 compound without an established MCL. These compounds are the hydrocarbon chains decane, dodecane, and undecane, which are generally diesel or gasoline components. In all cases, these three compounds were detected in 2 of 18 samples, at concentrations equal to or less than 2.3 µg/L. In addition, these three compounds were detected in samples from well MW-29U in April 1999 and

in samples from well BAT-16MU in September 1999. These observations suggest that the decane, dodecane, and undecane detections are not statistically significant.

Only 3 of the 14 Method 8260 compounds with established MCLs were detected in groundwater samples at concentrations above the MCLs. The compound 1,2-dichloroethane (1,2-DCA) was detected in 8 of 48 analyzed samples, at concentrations ranging from 1.65 to 11.54 µg/L, with an average detection of 7.4 µg/L. Three samples contained 1,2-DCA at concentrations above the MCL of 5 µg/L. All three of these samples were collected from the upgradient well GTI16-1, with the maximum concentration detected in the sample collected in September 1999. Trichloroethene (TCE) was detected in 4 of 41 analyzed samples, at concentrations ranging from 1 to 5 µg/L with an average detection of 2.7 µg/L. Only one sample, collected from the upgradient well GTI16-1 in September 1998, contained TCE at a concentration above the MCL of 5 µg/L. Vinyl chloride was detected in 1 of 42 analyzed samples, at a concentration of 2.61 µg/L in a sample from the upgradient well MW-66 in September 1999; this concentration is slightly above the MCL of 2 µg/L. No other Method 8260 compounds were detected at concentrations above the MCLs.

***Semivolatile Organic Compounds***

Seven groundwater samples collected from wells at and near Site 19 in September 1999 were analyzed for SVOCs. A summary of SVOC detections is presented in Table 5-4. These samples were analyzed in accordance with EPA Method 8270. Three of the Method 8270 compounds (acenaphthene, fluorene, and naphthalene) were detected in these groundwater samples. Acenaphthene was detected in three of seven samples, at concentrations ranging from 1 to 2 µg/L. Fluorene was detected in one of seven groundwater samples, at a concentration of 2 µg/L. Naphthalene was detected in two of seven groundwater samples, at concentrations of 2 and 76 µg/L. The maximum concentration for all of these detections was observed in the sample from the upgradient well MW-77.

***Total Metals***

Two groundwater samples were analyzed for 28 different total metals. Fifteen of the total metals were not detected in either of the two samples. The 13 remaining total metals were detected at concentrations within the range of total metals concentrations observed across the facility at NAS Fallon and are not considered to be a result of activities at Site 19. Twenty-nine groundwater samples were analyzed for total iron and total manganese. A summary of total metals detections in groundwater is presented in Table 5-5.

## 5.5 CONTAMINANT FATE AND TRANSPORT

Potential contaminants that could have been released as a result of activities at Site 19 include petroleum hydrocarbons, VOCs, SVOCs, and metals. VOCs and SVOCs have not been detected in soil or groundwater at concentrations above the action levels or MCLs on site or downgradient of the site. The concentrations of metals detected in groundwater are within the range observed in facility-wide groundwater samples.

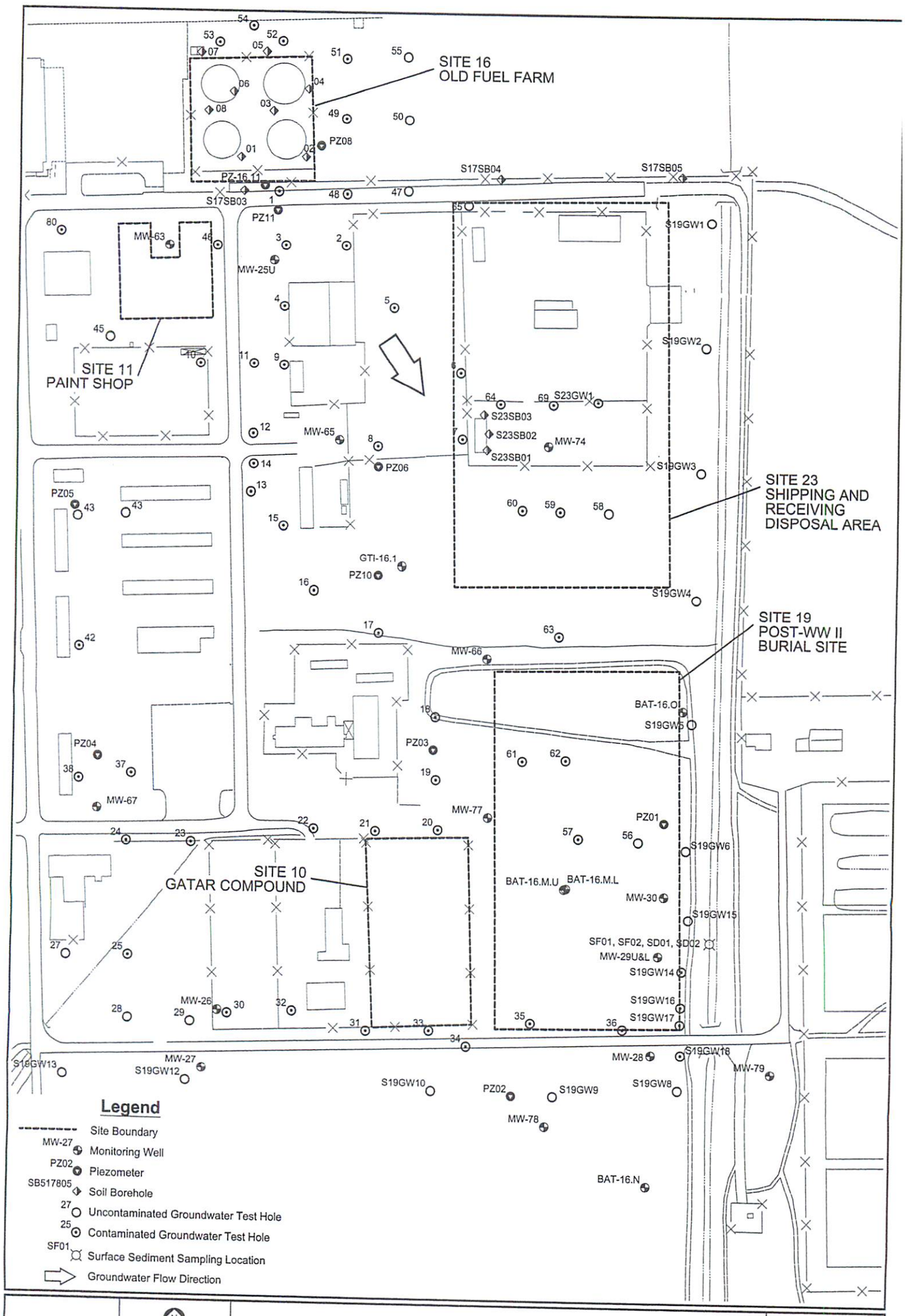
If VOCs and SVOCs were present in groundwater as a result of Site 19 activities, they would be subjected to natural attenuation during migration in groundwater. Natural attenuation includes physical and chemical processes that result in a decrease in contaminant concentration and total mass. Physical attenuation processes include adsorption, advection, dilution, dispersion, and diffusion. Chemical processes can be naturally occurring or biologically driven degradation. In general, biologically driven chemical attenuation processes are faster than naturally occurring chemical attenuation processes. Also, VOCs are generally more readily attenuated via chemical processes than SVOCs. However, VOCs and SVOCs have not been detected in groundwater at or downgradient of Site 19.

Groundwater flow has consistently been to the southeast, with an average hydraulic gradient that ranges from approximately 0.0011 to 0.002, depending on the data set. Groundwater flow velocity across Site 19 could be as high as 140 feet per year. Retardation of contaminants in groundwater could result in a decrease in contaminant migration rates on the order of 2 to 10 times. Retardation could result in a contaminant migration rate of 14 to 70 feet per year. Given these potential contaminant velocities in groundwater and the termination of disposal activities at Site 19 over 50 years ago (1949), VOC or SVOC contamination would likely be observed in samples collected from the on-site and downgradient monitoring wells if an ongoing source or sources were present at Site 19.

Monitoring of on-site wells MW-29(U & L), MW-30, BAT-16M(U & L), and BAT-16O over the past 4 to 9 years (depending on the well) shows that petroleum hydrocarbons, VOCs, and SVOCs are not present in groundwater at concentrations that exceed the action levels or MCLs. Monitoring of downgradient wells MW-28, MW-78, MW-79, and BAT-16N over the past 5 to 10 years (depending on the well) shows that petroleum hydrocarbons, VOCs, and SVOCs are not and have not migrated off site. Monitoring of upgradient wells MW-66, MW-77, and GTI16-1 over the past 5 to 9 years shows that petroleum hydrocarbons and limited VOCs and SVOCs are actually migrating onto Site 19 from an upgradient source. In fact, the only groundwater samples containing contaminants at concentrations above the action levels or MCLs were collected from these upgradient wells. Well BAT-16MU is the exception. The groundwater sample collected in September 1997 contained TPH-D at 1.3 mg/L. However, upgradient wells

have consistently yielded samples containing higher TPH-D concentrations. Figure 5-5 shows the distribution of petroleum hydrocarbons originating from Site 16, which is upgradient of Site 19. Petroleum hydrocarbons have been released from Site 16 and have migrated to the southeast onto Site 19. The petroleum hydrocarbons observed at Site 19 will be addressed through activities related to Site 16.

On the basis of the lack of contaminant concentrations above the laboratory reporting limits or MCLs in groundwater collected from on-site and downgradient wells at Site 19 over the past 5 to 9 years, it has been concluded that an ongoing contaminant source is not likely to be present at the site. Therefore, contaminants are not expected to migrate off Site 19, and no further action is required.

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0 35 70 140
SCALE IN FEET

**Figure 5-1**
**Sampling Locations at Site 19, Post-World War II Burial Site**

Delivery Order 0013
NAS Fallon
DECISION DOCUMENT
SITE 19

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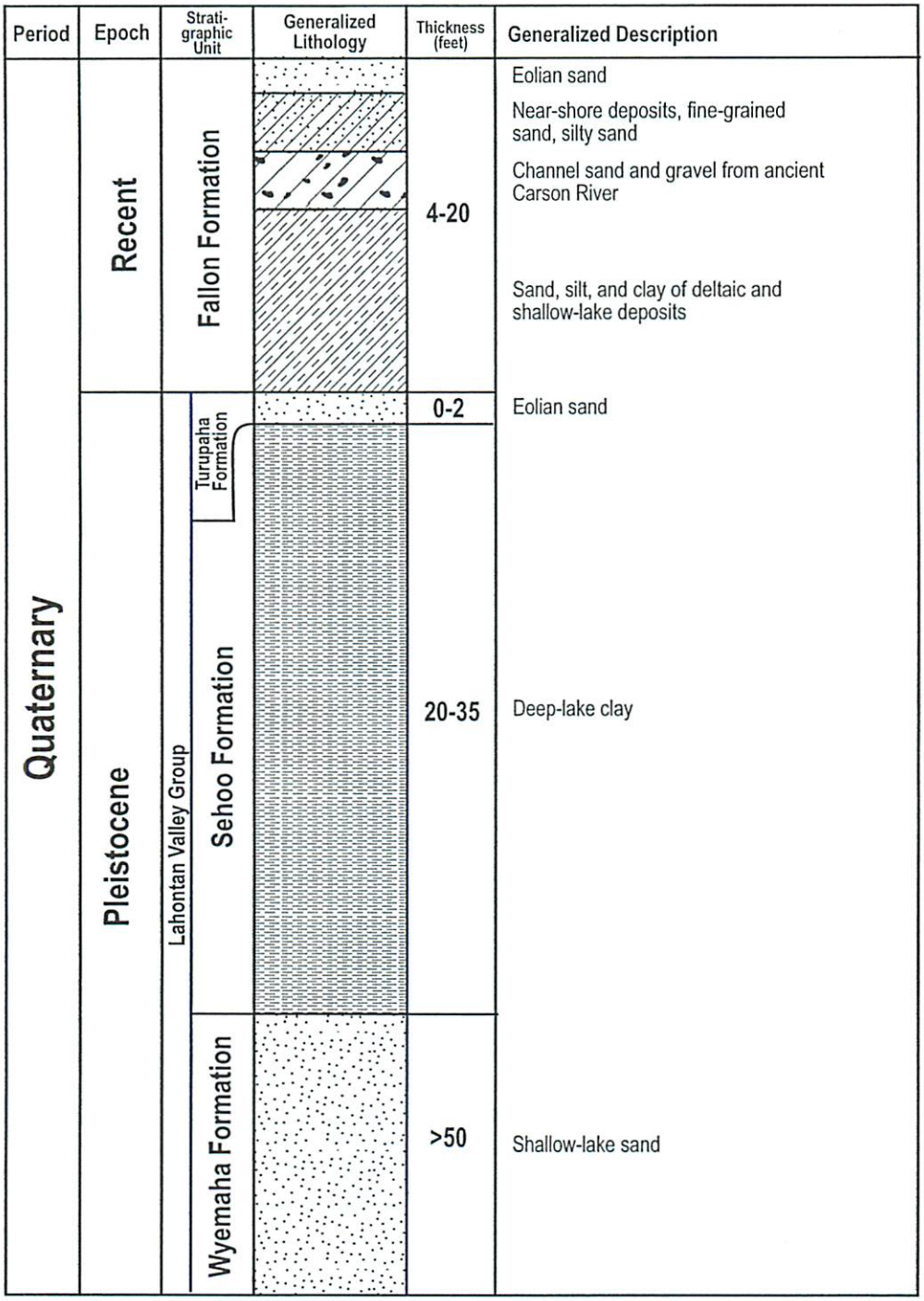


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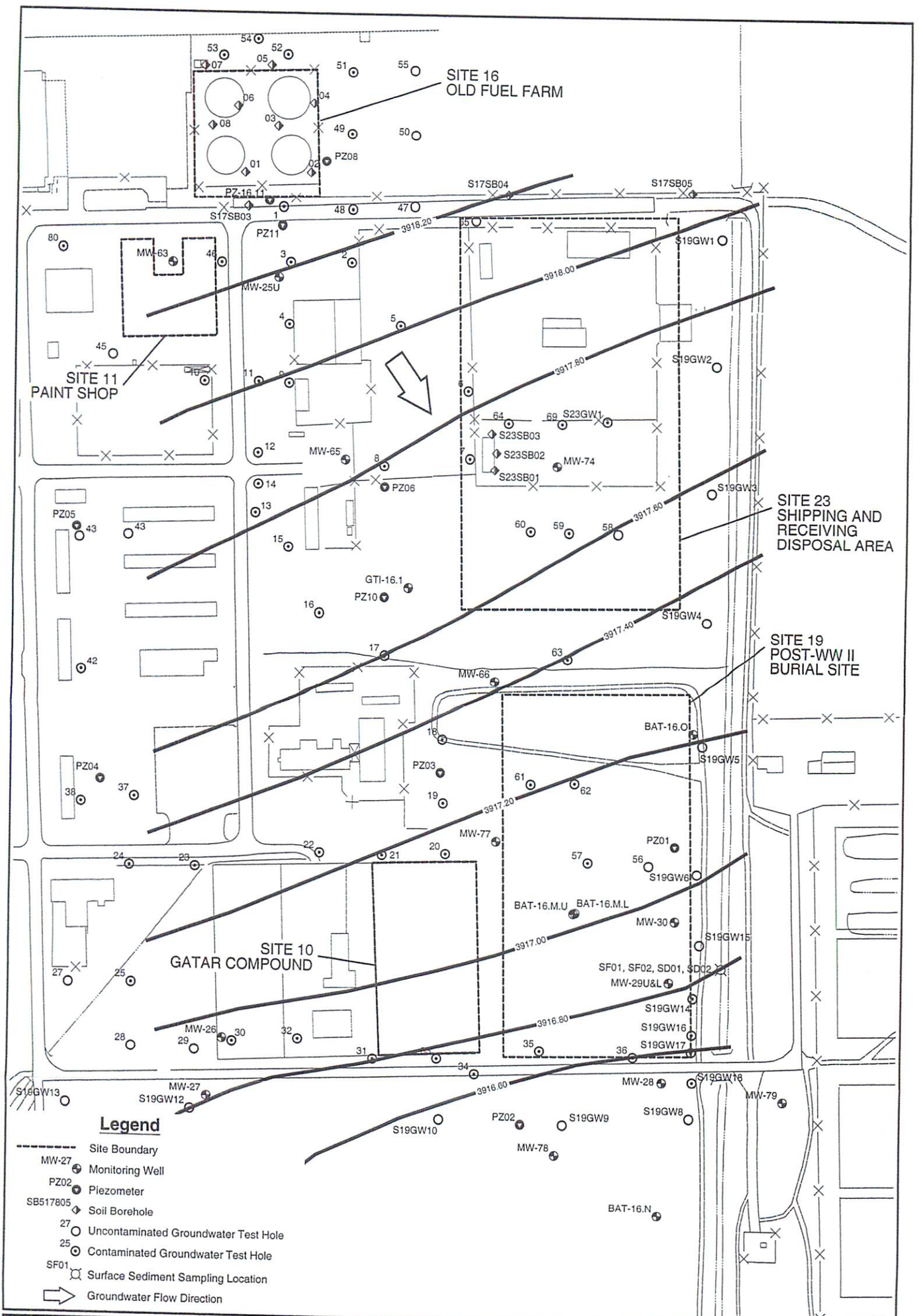
**Figure 5-2**
**Generalized Stratigraphy of NAS Fallon**

Delivery Order 0013
NAS Fallon
DECISION DOCUMENT
SITE 19




**U.S. NAVY**

**Figure 5-3**
**April 1992 Groundwater**
**Surface Elevation Contours at Site 19**

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NAS Fallon
DECISION DOCUMENT
SITE 19

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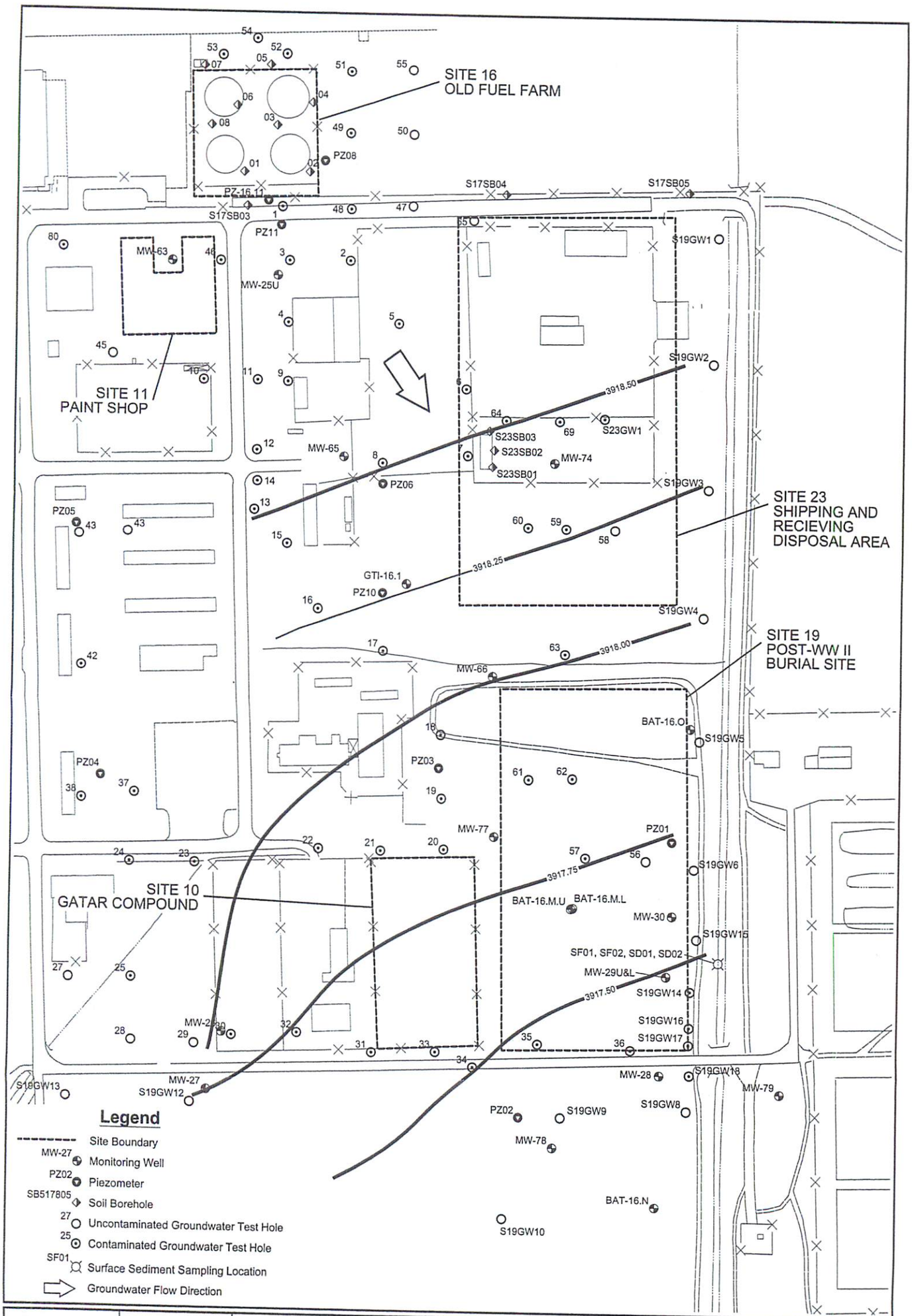


**U.S. NAVY**

**Figure 5-4**
**September 1997 Groundwater**
**Surface Elevation Contours at Site 19**

Delivery Order 0013
NAS Fallon
DECISION DOCUMENT
SITE 19

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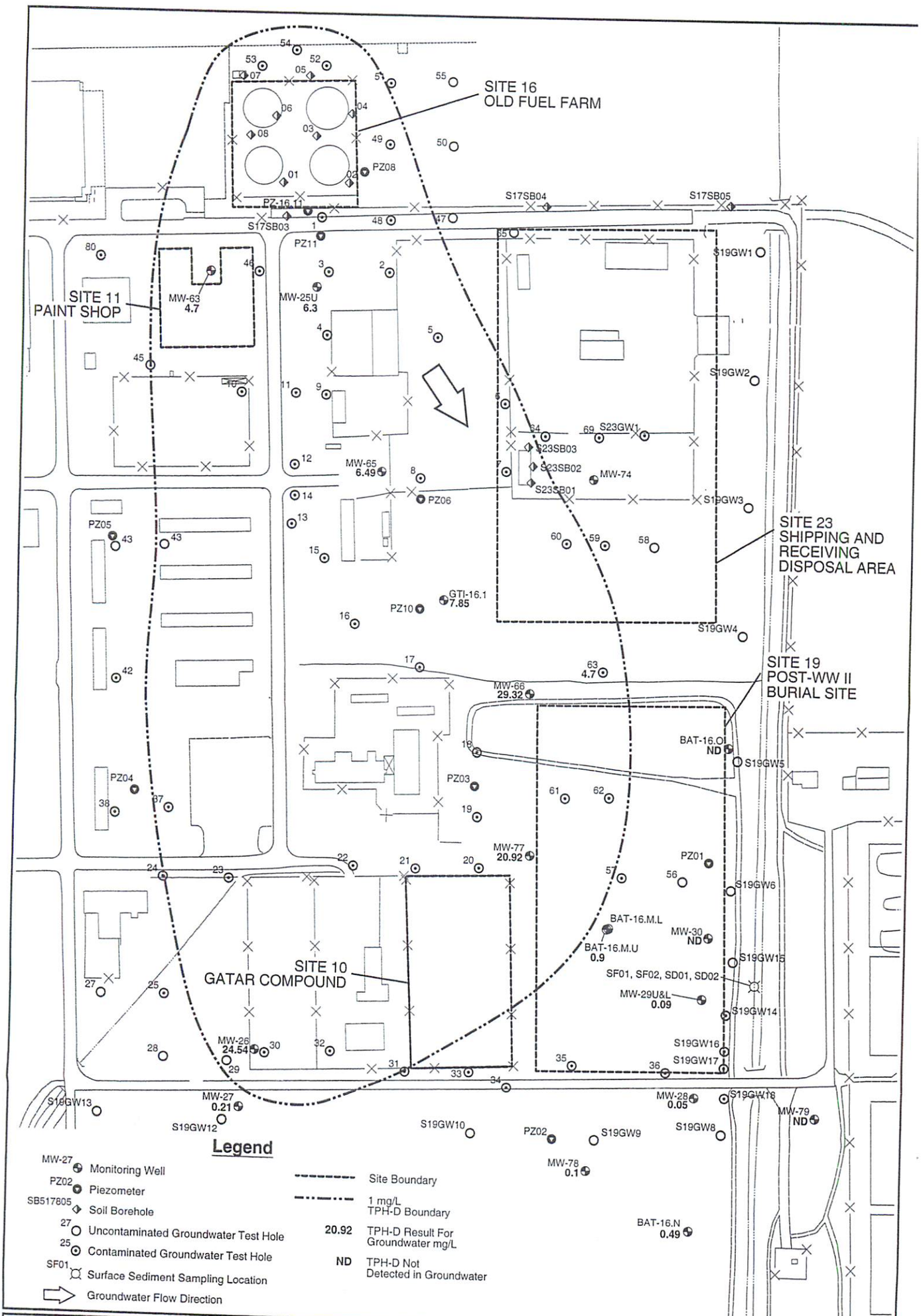


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SCALE IN FEET

**Figure 5-5**
**Petroleum Hydrocarbon Distribution in Groundwater From Site 16 (Based on April 1999 and September 1999 Data)**

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NAS Fallon
DECISION DOCUMENT
SITE 19

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## Table 5-1
## Analytical Results of Soil and Sediment Sampling at Site 19, Post–World War II Burial Site

| Sampling Location | Sample No. | Depth (feet bgs) | Total HBP PHC (mg/kg)[a] | Total LBP PHC (mg/kg)[b] | Semivolatile Organic Compounds (µg/kg)[c] | Volatile Organic Compounds (µg/kg)[d] |
|---|---|---|---|---|---|---|
| MW-28 | 3584 | 7 to 9 | 10U | 5U | None detected | Methylene chloride: 11 |
| MW-29 | 3585 | 7 to 9 | 10U | 8 | bis(2-Ethylhexyl)phthalate: 50J | Acetone: 6J<br>Methylene chloride: 12 |
| MW-30 | 3586 | 5 to 7 | 10U | 5U | bis(2-Ethylhexyl)phthalate: 68J | Carbon disulfide: 2J<br>Methylene chloride: 7 |
| SD01 | 3953 | Drain | 10U | 5U | bis(2-Ethylhexyl)phthalate: 940J | Methylene chloride: 4J |
| SD02 | 3955 | Drain | 10U | 5U | bis(2-Ethylhexyl)phthalate: 5,700 | None detected |
| SF01 | 3954 | Drain | 270 (as diesel) | 131 (as gasoline) | bis(2-Ethylhexyl)phthalate: 370 | Methylene chloride: 3J |
| SF02 | 3956 | Drain | 10U | 5U | bis(2-Ethylhexyl)phthalate: 1,800 | Methylene chloride: 5J |

[a]EPA Method 8015 Modified, action level = 100 mg/kg (NDEP)
[b]EPA Method 8015/8020, action level = 100 mg/kg (NDEP)
[c]EPA Method 3550/8270, laboratory reporting limit of 350 µg/kg
[d]EPA Method 8240, laboratory reporting limit of 5 µg/kg

Notes:
bgs - below ground surface
HBP PHC - high-boiling-point petroleum hydrocarbons
J - associated numerical value is an estimate
LBP PHC - Low-boiling-point petroleum hydrocarbons
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
NDEP - Nevada Division of Environmental Protection
U - analyte not detected above the laboratory reporting limit

## Table 5-2
## Detections of Petroleum Hydrocarbons in Groundwater at Site 19, Post–World War II Burial Site

| Chemical | Units | No. of Tests | No. of Detections | Detection Frequency | Maximum Detection | Minimum Detection | Average Detection | Action Level[a] | No. of Samples With Concentrations Greater Than MCL | Maximum Detection Limit | Location With Maximum Detection | Date of Last Maximum Detection | Locations With Detections Greater Than or Equal to MCL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | µg/L | 91 | 32 | 35% | 43 | 0.2 | 5.9 | 5[b] | 24 | 10 | GTI16-1 | 9/98 | MW-66, GTI16-1 |
| Ethylbenzene | µg/L | 90 | 13 | 14% | 8.3 | 0.7 | 0.8 | 700[b] | 0 | 10 | MW-77 | 4/99 | None |
| Toluene | µg/L | 90 | 6 | 7% | 5 | 0.4 | 0.15 | 1,000[b] | 0 | 10 | MW-66 | 3/97 | None |
| Total xylenes | µg/L | 40 | 8 | 20% | 78 | 6 | 4.8 | 10,000[b] | 0 | 10 | MW-77 | 9/97 | None |
| TPH-D | mg/L | 30 | 27 | 90% | 29.32 | 0.05 | 6.66 | 1[c] | 14 | 5 | MW-66 | 4/99 | GTI16-1, BAT16-MU, MW-66, MW-77 |
| TPH-E | mg/L | 40 | 13 | 33% | 26 | 0.07 | 1.32 | 1[c] | 10 | 0.5 | MW-77 | 9/96 | MW-66, MW-77, GTI16-1 |
| TPH-G | mg/L | 14 | 9 | 64% | 1.1 | 0.05 | 0.3 | 1[c] | 1 | 0.05 | MW-77 | 9/98 | MW-77 |
| TPH-P | mg/L | 5 | 2 | 40% | 0.22 | 0.16 | 0.3 | 1[c] | 0 | 0.5 | MW-66 | 9/91 | None |

[a]Regulatory value most appropriate for comparison to detected chemical concentrations
[b]Maximum contaminant level
[c]NDEP provisional action level

Notes:
MCL - maximum contaminant level (National Primary Drinking Water Regulations)
µg/L - microgram per liter
mg/L - milligram per liter
TPH-D - total petroleum hydrocarbons in the diesel range
TPH-E - total petroleum hydrocarbons—extractable
TPH-G - total petroleum hydrocarbons in the gasoline range
TPH-P - total petroleum hydrocarbons—purgeable

## Table 5-3
## Detections of Volatile Organic Compounds in Groundwater at Site 19, Post–World War II Burial Site

| Chemical | Units | No. of Tests | No. of Detections | Detection Frequency | Maximum Detection | Minimum Detection | Average Detection | MCL | No. of Samples With Concentrations Greater Than MCL | Maximum Detection Limit | Location With Maximum Detection | Date of Last Maximum Detection | Locations With Concentrations Greater Than or Equal to MCL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carbon tetrachloride | µg/L | 28 | 0 | 0% | NA | NA | NA | 5 | 0 | 5 | NA | NA | |
| Chlorobenzene | µg/L | 47 | 5 | 11% | 0.05 | 0.04 | 0.048 | 100 | 0 | 5 | Multiple | Multiple | |
| 1,2-Dibromo-3-chloropropane | µg/L | 42 | 0 | 0% | NA | NA | NA | 5 | 0 | 5 | NA | NA | |
| 1,2-Dichloroethane | µg/L | 48 | 8 | 17% | 11.54 | 1.65 | 7.4 | 5 | 3 | 5 | GT116-1 | 9/99 | GT116-1 |
| cis-1,2-Dichloroethene | µg/L | 42 | 10 | 24% | 4.68 | 1 | 2.8 | 70 | 0 | 5 | MW-66 | 9/99 | |
| trans-1,2-Dichloroethene | µg/L | 42 | 0 | 0% | NA | NA | NA | 100 | 0 | 5 | NA | NA | |
| 1,2-Dichloropropane | µg/L | 25 | 0 | 0% | NA | NA | NA | 5 | 0 | 5 | NA | NA | |
| Styrene | µg/L | 42 | 0 | 0% | NA | NA | NA | 100 | 0 | 5 | NA | NA | |
| Tetrachloroethene | µg/L | 42 | 0 | 0% | NA | NA | NA | 5 | 0 | 5 | NA | NA | |
| 1,2,4-Trichlorobenzene | µg/L | 42 | 0 | 0% | NA | NA | NA | 70 | 0 | 5 | NA | NA | |
| 1,1,1-Trichloroethane | µg/L | 42 | 0 | 0% | NA | NA | NA | 200 | 0 | 5 | NA | NA | |
| 1,1,2-Trichloroethane | µg/L | 42 | 0 | 0% | NA | NA | NA | 5 | 0 | 5 | NA | NA | |
| Trichloroethene | µg/L | 41 | 4 | 10% | 5 | 1 | 2.7 | 5 | 1 | 5 | GT116-1 | 9/99 | GT116-1 |
| Vinyl chloride | µg/L | 42 | 1 | 2% | 2.61 | NA | NA | 2 | 1 | 5 | MW-66 | 9/99 | MW-66 |
| 1,2,4,5-Tetramethylbenzene | µg/L | 18 | 11 | 61% | 6.45 | 0.78 | 3.28 | NE | NA | 0.09 | MW-77 | 9/99 | |
| 1,2,4-Trimethylbenzene | µg/L | 42 | 11 | 26% | 50 | 0.39 | 20.1 | NE | NA | 5 | MW-77 | 3/97 | |
| 1,3,5-Trimethylbenzene | µg/L | 42 | 7 | 17% | 15 | 0.41 | 8.3 | NE | NA | 5 | MW-77 | 3/98 | |
| 2-Methylbutane | µg/L | 18 | 4 | 22% | 9.4 | 9.28 | 9.34 | NE | NA | 2.2 | MW-66 | 9/99 | |
| 2-Methylpentane | µg/L | 18 | 4 | 22% | 1.48 | 1.45 | 1.47 | NE | NA | 1.09 | MW-66 | 9/99 | |
| 3-Methylpentane | µg/L | 18 | 2 | 11% | 1.15 | 1.15 | 1.15 | NE | NA | 0.79 | MW-66 | 9/99 | |
| Cyclohexane | µg/L | 18 | 9 | 50% | 5.95 | 1.08 | 4.23 | NE | NA | 2.06 | MW-66 | 9/99 | |
| Cyclopentane | µg/L | 18 | 11 | 61% | 6.69 | 1.65 | 4.43 | NE | NA | 8.34 | GT116-1 | 9/99 | |
| Decane | µg/L | 18 | 2 | 11% | 1.86 | 1.86 | 1.86 | NE | NA | 0.44 | BAT16-MU | 9/99 | |
| Dodecane | µg/L | 18 | 2 | 11% | 2.3 | 2.3 | 2.3 | NE | NA | 3.05 | BAT16-MU | 9/99 | |
| Isopropylbenzene | µg/L | 42 | 18 | 43% | 6 | 2 | 4.3 | NE | NA | 5 | MW-66 | 9/99 | |
| Methylcyclohexane | µg/L | 18 | 7 | 39% | 4.22 | 2.35 | 3 | NE | NA | 2.23 | MW-77 | 9/99 | |

## Table 5-3 (Continued)
## Detections of Volatile Organic Compounds in Groundwater at Site 19, Post–World War II Burial Site

| Chemical | Units | No. of Tests | No. of Detections | Detection Frequency | Maximum Detection | Minimum Detection | Average Detection | MCL | No. of Samples With Concentrations Greater Than MCL | Maximum Detection Limit | Location With Maximum Detection | Date of Last Maximum Detection | Locations With Concentrations Greater Than or Equal to MCL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Methylcyclopentane | µg/L | 18 | 7 | 39% | 4.19 | 2.81 | 3.68 | NE | NA | 1.63 | MW-66 | 9/99 | |
| Naphthalene | µg/L | 42 | 14 | 33% | 145.04 | 14 | 67.3 | NE | NA | 5 | MW-77 | 9/99 | |
| *n*-Butylbenzene | µg/L | 42 | 7 | 17% | 2.52 | 1 | 2 | NE | NA | 5 | MW-77 | 9/99 | |
| *n*-Propylbenzene | µg/L | 42 | 6 | 14% | 2.77 | 0.4 | 1.7 | NE | NA | 5 | MW-77 | 9/99 | |
| *p*-isopropyltoluene | µg/L | 42 | 12 | 29% | 5.17 | 0.42 | 1.9 | NE | NA | 5 | MW-66 | 9/99 | |
| *sec*-Butylbenzene | µg/L | 42 | 17 | 40% | 2 | 0.77 | 1.4 | NE | NA | 5 | MW-66 | 9/99 | |
| *tert*-Butylbenzene | µg/L | 42 | 2 | 5% | 6.07 | 6.07 | 6.07 | NE | NA | 5 | MW-77 | 9/99 | |
| Undecane | µg/L | 18 | 2 | 11% | 2.25 | 2.25 | 2.25 | NE | NA | 0.95 | BAT-16MU | 9/99 | |

Notes:
MCL - maximum contaminant level (National Primary Drinking Water Regulations)
µg/L - microgram per liter
NA - not applicable
NE - not established

## Table 5-4
## Detections of Semivolatile Organic Compounds in Groundwater at Site 19, Post–World War II Burial Site

| Chemical | Units | No. of Tests | No. of Detections | Detection Frequency | Maximum Detection | Minimum Detection | Average Detection | MCL | No. of Samples With Concentrations Greater Than MCL | Maximum Detection Limit | Location With Maximum Detection | Date of Last Maximum Detection | Locations With Concentrations Greater Than or Equal to MCL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acenaphthene | µg/L | 7 | 3 | 43% | 2 | 1 | 1.7 | NE | NA | NA | MW-77 | 9/97 | NA |
| Fluorene | µg/L | 7 | 1 | 14% | 2 | NA | NA | NE | NA | NA | MW-77 | 9/97 | NA |
| Naphthalene | µg/L | 7 | 2 | 29% | 76 | 2 | 39 | NE | NA | NA | MW-77 | 9/97 | NA |

Notes:
MCL - maximum contaminant level (National Primary Drinking Water Regulations)
µg/L - microgram per liter
NA - not applicable
NE - not established

## Table 5-5
## Detections of Total Metals in Groundwater at Site 19, Post–World War II Burial Site

| Chemical | Units | No. of Tests | No. of Detections | Detection Frequency | Maximum Detection | Minimum Detection | Average Detection | MCL | No. of Samples With Concentrations Greater Than MCL | Maximum Detection Limit | Location With Maximum Detection | Date of Last Maximum Detection | Locations With Detections Greater Than or Equal to MCL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | mg/L | 2 | 0 | 0% | NA | NA | NA | NE | 0 | 0.2 | NA | NA | NA |
| Antimony | mg/L | 2 | 0 | 0% | NA | NA | NA | 0.006 | 0 | 0.2 | NA | NA | NA |
| Arsenic | mg/L | 2 | 2 | 100% | 1.46 | 0.826 | 1.143 | 0.05 | 2 | 0.01 | MW-78 | 3/97 | MW-77, MW-78 |
| Barium | mg/L | 2 | 0 | 0% | NA | NA | NA | 2 | 0 | 0.1 | NA | NA | NA |
| Beryllium | mg/L | 2 | 0 | 0% | NA | NA | NA | 0.004 | 0 | 0.01 | NA | NA | NA |
| Boron | mg/L | 2 | 2 | 100% | 60.6 | 58.7 | 59.65 | NE | NA | 0.05 | MW-78 | 3/97 | NA |
| Cadmium | mg/L | 2 | 0 | 0% | NA | NA | NA | 0.005 | 0 | 0.01 | NA | NA | NA |
| Calcium | mg/L | 2 | 2 | 100% | 40.2 | 30.1 | 35.15 | NE | NA | 0.2 | MW-77 | 3/97 | NA |
| Chromium | mg/L | 2 | 0 | 0% | NA | NA | NA | 0.1 | 0 | 0.03 | NA | NA | NA |
| Cobalt | mg/L | 2 | 0 | 0% | NA | NA | NA | NE | 0 | 0.05 | NA | NA | NA |
| Copper | mg/L | 2 | 0 | 0% | NA | NA | NA | 1.3 | 0 | 0.025 | NA | NA | NA |
| Iron | mg/L | 29 | 8 | 28% | 0.41 | 0.022 | 0.177 | NE | NA | 0.2 | MW-77 | 4/99 | NA |
| Lead | mg/L | 2 | 0 | 0% | NA | NA | NA | 0.015 | 0 | 0.005 | NA | NA | NA |
| Lithium | mg/L | 2 | 2 | 100% | 0.875 | 0.791 | 0.833 | NE | NA | 0.02 | MW-77 | 3/97 | NA |
| Magnesium | mg/L | 2 | 2 | 100% | 233 | 178 | 205.5 | NE | NA | 0.1 | MW-77 | 3/97 | NA |
| Manganese | mg/L | 29 | 29 | 100% | 1.3 | 0.029 | 0.44 | NE | NA | 0.02 | MW-66 | 4/99 | NA |
| Mercury | mg/L | 2 | 0 | 0% | NA | NA | NA | 0.002 | NA | 0.0002 | NA | NA | NA |
| Molybdenum | mg/L | 2 | 2 | 100% | 3.66 | 1.71 | 2.69 | NE | NA | 0.05 | NA | NA | NA |
| Nickel | mg/L | 2 | 0 | 0% | NA | NA | NA | NE | NA | 0.05 | NA | NA | NA |
| Potassium | mg/L | 2 | 2 | 100% | 487 | 469 | 478 | NE | NA | 0.5 | NA | NA | NA |
| Selenium | mg/L | 2 | 1 | 50% | 0.01 | NA | NA | 0.05 | 0 | 0.01 | MW-78 | 3/97 | None |
| Silver | mg/L | 2 | 0 | 0% | NA | NA | NA | NE | 0 | 0.02 | NA | NA | NA |
| Sodium | mg/L | 2 | 2 | 100% | 22500 | 21600 | 22050 | NE | NA | 60 | NA | NA | NA |
| Strontium | mg/L | 2 | 2 | 100% | 5.61 | 5.17 | 5.39 | NE | NA | 0.01 | MW-77 | 3/97 | NA |
| Thallium | mg/L | 2 | 0 | 0% | NA | NA | NA | 0.002 | 0 | 0.02 | NA | NA | NA |
| Titanium | mg/L | 2 | 0 | 0% | NA | NA | NA | NE | NA | 0.02 | NA | NA | NA |

## Table 5-5 (Continued)
## Detections of Total Metals in Groundwater at Site 19, Post–World War II Burial Site

| Chemical | Units | No. of Tests | No. of Detections | Detection Frequency | Maximum Detection | Minimum Detection | Average Detection | MCL | No. of Samples With Concentrations Greater Than MCL | Maximum Detection Limit | Location With Maximum Detection | Date of Last Maximum Detection | Locations With Detections Greater Than or Equal to MCL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vanadium | mg/L | 2 | 2 | 100% | 0.256 | 0.023 | 0.139 | NE | NA | 0.02 | NA | NA | NA |
| Zinc | mg/L | 2 | 0 | 0% | NA | NA | NA | NE | NA | 0.025 | NA | NA | NA |

Notes:
MCL - maximum contaminant level (National Primary Drinking Water Regulations)
mg/L - milligram per liter
NA - not applicable
NE - not established

# 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 as it has for the past 50 years. The location of Site 19 is unused, open land (with the exception of a concrete pad described in Section 5). NAS Fallon does not expect any change in the use of this land or that of the surrounding sites, in the near future.

Land-use controls have been also established for former landfill sites at NAS Fallon as part of the facility Master Plan. 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 19 will be subjected to an environmental review. The Natural Resources branch of the Environmental Office 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 Compliance and IR branches of the Environmental Office. This process is included in all NAS Fallon planning activities. Information provided by the IR branch 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 not confirmed the presence of potential contaminants as a result of past activities at Site 19. The baseline risk assessment and the results of subsequent sampling activities indicated no identifiable exposure pathways or receptors for Site 19. This being the case, there is no quantifiable risk posed by from Site 19 to human health or the environment. Considering the absence of risk from Site 19, the preferred alternative is No Further Action.

Nonetheless, Site 19 was examined during the human health and ecological baseline risk assessments. Exposure pathways associated with possible contamination were evaluated in both soil and groundwater. In addition, surface water and sediment in two drains were evaluated as sitewide risk units. Site 1 and the Group IV sites (shown in Figure 2-2 and described in detail in the Administrative Record) were the only two locations at NAS Fallon that were at risk for exposure in the future. Although Site 19 is one of the Group IV Sites, subsequent monitoring of on-site wells, as described in Section 5, indicate that potential contaminants (VOCs, SVOCs, and petroleum hydrocarbons) are actually migrating to Site 19 from an upgradient source, possibly Site 16.

Current human exposure to contaminated soil is possible only for construction workers at sites that are located inside the security fences or at sites that have only subsurface contamination. No current or future exposure is plausible at landfills that are covered with clean overburden, because excavation activities would be subject to restrictions, during the environmental review (as described in Section 6). Possible exposure routes for the exposure scenarios evaluated are incidental ingestion of, dermal contact with, and inhalation of volatile organics or fugitive dust from contaminated soil.

For the ecological baseline risk assessment, groundwater was assessed only in terms of potential phytotoxic effects and only as a contingency in the event that native shrubs recolonize the sites in the future. It was assumed that no direct or indirect exposure of animal receptors (via the food chain) to contaminated groundwater occurs. Again, the only sites posing any threat were Site 1 and the Group IV sites.

The ecological baseline risk assessment for contaminated soil was also evaluated as it relates to ecological receptors. Contaminated soils were evaluated only for invading plant species, vagrant rodents, and three raptors (peregrine falcon, golden eagle, and red-tailed hawk). The exposure pathways evaluated for the rodent were direct exposures due to incidental ingestion of, dermal contact with, and inhalation of volatile organics or fugitive dust from surface soil; and indirect

exposures to surface and subsurface soils via the food chain (plant and invertebrate ingestion). The exposure pathways evaluated for raptors included only indirect exposures to surface and subsurface soils via the food chain (bird and rodent ingestion). Using the current maximum soil concentrations for all exposure point concentrations, the hazard index values for soil were below the point of concern at the Group IV sites.

# 8.0 STATUTORY AUTHORITY FINDING

Historical and recent groundwater monitoring shows that contaminant concentrations in groundwater have exceeded the action levels (for petroleum hydrocarbons) or MCLs (for VOCs, SVOCs, and metals) only in samples collected from upgradient wells. BAT-16MU is the only exception to this observation, with one of the four samples collected from this well and analyzed for TPH-D between September 1997 and April 1999 containing TPH-D at 1.3 mg/L (the September 1997 sample). However, in all cases, the maximum detected petroleum hydrocarbon concentration, regardless of the analytical method, has come from an upgradient well. This demonstrates that the limited volume of contamination observed in groundwater samples at Site 19 are a result of activities conducted at the upgradient Site 16. Contamination in groundwater at Site 19 will be addressed via the remedial alternatives being evaluated for Site 16. 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

No comments were received by the Navy during the public comment period; therefore, no changes were made after the public comment period.

# 10.0 BIBLIOGRAPHY

This document was prepared with the use of information contained in the Administrative Record for Site 19, the Post–World War II Burial Site, 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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# APPENDIX A

## Responsiveness Summary

## RESPONSIVENESS SUMMARY

Notice of the public comment period was published in the *Lahontan Valley News/Fallon Eagle Standard* on February 12 and 13, 2002. The public comment period extended from February 14, 2002, through March 16, 2002. The public meeting presenting the Proposed Plan was held at the Agricultural Center in Fallon, Nevada, on February 21, 2002. As of March 19, 2002, the Navy had received no public comments.