

# Proposed Plan

For Active ERP Sites 4, 5, 6, 7 and 8 and Site  
Summary for Active Site 1 and Inactive Sites  
2 and 3

Montana Air National Guard Base – Great  
Falls International Airport

Draft Final

April 2024

**Site:**

Montana Air National Guard Base  
Great Falls International Airport  
2800 Avenue B  
Great Falls, MT

**Prepared for:**

Air National Guard  
Joint Base Andrews, Maryland  
Contract #: GS00Q14OADU140  
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**Draft Final Proposed Plan**

**For Active ERP Sites 4, 5, 6, 7 and 8 and Site Summary for Active Site 1 and Inactive Sites 2 and 3**

**Environmental Restoration Program**

**120TH AIRLIFT WING**

**MONTANA AIR NATIONAL GUARD BASE**

**GREAT FALLS INTERNATIONAL AIRPORT**

**GREAT FALLS, MONTANA**

**APRIL 2024**

**Prepared For: Air National Guard**

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**Contract Number: GS00Q14OADU140**

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## Acronyms and Abbreviations

ANG	Air National Guard
ANGB	Air National Guard Base
AR	Administrative Record
AFCEC	Air Force Civil Engineer Center
AFFF	aqueous film forming foam
bgs	below ground surface
BV	Bioventing
BV/VE	Bioventing/Vapor Extraction
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
COPEC	contaminant of potential ecological concern
CVOCs	Chlorinated Volatile Organic Compounds
cy	cubic yards
1,2-DCE	1,2-Dichloroethene
DD	Decision Document
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DEQ	Department of Environmental Quality
DEQ-7	Circular DEQ-7 Montana Numeric Water Quality Standards
DO	dissolved oxygen
EE/CA	Engineering Evaluation/Cost Analysis
ERP	Environmental Restoration Program
E/I	Extraction/Injection
EPA	Environmental Protection Agency
ES	Engineering Science, Inc.
EVO	Emulsified Vegetable Oil
°F	degrees Fahrenheit
ft	foot/feet
FTA	Fire training Area
FY	Fiscal Year
HA	Health Advisory
HHRA	Human Health Risk Assessment
HQ	hazard quotient
IR	Information Repository
JP-4	Jet Propellant number4
LNAPL	Light Nonaqueous Phase Liquid
LTM	Long Term Monitoring
LUCs	Land Use Controls
LUCIP	Land Use Controls Implementation Plan
µg/L	micrograms per Liter
mg/kg	milligrams per kilogram
MANG	Montana Air National Guard

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MANGB	Montana Air National Guard Base
MDEQ	Montana Department of Environmental Quality
MDHES	Montana Department of Health and Environmental Services
MNA	Monitored Natural Attenuation
msl	mean sea level
ng/l	nanograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NSZD	natural source zone depletion
NGB	National Guard Bureau
NA	No Action
NTCRA	Non Time Critical Removal Action
NFA	No Further Action
OSD	Office of the Secretary of Defense
OWS	oil water separator
PFAS	per-and polyfluoroalkyl substances
PFOS	perfluorooctane sulfonate
PFOA	perfluorooctanoic acid
POET	point of entry treatment
PA	Preliminary Assessment
PALs	Project Action Limits
PCE	perchloroethylene
PCB	polychlorinated biphenyls
PP	Proposed Plan
RfD	reference dose
ROI	radius of influence
RG	Remediation Goal
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
RSK	Risk-Based Standards for Kansas
RBSLs	Risk Based Screening Levels
SARA	Superfund Amendments and Reauthorization Act
SRI/FFS	Supplemental Remedial Investigation/Focused Feasibility Study
SI	Site Investigation
SLERA	Screening Level Ecological Risk Assessment
SVOC	semi-volatile organic compound
TCE	trichloroethene
TMB	trimethylbenzene
TOC	total organic carbon
TPH	Total Petroleum Hydrocarbon
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VI	Vapor Intrusion
VC	Vinyl Chloride
VOC	volatile organic compound

This Proposed Plan (PP) and Summary Report is being prepared for Air National Guard (ANG) by AECOM under Contract Number: GS00Q14OADU140 Delivery Order: W9133L19F0033. By law, the ANG is required to identify, characterize and, when necessary, clean up or control contamination at sites of past hazardous waste disposal operations and hazardous material spills. The process is carried out in compliance with federal, state, and local laws and regulations, in particular, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Montana Department of Environmental Quality (MDEQ) has listed Montana Air National Guard Base (MANGB) on the state Superfund list. As indicated, National Guard Bureau (NGB) through the ANG, manages cleanup activities under the CERCLA and the NCP, and in accordance with the Defense Environmental Restoration Program (DERP) manual and retains lead agency status. NGB is lead agency in making the cleanup decisions and follows CERCLA/DERP. NGB is not required to comply with state cleanup statutes unless aspects of those regs constitute ARARs.

As the lead agency for environmental decisions at Environmental Restoration Program (ERP) Sites 1 through 8 at the 120<sup>th</sup> Airlift Wing of the MANGB located at Great Falls International Airport (**Figure 1-1**), the ANG has managed the Sites in a manner that ensures the protection of human health and the environment. Sites 1, and 4 through 8 are consider active ERP Sites while Sites 2 and 3 are considered inactive. The ANG completed environmental restoration activities in accordance with CERCLA under DERP, which was established by Section 211 of the SARA of 1986. DERP was established to promote and coordinate efforts for the evaluation and cleanup of contamination at Department of Defense (DoD) installations. Through this program, potential contamination at DoD installations and formerly owned or used properties are investigated and as required, cleaned up.

A summary of inactive Sites 2 and 3 results, site activities, risk assessment, conclusions, and final dispositions of No Further Action (NFA) will not be included in the document. MTDEQ has issued closures letter found in the Administrative Record and included in Appendix D. The ANG did not previously document approval to close these sites in an NGB signed decision document, therefore these sites will be included in Section 8 to obtain ANG approval and complete the CERCLA process.

A summary of active Site 1 (FT001) is also included, but will not be included in Section 8, as this site has been re-opened and is being further investigated to determine if legacy contaminants have naturally attenuated after earlier interim remedial actions were completed, or if chemicals used during fire training activities still exist in the subsurface. Legacy contamination samples have been collected at the airport fence line and samples of the off-Base, down-gradient drinking water wells (Property #1 and #2) have been collected. The intent of the samples was to determine if additional load was being placed on the Point of Entry Treatment System (POET) and to verify if legacy contamination is a concern at Property #2. To date, there are no exceedances of the Circular DEQ-7 Montana Numeric Water Quality (DEQ-7) legacy contaminant in groundwater at the fence line or at the two downgradient properties (Property #1 and #2) at Site 1 (FT001). A supplemental remedial investigation (RI) is being contracted in Fiscal Year (FY) 2024 with the purpose of verifying current preliminary results, or providing data required to support NFA for legacy contaminants at Site 1. Final data driven conclusions and recommendations will be included in the Supplemental RI report (for legacy contaminants only).

A remedial investigation has been planned, but not scheduled to further investigate per-and polyfluoroalkyl Substances (PFAS) contaminants related to aqueous film forming foam (AFFF) usage at MTANGB that will include Site 1. Note: Site 1 will not be discussed further in this document. A proposed PP and Record of Decision (ROD) will be prepared separately for Site 1 at date to be determined.

As the supporting agency, MDEQ provides primary state oversight of the environmental restoration activities in accordance with CERCLA. Funding is provided by the Defense Environmental Restoration Account, a funding source approved by Congress to clean up contaminated sites on DoD installations.

## 1.1 PURPOSE

This PP is issued by the ANG as the lead agency under the DERP, in accordance with CERCLA. This PP presents the preferred remedial alternative for soil and groundwater, as selected by the ANG, for active ERP Sites 4, 5, 6, 7, and 8 at the 120th Airlift Wing of the Montana ANG (MANG) located at Great Falls International Airport, Cascade County (Figure 1-2). To assist in understanding the status of other sites at the base, the document also summarizes the results, site activities, risk assessment, conclusions and NFA final dispositions previously determined for inactive Sites 2 and 3, as well as describing the ongoing activities at Site 1. This PP also provides an explanation of how the public can participate in the decision-making process.

MDEQ concurs with and supports the proposed alternatives for Sites 4, 5, 6, 7, and 8 (MDEQ 2023). No remedial alternatives were proposed for Sites 1, 2 and 3 as ANG has received concurrence for closure with conditions for Sites 1,2 and 3, however, the conditions set forth in MDEQ's closure letters remain protective of human health of and the environment for Sites 2 and 3, and therefore the terms of the closure letters for Sites 2 and 3 remain valid.

For Site 1, there was sufficient reason to re-open this site and conduct additional investigation. PFAS Site Inspection data indicated downgradient impacts at two offsite residences (Property #1 and #2) providing further justification for ANG to conclude the conditions in the MDEQ letter were no longer protective at Site 1. ANG concluded that additional investigation of legacy and PFAS contamination at Site 1 is required. In addition, an interim removal action for drinking water was required to add a Point of Entry Treatment System to Property #1 with regular operation and maintenance. Properties #1 and #2 are included in a semi-annual drinking water sampling program. These decisions are based on the investigations completed as presented in the Administrative Record (AR) file for this site.

The purpose of this PP is to inform the public and solicit public comment. This PP summarizes information presented in the Final Supplemental Remedial Investigation/Focused Feasibility Study Sites 4, 5, 6, 7 and 8 Report (SRI/FFS) (AECOM 2023). Historical documents are available for public review in the AR, which is a collection of technical documents that form the basis for the selection of a cleanup remedy. The AR is available online at <https://ar.afcec-cloud.af.mil>.

## 1.2 PUBLIC PARTICIPATION

A request for public involvement is required for PPs under Section 117(a) of CERCLA and Section 300.430(f)(2) of the NCP. A fact sheet will be mailed to community leaders, residents, and businesses in the area of Inactive Sites 2 and 3 and Active Sites 1, 4, 5, 6, 7, and 8 to announce that the PP is available for review and comment and identify the publicly available website where the PP will be posted. Citizens may submit written comments or request a public meeting during the public comment period (**Table 1-1**).

**TABLE 1-1 UPCOMING EVENTS**

Public Comment Period 3/12/24 through 4/12/24:	The ANG will accept written comments on the Proposed Plan during the public comment period.
Public Meeting:	<p>The ANG will post a Notice of Availability in the local newspaper and the PP will be posted to a MANGB publicly available site for review.</p> <p>Upon request, the ANG will hold a public meeting to explain the recommended action. To request a meeting, please contact:</p> <p>Mr. Mark Dickerson Restoration Program Manager and Contracting Officer Representative Air National Guard Shepperd Hall, 3501 Fetchet Avenue Joint Base Andrews, Maryland 20762 mark.dickerson@us.af.mil</p>
For more information, see the Administrative Record:	<p>MANGB publicly available web site.</p> <p><a href="http://www.120thairliftwing.ang.af.mil">www.120thairliftwing.ang.af.mil</a></p>

Interaction between the agencies and the public is critical to the CERCLA process and to making sound environmental decisions. The public is encouraged to review the documents available in the AR to gain a more comprehensive understanding of the Sites and associated environmental history. Public comment on the PP will be documented in a responsiveness summary section of the upcoming ROD document. The ROD is a legal document that sets forth the selected remedy or NFA decision for the Sites. The ROD will be prepared after the public comment period and the Final ROD will be online at the Air Force Civil Engineer Center (AFCEC) AR website at <https://ar.afcec-cloud.af.mil/Search>.



## 2.1 SITES NAME, LOCATION, AND DESCRIPTION

Great Falls International Airport opened in the late 1920s as a municipal airport. The airport housed the 186<sup>th</sup> Fighter Squadron starting in 1947 when the area was leased to the United States government to support the war effort. In 1948, the airport was released back to the city of Great Falls for commercial air travel, but the ANG retained a lease on some space in order to accommodate the military's presence. The 186<sup>th</sup> played an active part in national defense missions until 2014 when the Base was converted to the 120<sup>th</sup> Airlift Wing of the Montana Air National Guard (MANG). The Great Falls International Airport currently is an active civil-military airport, supporting airfreight, civilian passengers, and the ANG (Leidos, 2019).

The following sections provide general background information with a brief Site description and a summary of the environmental conditions for active Sites 4 through 8 at the Great Falls MANGB (Figure 1-2).

### 2.1.1 ERP Site 4 (Former Fire Training Area 1)

ERP Site 4 was used for one fire training exercise per month from 1959 through 1963. Approximately 1,200 to 1,500 gallons of fuel were used for each exercise. Assuming a 70 percent burn rate, up to approximately 20,000 gallons of unburned fuel may have been deposited at the Site (SAIC 2004a). The Site 4 area was reworked and partially paved during construction of the "Hush House" and the runway extension. Reportedly, soils from this area were removed and clean soils were imported during various construction activities. Site 4 is located approximately 150 feet (ft) north/northwest of Building 71 (Hush House), as indicated in Figure 1-2.

### 2.1.2 ERP Site 5 (Former Fire Training Area 2)

ERP Site 5 was used for one fire training exercise per month from 1964 through 1966. Approximately 500 to 600 gallons of fuel were used for each exercise. Assuming a 70 percent burn rate, up to approximately 6,500 gallons of unburned fuel may have been deposited at the Site (SAIC 2004b). Site 5 is located approximately 70 ft north/northwest of Buildings 45 through 48 (Alert Barns), as indicated in Figure 1-2.

### 2.1.3 ERP Site 6 (Aerospace Ground Equipment Area)

ERP Site 6 consists of a former dry well located within the Aerospace Ground Equipment Area, as indicated in Figure 1-2. This dry well was used between 1962 and 1978 for disposal of chemical wastes. Approximately 17,000 gallons of POL waste, hydraulic fluid, and solvents were reportedly dumped into the dry well and leached into the subsurface. Results of the Engineering Evaluation/Cost Analysis, completed in 1998 (OTC 1998), identified the presence of light nonaqueous phase liquid (LNAPL) in nearby Monitoring Well 6-MW2. A LNAPL bail-down test conducted by SAIC indicated an estimated LNAPL formation thickness of 0.22 ft at this well.

### 2.1.4 ERP Site 7 (Dry Well – Off Corrosion Control Building Area)

ERP Site 7 consists of a dry well located north of the former Corrosion Control Building (Building 23) and the POL Area. The dry well was used from 1955 until 1964 for disposal of petroleum wastes. Approximately 9,400 gallons of motor pool waste oils and fuels were disposed of through an underground pipe to the dry well (SAIC 2006). The historical source of groundwater contamination at Site 7 was originally generated from chemical waste leaching from the dry well. During 2002, the exact location of the former dry well at Site 7 was located.

### 2.1.5 ERP Site 8 (Dry Well – Off Corrosion Control Building Area)

ERP Site 8 is located between Buildings 30 and 32, as shown in **Figure 1-2**. According to historical records, a dry well was located approximately midway between the two buildings and is currently paved over with asphalt. The dry well was used from 1971 through 1977 for disposal of small amounts of waste engine oil, hydraulic fluids, paint thinners, jet propellant number 4 (JP-4), and PD-680. Based on monitoring well data, no LNAPL has been detected in this area. However, chlorinated volatile organic compounds (CVOCs) are dissolved in the groundwater as a result of leaching from the dry well. A natural attenuation program was implemented in July 1998 (SAIC 2006). During 2012 a series of emulsified vegetable oil injections were conducted at the Site to enhance the reductive dechlorination of the chlorinated solvent plume at the Site (Leidos 2014b). Currently, tetrachloroethene (PCE), trichloroethene (TCE), and 1,2-Dichloroethene (1,2-DCE) remain in the groundwater at concentrations above the MDEQ standards.

## 2.2 Site History and Enforcement Activities Active ERP Site 1 and Inactive ERP Sites 2 and 3

A preliminary assessment (PA) was conducted at active ERP Site 1 in 1988 (HMTTC, 1988) followed by subsequent investigation and remediation as documented in Section 2.2.1. The Site remains active and is scheduled to be further investigated in FY2024.

Inactive ERP Sites 2 and 3 were identified and described in the same PA as Site 1. These two Sites are currently inactive. Each of these Sites were further assessed in the site investigation (SI) issued during 1992 (ES, 1992a), and no remedial actions are on-going at inactive Sites 2 and 3.

Relevant historic analytical data and figures showing sample locations for the closed Sites were provided from documents in the United States Air Force (USAF) online AR at <http://afcec.publicadmin-record.us.af.mil>.

### 2.2.1 Active ERP Site 1 (Former “Current” Fire Training Area)

The Former “Current” Fire Training Area, ERP Site 1, was used for fire training exercises from 1968 until early 1989. As shown on Figure 1-2, Site 1 is located on the west side of the airport facility and consisted of one large and three small fire training areas (FTAs). As much as 30,000 gallons of fuel and other flammable liquids were used during fire training exercises, with

the potential for these liquids to migrate through soil to groundwater (ES, 1992). Investigations and remedial actions conducted at Site 1 include:

- Preliminary Assessment (HMTTC, 1988)
- Site Investigation Report (ES, 1992a)
- Action Memorandum Fire Training Area (ES, 1992b)
- Summary Report Bioremediation of Contaminated Soil (AGI, 1995)
- No Further Action Letter for Site 1 (MDHES, 1995)
- Final Remedial Investigation Report (HAZWRAP, 1997)
- Abandonment of Site 1 Monitoring Wells (SAIC, 2006a)
- Supplemental PFAS Site Investigation Report (EA, 2021)
- Action Memorandum for Non-time-critical Removal Action (NTCRA) of Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA) (NGB, 2022)
- Concurrence Letter for NTCRA of PFOS and PFOA (MDEQ, 2022a)

Sampling conducted during the 1990 SI indicated that fuel-related contamination was present in soils at the burn pit. A remedial action was conducted during 1994 in which 11,300 cubic yards (cy) of petroleum-contaminated soil were excavated. Excavation depths were limited by refusal in the weathered sandstone, which was encountered at 2 to 4 ft below ground surface (bgs). Ex-situ bioremediation of the contaminated soil was completed in a treatment cell constructed adjacent to the excavation area. Once contaminant concentrations in soil were detected at or below remediation cleanup levels, which were established at 800 milligrams per kilogram (mg/kg) for total petroleum hydrocarbons (TPHs), it was used to backfill the excavation (AGI, 1995). During 1995, the Montana Department of Health and Environmental Services (MDHES) determined that NFA was acceptable for the soils at ERP Site 1 (MDHES, 1995). A remedial investigation (RI) for groundwater was performed at Site 1 during 1996, that recommended preparation of a decision document (DD) to support NFA for groundwater at ERP Site 1 (HAZWRAP, 1997).

In July 2020, a Supplemental Site Investigation for PFAS, PFOS and PFOA was performed at Site 1 to determine if PFAS was present in soil and/or groundwater. Four soil borings (SB-1 through SB-4), were completed within the footprint of the former Site 1 FTA, and seven monitoring wells were installed upgradient, side gradient, and downgradient of Site 1 to determine the potential for off-Base (off airport property) migration of PFAS contaminants (EA, 2021). Both PFOS and PFOA were detected greater than Environmental Protection Agency (EPA) Health Advisory (HA) levels in soils, and in groundwater samples collected from MW-3 and MW-6 (EA, 2021).

Two private drinking water wells were identified approximately 2,000 ft downgradient of the northwestern property boundary near Site 1. An existing reverse osmosis water treatment system was in place at one of the properties, which treated water from the kitchen faucet. The well on this property was sampled in July 2021 and September 2021, with combined concentrations of PFOS and PFOA detected in unfiltered drinking water at 166 nanograms per liter (ng/L) and 69.4 ng/L, respectively. The combined concentration of PFOS and PFOA from the July 2021 unfiltered drinking water sample was greater than the DoD screening level of 70 ng/L. PFOS or PFOA were not detected in the filtered drinking water. The second property was deemed vacant, but habitable. Drinking water from the well on this property was sampled in September and November 2021, with combined concentrations of PFOS and PFOA detected less than the DoD screening level at a concentration of 44 ng/L in each event.

The NGB prepared and submitted an Action Memorandum in April 2022, detailing plans to install a whole house POET system at the property with concentrations of PFOS and PFOA greater than the DoD screening level (NGB, 2022). MDEQ provided concurrence on this plan via letter dated May 20, 2022 (MDEQ, 2022a), and the POET system was installed. Provisions are in place to install a POET system at the second property should the property become inhabited.

### 2.2.2 Inactive ERP Site 2 (Drainage Ditch Off Old Power Check Pad)

ERP Site 2, Drainage Ditch Off Old Power Check Pad, is located northwest of the main portion of the Base, as shown in **Figure 1-2**. The northeast-trending drainage ditch, located on the west side of the airport facility, is between an old power check pad and the small arms firing range. Waste POL from overflow of an underground oil/water separator (OWS) and storage tank, located adjacent to the power check pad, drained through a 10-inch diameter buried pipe and discharged to a ditch approximately 250 ft away. The ditch also received stormwater runoff from the power check pad. Waste quantities discharged at this Site are unknown (SAIC, 2004a).

Investigations and remedial actions conducted at Site 2 include:

- Preliminary Assessment (HMTTC, 1988)
- Site Investigation Report (ES, 1992a)
- Groundwater Monitoring (SAIC, 2000b)
- Final Decision Document Site 2 – Drainage Ditch Off Old Power Check Pad (SAIC, 2004a)
- Declaration of Restrictive Covenants on Real Property for Site 2 (SAIC, 2004a)
- NFA Letter for Site 2 (MDEQ, 2004)

The SI, conducted by Engineering Science (ES) in 1991, included the installation of soil borings, collection of soil and sediment samples, and installation and sampling of two groundwater

monitoring wells. Groundwater sampling was conducted during April and July 2000. Samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and TPHs (SAIC, 2004a).

Based on the data from the SI and the confirmatory groundwater sampling, it was determined that there was not an unacceptable risk to human health and the environment from the soils, sediment, and/or groundwater at ERP Site 2, under industrial risk criteria. Because residential screening levels were not met, a land use control (LUC) in the form of a deed restriction was required, a Declaration of Restrictive Covenants on Real Property was signed, and the MDEQ issued a letter indicating no additional remediation or monitoring (NFA) was required, provided the property is not used for residential purposes (SAIC, 2004a). Results of the SI are discussed in Section 3.5.1.

### 2.2.3 Inactive ERP Site 3 (North Disposal and Fire Training Pit)

ERP Site 3, the North Disposal and Fire Training Pit, is believed to have been located at the north end of the main runway, at the edge of Sun River Bench. The approximate location of Site 3 is shown on Figure 1-2 of the *Final Decision Document Site 3 – North Disposal and Fire Training Pit* (SAIC, 2000a) and is also included in **Appendix A** as Figure B3-4, though the precise location of the potential release within the Site could not be definitively identified.

Investigations and remedial actions conducted at Site 3 include:

- Preliminary Assessment (HMTC, 1988)
- Site Investigation Report (ES, 1992a)
- Groundwater Investigation (SAIC, 1999a)
- Final Decision Document Site 3 – North Disposal and Fire Training Pit (SAIC, 2000a)
- No Further Action Letter for Site 3 (MDEQ, 2000)

The PA identified three potential sources of contamination released in or near a pit at ERP Site 3 that included contaminated jet fuel (from 1957 to 1960), waste fuels, oils, thinners, and solvents from fire training activities (from 1966 to 1968) and unknown quantities of flammable liquids disposed of in the pit and surrounding areas over the life of the Site. According to the PA, up to 90,000 gallons of flammable liquids may have been released and up to 27,000 gallons of fuel may have remained unburned, assuming at least 70 percent of the flammable liquid was burned (HMTC, 1988).

Nine soil samples, 3-SB1 through 3-SB9, ranging in depth from 1.5 to 4 ft, and two groundwater samples from 3-MW1 (two events) were collected during the SI for analysis of VOCs, SVOCs, metals, and TPHs (ES, 1992a). Additional groundwater sampling was conducted at two locations (3-MW1, downgradient of Site 3, and piezometer 3-P1, upgradient of Site 3) during April and July 1999 to investigate TPHs (SAIC, 1999a). The SI concluded that the chemical analyses of soil and groundwater provided little indication that an FTA or disposal pit were located in the area investigated.

The Final Decision Document Site 3 – North Disposal and Fire Training Pit was issued during 2000, stating NFA is acceptable (SAIC, 2000a). A closure letter was issued by MDEQ on June 21, 2000, stating NFA is acceptable for ERP Site 3 as long as the ERP Site 3 is used as industrial airport property (MDEQ, 2000).

### **2.3 SITE HISTORY AND ENFORCEMENT ACTIVITIES – ACTIVE ERP SITES 4, 5, 6, 7, AND 8**

There are five active areas ERP Sites (Site 4, Site 5, Site 6, Site 7, and Site 8) that have been the focus of additional investigations, corrective actions, and remedial design efforts since the late 1990s. Sites 4 and 5 were former FTAs. These actions are considered interim remedial actions under the provisions of CERCLA. Sites 6, 7, and 8 were former dry wells used for liquid disposal during historical Site operations. The POL storage area has also been included in the investigations and is addressed under Site 7 (Leidos, 2014b).

The following sections provides background information and summarize the investigations that preceded this PP at ERP Sites 4, 5, 6, 7, and 8 at MANGB Great Falls. Analytical results from all site investigations for the active ERP Sites are discussed further in **Section 3.5**. Site features for the Sites are shown on **Figure 2-1** through **Figure 2-5**.

#### **2.3.1 ERP Site 4 (Former Fire Training Area 1)**

Investigations and remedial actions conducted at ERP Site 4 include:

- Preliminary Assessment (HMTTC, 1988)
- Site Investigation Report (ES, 1992a)
- Groundwater Sampling during April and July 2000 (SAIC, 2004b)
- Final Site 4 and 5 – Site Investigation Technical Memorandum (SAIC, 2011a)
- Injections to stimulate oxidative biodegradation (Leidos, 2014b)
- Surfactant flushing and recovery to recover residual product (Leidos, 2014b)
- Groundwater Monitoring Program 2012 – Present
- Supplemental Remedial Investigation (Tetra Tech, 2018a)
- Final Supplemental Remedial Investigation/Focused Feasibility Study Sites 4, 5, 6, 7, and 8 Report (AECOM, 2023)

A DD was prepared that proposed NFA for soils and groundwater under an industrial use scenario (SAIC, 2004b). In response to new regulatory standards published by MDEQ, further site investigation was required for closure and additional soil and groundwater sampling was conducted during 2010/2011. Two shallow monitoring wells (4-MW2 and 4-MW3) contained

petroleum related compounds above either the MDEQ or EPA standards (SAIC, 2011a). Monitoring Wells 4-MW4, 4-MW5, and 4-MW6 were installed in September 2017 to evaluate the perched water zone surrounding Well 4-MW3A to delineate groundwater and LNAPL impacts in 4-MW3A.

### 2.3.2 ERP Site 5 (Former Fire Training Area 2)

Investigations conducted at ERP Site 5 include:

- Preliminary Assessment (HMTTC, 1988)
- Site Investigation Report (ES, 1992a)
- Final Sites 4 and 5 – Site Investigation Technical Memorandum (SAIC, 2011a)
- Technical Memorandum Addendum for Site 5 (Leidos, 2014a)
- Final Technical Work Plan Addendum for ERP Site 5 (BB&E, 2015)
- Groundwater Monitoring Program 2010 – Present
- Final Supplemental Remedial Investigation/Focused Feasibility Study Sites 4, 5, 6, 7, and 8 Report (AECOM, 2023)
- No remedial actions have been conducted at ERP Site 5.

Recommendation for closure at ERP Site 5 occurred in the DD issued during 2004 (SAIC, 2004c). Due to new regulatory standards published by MDEQ, additional soil and groundwater samples were collected during 2010. During the 2010 investigation, barium was detected in soil at one location at a concentration exceeding the MDEQ impact to groundwater soil screening level.

A site-specific calculation of chemical travel time from the vadose zone to groundwater for barium was performed and summarized in the Technical Memorandum Addendum for ERP Site 5, which concluded that under the most conservative scenario, barium would not leach to the groundwater in a concentration exceeding MDEQ groundwater standards for a minimum of 75 years, and likely more than 1,119 years (Leidos, 2014a). This calculation, combined with existing data showing limited barium exceedances in soil and no exceedances of the MDEQ in groundwater, justified eliminating barium as a threat to leach to groundwater, and No Further Response Action was recommended (Leidos 2014b).

Two site wells (5-MW2 and 5-MW3) have been used for groundwater and LNAPL gauging since 2010. ERP Site 5 was added back to the monitoring program during 2018 due to the detection of trace amounts of LNAPL in Monitoring Wells 5-MW2 and 5-MW3 (Tetra Tech, 2019). Groundwater sampling was discontinued at Site 5 in quarter 2 (Q2) 2020, as sampling results from the November 2019 event confirmed that no contamination above regulatory standards was present at Site 5 and no LNAPL was detected since 2018 (AECOM), 2021). Semi-annual water level and LNAPL gauging are performed as part of the ongoing LTM program.

### 2.3.3 ERP Site 6 (Aerospace Ground Equipment Area[Former Building 22])

Investigations and remedial actions conducted at ERP Site 6 include:

- Preliminary Assessment (HMTC, 1988)
- Site Investigation Report (ES, 1992a)
- Remedial Investigation (HAZWRAP, 1997)
- Engineering Evaluation/Cost Analysis Report IRP Sites 6, 7, and 8 (OTC, 1998a)
- Action Memorandum for Sites 6, 7, and 8 (OTC, 1998b)
- Treatability Study Technical Memorandum (SAIC, 1998a) Site 6 Dry Well Abandonment (SAIC, 1998b)
- Installation of free-phase product recovery system at Monitoring Well 6-MW2 (SAIC, 1999b)
- Quarterly groundwater sampling from 1998 – 2001 to assess natural attenuation (SAIC, 2006d)
- Vapor Extraction Pilot Study (SAIC, 2006d)
- Final Phase II Remedial Investigation (SAIC, 2006d)
- Final Feasibility Study Report (SAIC, 2006c)
- Final Record of Decision ERP Sites 6, 7, and 8 (SAIC, 2007b)
- Remedial Action Completion Report, Volumes I and II (SAIC, 2009a; 2009b)
- Injections to Stimulate Oxidative Biodegradation (Leidos, 2014b)
- Groundwater Monitoring Program 2008 - Present
- Final Remedial Action Completion Report for ERP Sites 4, 5, 6, 7, and 8 (Leidos, 2014b)
- Final Vapor Intrusion Study Technical Memorandum (EA, 2017)
- Supplemental Remedial Investigation (Tetra Tech, 2018a)
- Final Technical Memorandum – Supplemental Vapor Intrusion Study (EA, 2019)

- Final Supplemental Remedial Investigation/Focused Feasibility Study Sites 4, 5, 6, 7, and 8 Report (AECOM, 2023)

A remediation system consisting of a modular groundwater bioremediation system comprised of either groundwater injection and extraction or dual use extraction/injection (E/I) wells and a bioventing (BV) system, and a mobile BV and/or vapor extraction (BV/VE) trailer was installed at the Site in 2008 (Leidos, 2014b). The groundwater bioremediation was used to extract contaminants within the subsurface at ERP Site 6, and the mobile BV/VE trailer was used to address the hydrocarbon vapors in the vadose zone. The system ran from October 2008 through September 2016, at which point it was mothballed.

In addition, magnesium sulfate injections were also conducted at ERP Site 6 in October 2012 to stimulate the biodegradation of residual petroleum hydrocarbon injections at the Site (Leidos, 2014b).

A groundwater monitoring program has been in place at ERP Site 6 since October 2008. Semi-annual LNAPL gauging is performed at all Site 6 monitoring wells under the current LTM program, and LNAPL is removed using absorbent socks if it is encountered during gauging activities.

Building 25, located adjacent to ERP Site 6, was part of a vapor intrusion (VI) investigation conducted in January 2017 and March 2018, which included the collection of both indoor air and sub-slab soil gas samples within the footprint of Building 25. Analytical results indicated that one sub-slab soil gas location exceeded project action limits (PALs) for ethylbenzene and m, p-xylene. This sub-slab location was located beneath the tool crib. The VI investigation concluded that the VI pathway is not impacting human receptors within the building (EA, 2019).

#### **2.3.4 ERP Site 7 (Dry Well Off Corrosion Control Building [Former Building 23])**

Investigations and remedial actions conducted at ERP Site 7 include:

- Preliminary Assessment (HMTTC, 1988)
- Site Investigation Report (ES, 1992a)
- Remedial Investigation (HAZWRAP, 1997)
- Engineering Evaluation/Cost Analysis Report IRP Sites 6, 7, and 8 (OTC, 1998a)
- Action Memorandum for Sites 6, 7, and 8 (OTC, 1998b).
- Treatability Study Technical Memorandum (SAIC, 1998a) Site 7 Well Installation and Groundwater Sampling Activities Technical Memorandum (SAIC, 2001a)
- Site Assessment Report (SAIC, 2005)
- Final Feasibility Study Report (SAIC, 2006c)

- Interim Remedial Action Construction – Sites 7 and 8 Dry Well Abandonment Technical Memorandum (SAIC, 2006b)
- Final Record of Decision ERP Sites 6, 7, and 8 (SAIC, 2007b)
- Supplemental Site Characterization Report for the POL Storage Area (SAIC, 2007a)
- Remedial Action Completion Report, Volumes I and II (SAIC, 2009a; 2009b)
- Injections to stimulate oxidative biodegradation of petroleum hydrocarbon contaminants (Leidos, 2014b)
- Surfactant flushing and recovery to recover residual product (Leidos, 2014b)
- Groundwater Monitoring Program 2008 - Present
- Final Remedial Action Completion Report for ERP Sites 4, 5, 6, 7, and 8 (Leidos, 2014b).
- Supplemental Remedial Investigation (Tetra Tech, 2018a)
- Final Supplemental Remedial Investigation/Focused Feasibility Study Sites 4, 5, 6, 7, and 8 Report (AECOM, 2023)
- Technical Memorandum Site 7 Soil Investigation (AECOM, 2024)

An additional source of contamination was identified in 2004 in the POL storage area near ERP Site 7. A jet fuel release, DEQ Release #4368, originated from flanges connecting the underground storage tanks (USTs) to the piping at the fuel pumps. The volume of fuel released is unknown. The underground fuel lines and flanges were removed and impacted soil was removed and replaced during 2005 (Leidos, 2014b).

The remediation system, currently mothballed at ERP Site 7, includes a groundwater bioremediation system and BV/VE system that was installed during 2008 (Leidos, 2014b). The groundwater bioremediation system was used to treat the dissolved-phase hydrocarbon plume present within the subsurface at Site 7. The BV/VE system was used to address the hydrocarbon vapors in the vadose zone. Both systems operated through April 2016. A more detailed description of the remediation systems can be found in the first quarter (Q1) 2014 report by Leidos (2014b). Magnesium sulfate injections were also conducted at Site 7 during October 2012 to stimulate the biodegradation of residual petroleum hydrocarbon injections at the Site (Leidos, 2014b).

A groundwater monitoring program has been in place at ERP Site 7 since October 2008. Quarterly LNAPL gauging was conducted from 2008 through 2013 to monitor the extent of LNAPL in the subsurface. Since 2013, LNAPL gauging has been conducted on a semi-annual basis. More frequent gauging and removal is conducted at wells that contain measurable LNAPL. Between February 2020 and April 2022, LNAPL has been detected in five wells (7-

MW1, 7-MW19, 7-MW22, 7-MW29, and 7-MW35), ranging in thickness from a sheen to 0.48 ft (7-MW19).

### **2.3.5 ERP Site 8 (Dry Well Off Composite Maintenance Building [Former Building 32])**

Investigations and remedial actions conducted at Site 8 include:

- Preliminary Assessment (HMTTC, 1988)
- Site Investigation Report (ES, 1992a)
- Remedial Investigation (HAZWRAP, 1997)
- Engineering Evaluation/Cost Analysis Report IRP Sites 6, 7, and 8 (OTC, 1998a)
- Action Memorandum for Sites 6, 7, and 8 (OTC, 1998b)
- Treatability Study Technical Memorandum (SAIC, 1998a)
- Final Feasibility Study Report (SAIC, 2006c)
- Interim Remedial Action Construction – Sites 7 and 8 Dry Well Abandonment Technical Memorandum (SAIC, 2006b)
- Final Record of Decision ERP Sites 6, 7, and 8 (SAIC, 2007b)
- Remedial Action Completion Report, Volumes I and II (SAIC, 2009a; 2009b)
- Bioventing System (Leidos, 2014b)
- Biostimulation and bioaugmentation injections (Leidos, 2014b)
- Groundwater Monitoring Program 2012 - Present
- Final Vapor Intrusion Study Technical Memorandum (EA, 2017)
- Supplemental Remedial Investigation (Tetra Tech, 2018a)
- Final Technical Memorandum – Supplemental Vapor Intrusion Study (EA, 2019)
- Final Supplemental Remedial Investigation/Focused Feasibility Study Sites 4, 5, 6, 7, and 8 Report (AECOM, 2023)

The 1997 Draft RI recommended NFA for soils and a preparation of an Engineering Evaluation/Cost Analysis (EE/CA) to evaluate potential remedial measures for groundwater. The EE/CA recommended monitored natural attenuation (MNA) for the dissolved phase

contaminants (OTC, 1998a; 1998b). In 2001, following a review of MNA groundwater analytical data collected between 1998 and 2001, ANG recommended implementation of enhanced remedial alternatives to shorten the time required to obtain closure at the Site (SAIC, 2002).

During 2012, a series of emulsified vegetable oil injections were conducted at the ERP Site 8 to enhance the reductive dechlorination of the chlorinated solvent plume at the Site (Leidos, 2014b). A remediation system consisting of a modular groundwater bioremediation system comprised of either groundwater injection and extraction or dual use E/I wells and a BV system, and a mobile BV/VE trailer was installed at the Site during 2008 (SAIC, 2014). The groundwater bioremediation system was used to treat the dissolved-phase hydrocarbon plume present within the subsurface at Site 8, and the mobile BV/VE trailer was used to address the hydrocarbon vapors in the vadose zone. The systems ran from October 2008 through April 2016, at which point they were mothballed.

A groundwater monitoring program has been in place at ERP Site 8 since October 2008. A more detailed description of the remediation systems can be found in the Q1 2014 report by Leidos (2014a).

Building 30, located adjacent to ERP Site 8, was part of a VI investigation conducted in January 2017 and March 2018, which included the collection of both indoor air and sub-slab soil gas samples within the footprint of Building 30. The VI investigation concluded that the VI pathway is not impacting human receptors within the building. Building 32 was originally included in the January 2017 VI investigation but was removed from further evaluation because the building was demolished in June 2018.

### 3.1 PHYSIOGRAPHY AND CLIMATE

The city of Great Falls is located in central Montana, east of the Continental Divide, 91 miles northeast of Helena, and approximately 120 miles south of the Canadian border. Major highways serving the city are Interstate 15, US Highways 87 and 89, and Montana Highway 200 (**Figure 1-1**). The Sites are located approximately 3 miles southwest of Great Falls, on the northeastern edge of the Sun River bench, a topographic feature situated approximately 350 ft above the confluence of the Sun and Missouri Rivers. The elevation of the Sites is about 3,680 ft above mean sea level (msl). The Sites are located in the Great Plains physiographic province east of the boundary of the Northern Rocky Mountains province and the Great Plains province (SAIC, 2006).

Great Falls International Airport is bordered on the west by agricultural land and on the north and northwest by agricultural and sparse residential areas. The area south of the airport is designated industrial and commercial, and an open area southwest of the airport is used for active outdoor recreation (SAIC, 2006).

The climate of the Great Falls area is semi-arid. The mean annual precipitation is approximately 15 inches per year, and the net precipitation value (including evapotranspiration) is approximately 19 inches per year. The maximum rainfall intensity, based on a 1-year, 24-hour rainfall, is 1.25 inches. Approximately 70 percent of the annual total rainfall normally occurs between April and September. The mean annual temperature is approximately 44 degrees Fahrenheit (°F), with winters averaging 25°F and summers averaging 66°F (SAIC, 2006).

### 3.2 GEOLOGY AND HYDROGEOLOGY

The Base is located on the northeastern edge of the Sun River bench, a plateau or cuesta of Cretaceous age rocks on the northwestern flank of the Sweetgrass Arch; it rises about 350 ft above Great Falls and dips gently off toward the northwest. The rock units underlying the Base consist of, in descending order, the Taft Hill and Flood Members of the Blackleaf Formation of the Colorado Group and the Kootenai Formation. Both the Blackleaf and Kootenai are Cretaceous in age. These are underlain in turn by the Morrison and Swift Formations of Jurassic age and the Madison Group of Mississippian age (Leidos, 2019).

Erosional remnants of the Taft Hill Member outcrop at and around the Base and make up the majority of the unconsolidated and consolidated material found in the upper 15 to 20 ft underlying the Base. At the type locality for the Taft Hill located to the west of the Base, the member is reported to be 250 ft thick with beds thinning to the east. The member consists predominantly of marine strata with medium gray, soft bentonitic clayey to silty shales and greenish gray, glauconitic sandstones (Leidos, 2019).

The upper sandstone forms the cliffs around the edge of the Sun River bench southwest of Great Falls. It consists of light gray, very fine- to medium-grained quartz and chert sandstone. The sandstone weathers tan-brown to red-brown and has either a clayey matrix or siliceous cement. The sandstone is characterized by massive bedding in the lower part with distinct vertical and horizontal joints; the upper part is characterized by irregular vertical joints and

bedding plane partings. The contact between the upper and middle unit of the Flood Member is gradational (Leidos, 2019).

The middle unit of the Flood Member consists of interbedded sandstone and shales. The sandstone is tan and fine- to medium-grained and weathers to a light tan gray; some sandstone beds are siliceously cemented, others are argillaceous and friable. The shale beds are dark gray and weather light gray, are both sandy and silty, and generally are calcareous. Occasionally, coal laminae may be present (Hazardous Waste Remedial Actions Program, 1997). The surface soil at the Base consists of yellowish-brown sand with occasional very thin gravel interpreted to be from the Taft Hill Member of the Colorado Group. Thickness of the surface soils ranges from approximately 4 to 15 ft across the Base. The unconsolidated deposits are underlain by weathered siltstone to fine sandstone of the Flood Member. The depth to competent siltstone/sandstone encountered in the well borings ranges from 2 to 55 ft bgs (Tetra Tech, Inc [Tetra Tech], 2018). The thickness of the sandstone ranges from 38 to 44 ft. Relatively flat-lying gray siltstone-shale bedrock of the Flood Member with no major structural displacement lies beneath the competent sandstone (Leidos, 2019).

Two groundwater bearing zones are present at the Sites. A regional groundwater bearing zone is present beneath the Sites and is encountered in all monitoring wells with screen depth intervals between approximately 35 to 60 ft bgs. Groundwater is encountered at the contact between upper sandstone and the underlying shale of the Flood Member (Leidos, 2014b). A shallow perched groundwater bearing zone is also present, but its extent is limited to ERP Site 4. Monitoring wells within the perched groundwater bearing zone are installed at depths ranging between approximately 10 to 30 ft bgs (AECOM, 2021).

### 3.3 SURFACE WATER HYDROLOGY

No natural or significant surface water bodies, navigable waterways, or wetlands are present at Great Falls MANGB. Seasonal surface water may appear in the drainage ditch associated with Stormwater Outfall 001 depending on precipitation events (HMTC, 1988). Surface water flow at MANGB Great Falls is dictated by the Base's man-made surface drainage system. Stormwater is captured by drainage ditches located throughout the property and directed southwest off Base (Leidos, 2018). The confluence of the Sun River and Missouri River is approximately 2 miles northeast of the Base (Leidos, 2019).

### 3.4 ECOLOGY

Ecological risk assessments for active ERP Sites 4, 5, 6, 7, and 8 concluded that given the location of the Sites within the Great Falls International Airport, an industrial site that is dominated by buildings, mowed landscapes, and paved surfaces. No sensitive ecological habitats were identified either within the facility or the immediate vicinity. Even if the pavements/buildings were removed or not maintained, quality habitat would not exist on the Sites.

### 3.5 NATURE AND EXTENT OF CONTAMINATION – INACTIVE AND ACTIVE ERP SITES

The following sections summarize the nature and extent of contaminants of concern (COCs) in soil, groundwater, and soil gas (where applicable) at inactive ERP Sites 2 and 3 and active ERP Sites 1, 4, 5, 6, 7, and 8. The discussion is primarily based on the results of the current LTM monitoring program for these Sites, which has been on-going for Sites 6, 7, and 8 since 2008 and Site 4 since 2012. However, the initial investigation of the Sites began with the preparation of the SI Report in 1992 (ES, 1992a). The current monitoring well network for the Sites is shown on **Figure 2-1**.

All current on-going remedial activities are associated with groundwater. In addition, no surface waters that have a potential to be impacted have been identified. A VI study was conducted in buildings located in the vicinity of the active ERP Sites determined to have a potential to warrant a concern with respect to VI (EA, 2019). The VI assessment concluded that no additional response actions were required and that there were no immediate or long-term threats to human receptors (EA 2017, 2019). All on-going monitoring at the active Sites is for VOCs due to the discovery of chlorinated and petroleum-related compounds and for petroleum hydrocarbons. A full discussion of the historical data of the active and inactive ERP Sites can be found in Final SRI/FFS Sites 4, 5, 6, 7 and 8 Report (AECOM 2023).

#### 3.5.1 Inactive ERP Sites

Investigation activities for inactive ERP Sites 2 and 3 occurred between 1990 and 2000. This section discusses these activities and evaluates the current nature and extent of remaining contamination compared to current applicable screening criteria, as outlined in **Section 1.2**.

##### 3.5.1.1 Drainage Ditch Off Old Power Check Pad (Site 2)

The analytical results that were reviewed for ERP Site 2 are provided in **Appendix A** along with figures showing sample locations. The results reviewed include:

- Soil samples were collected from six locations during the 1990 SI (ES, 1992a). These results are presented in **Appendix A** as **Tables B2-1** and **B2-2** and **Figure B2-1**.
- Sediment samples were collected from three locations during the 1990 SI (ES, 1992a). These results are presented in **Appendix A** as **Table B2-3** and **Figure B2-1**.
- Groundwater samples were collected during four sampling events across the 1990 SI and in early 2000 to support Site closure (ES, 1992a; SAIC, 2000b). These results are provided in **Appendix A** as **Table B2-4** and **Figure B2-1**.
- A soil gas survey was completed during the 1990 SI on a grid pattern to delineate the extent of contamination (ES, 1992a). This information is provided in provided in **Appendix A** as **Table B2-5** and **Figure B2-2**.

A summary of ERP Site 2 soil analytical results is provided in **Table 3-3**, and a summary of groundwater results is presented in **Table 3-4**. The results are compared to the current screening criterion as discussed in **Section 1.2**.

### **Soils**

Contaminants present at ERP Site 2 were assessed through the collection of nine soil samples from six soil borings (2-SB1 through 2-SB6). Soil samples were collected at depths ranging from 1 to 3 ft bgs and were analyzed through the EPA CLP for VOCs, SVOCs, metals, and TPHs.

**Appendix A, Tables B2-1 and B2-2** summarize the detections of constituents in soil samples collected from 0 to 2 ft bgs and 2 to 3 ft bgs, respectively. In general, constituent concentrations were non-detect or were detected within background concentrations. One VOC (acetone), three SVOCs (all phthalates), TPHs, and metals were detected in the soil samples. The acetone and phthalates detections were considered likely attributed to laboratory contamination and were less than the current screening criteria. TPHs were found in one soil sample (2-SB6(1')) at 46 mg/kg, at a depth of less than 2 ft bgs, which is less than the MDEQ Tier 1 RBSL for residential use for all EPH fractions when converted. A second sample (2-SB6(2')) collected from 2 to 3 ft bgs in this boring was not detected for TPHs. The metals cadmium, chromium, lead, mercury, nickel, selenium, and zinc were detected in one or more sample above background concentrations (SAIC 2004a), but they did not exceed the current screening criteria.

### **Sediment**

Three sediment samples were collected during the SI at ERP Site 2 and analyzed through the EPA CLP for VOCs, SVOCs, metals, and TPHs. The sediment samples were collected from the bottom of the drainage ditch (**Appendix A, Table B2-3**). It is assumed that the ditch would not support aquatic life, and the sediment samples were therefore compared to soil screening criteria. Locations of the sediment samples are shown in **Appendix A, Figure B2-1**. No VOCs were detected in the sediment, and SVOCs were detected in the sediment at concentrations less than EPA industrial soil screening levels. TPHs analyses indicated contamination ranging from 82 to 590 mg/kg in all three sediment samples. A distribution of 30 percent as C11-C22 aromatics and 70 percent as C9-C18 aliphatics of TPHs was used for comparison to current criteria. The resultant concentrations were less than Tier-1 RBSLs (see **Table 3-4**).

Concentrations of chromium at in one soil sample, 24.2 mg/kg at 2-SED2, were greater than the MDEQ RBCA Screening Level of 3.8 mg/kg. However, this concentration was within the regional background concentrations and the area of cadmium contamination is minimal (i.e., less than 8 ft<sup>2</sup>) based on surrounding surface soil and groundwater samples (SAIC, 2004a).

Cadmium, copper, lead, mercury, nickel, and zinc were detected in the sediment samples above background range concentrations, but they did not exceed the applicable human health screening criteria in place at the time of reporting (SAIC, 2004a).

### **Soil Gas**

A screening-level soil gas survey was conducted during the SI. The survey was completed on a grid pattern to help determine the presence and extent of VOC contamination at ERP Site 2 (**Appendix A, Figure B2-2**). Vertical profiles, consisting of four samples per location based on refusal depth, were completed at each location; sample depths ranged from 2 to 5 ft bgs. Survey results are summarized in **Appendix A** in **Figure B2-2**, and sample locations are shown in **Table B2-5**.

The samples were analyzed for benzene, toluene, o-xylene, TCE, 1,2-DCE, and 1,1-DCE, due to the type of gas chromatograph used. TCE was detected in one sample, toluene was detected in four samples, and o-xylene was detected in three samples. The samples were collected along the pipeline and centerline of the ditch and showed no obvious trends (ES, 1992a).

### **Groundwater**

One monitoring well (2-MW1) was constructed approximately 500 ft downgradient from ERP Site 2. Water levels from 2-MW1 were used in conjunction with Piezometer (1-2)-P3 data to evaluate groundwater flow direction and gradient. The first sampling event occurred during October 1990, and the second sampling event occurred during February 1991. Samples were analyzed through the EPA CLP program for VOCs and SVOCs, TPHs, and priority pollutant metals plus barium. Two more events were conducted during 2000 for petroleum hydrocarbons (EPHs and VPHs). A summary of detected results is shown on **Appendix A, Table B2-4**, and well locations and general groundwater direction are shown on **Figure B2-1**.

TPHs were detected during the first event conducted during October 1990 at 7,000 µg/L in Monitoring Well 2-MW1, but they were not detected in subsequent sampling events during February 1991, April 2000, and July 2000. Therefore, October 1990 sampling data is considered unrepresentative of actual aquifer conditions and was not compared to applicable standards. The metals arsenic, copper, selenium, and zinc were detected at values exceeding the established background concentrations during one or more events but did not exceed applicable screening criteria in place at the time of reporting (SAIC, 2004a). VOCs were not detected during any of the sampling events.

#### **3.5.1.2 North Disposal and Fire Training Pit (Site 3)**

The analytical results that were reviewed for ERP Site 3 are provided in **Appendix A** along with figures showing sample locations. The results reviewed include:

- Soil samples were collected from soil borings during the 1990 SI (ES, 1992a). These are presented in **Appendix A** as **Table B3-1** and **Figure B3-1**.
- Groundwater samples were collected during three sampling events across the 1990 SI and in 1999 to support site closure. The 1990 SI results are presented in **Appendix A** as **Table B3-2** and **Figure B3-1**. The results from the 1999 Groundwater Investigation were not summarized in a table; therefore, the analytical laboratory summary reports are presented in **Appendix A** as **Table B3-3** (SAIC, 1999a).

- A soil gas survey was completed during the 1990 SI on a grid pattern to delineate the extent of contamination at Site 3 (ES, 1992a). This information is provided in **Appendix A** as **Table B3-4** and **Figure B3-2**.

A summary of ERP Site 3 soil analytical results is provided in **Table 3-5**, and a summary of groundwater results is presented in **Table 3-6**. The results are compared to the current screening criterion as discussed in **Section 1.2**.

### **Soils**

Eleven soil samples were collected from 9 soil borings (3-SB1 through 3-SB9). Soil borings were collected at depths ranging from 1.5 to 4 ft bgs. These samples were analyzed through the EPA CLP for VOCs, SVOCs, metals, and TPHs. **Appendix A, Table B3-1** summarize detections, and **Appendix A, Figure B3-1** shows the locations of soil borings. In general, results were not detected or were within background concentrations. Two VOCs (acetone and toluene) and two SVOCs (diethyl phthalate and butyl-benzyl phthalate) were detected but did not exceed screening criteria (see **Table 2-4**). TPHs were not detected, and the metals arsenic, chromium, lead, nickel, and zinc were detected above background in one or more sample. Metals results did not exceed the screening criteria, with the exception of arsenic. Arsenic background concentrations of 1.9 to 9.9 mg/kg exceed the screening criteria of 3.0 mg/kg. The highest concentration observed at the Site was 23.4 mg/kg, which slightly exceeds the state-wide background concentration and likely represents a natural variation, since no source of arsenic contamination has been identified at the ERP Site 3.

### **Soil Gas**

During the SI, a screening-level soil gas survey was completed on a grid pattern to help determine the presence and extent of volatile organic contamination at ERP Site 3 (**Appendix A, Figure B3-2**). The samples were collected at three or four different depths (at a single point) to complete a depth profile. The samples were then analyzed, and the depth at which the highest volatile concentrations were found was used as the sampling depth for Site 3. The sample depths ranged from 2 to 5 ft bgs. The soil gas survey results are summarized in **Appendix A, Figure B3-3**, and **Table B3-4**. The results indicated no evidence of a clearly defined waste disposal pit (ES, 1992a).

### **Groundwater**

One monitoring well (3-MW1) was constructed at ERP Site 3 in 1990 to obtain groundwater samples for evaluation of groundwater quality. The well was located approximately 15 ft in the presumed downgradient direction from the probable location of Site 3. Water levels from 3-MW1 were used in conjunction with piezometer data to evaluate groundwater flow direction and gradient. Sampling events 1 and 2 occurred during October 1990 and February 1991, respectively.

Samples were analyzed through the EPA CLP program for VOCs, SVOCs and priority pollutant metals plus barium. A summary of detected results is shown on **Appendix A, Table B3-2**, and well locations are shown on **Appendix A Figure B3-1**. TPHs were detected in groundwater during the first sampling event but were not detected in groundwater during the second

sampling event. No VOCs or SVOCs were detected, and the metals detected were within anticipated background ranges (ES, 1992a). None of the detections of TPHs or metals approached the groundwater screening criteria.

Additional groundwater sampling was conducted at Monitoring Well 3-MW1 during April and July 1999 for at the request of the MDEQ, who stated that additional sampling would not be required if no groundwater issues were reported. The well was sampled for EPHs and VPHs, and neither were detected during either of the two sampling events (SAIC, 1999a).

### 3.5.2 Active ERP Sites

Investigation activities for active ERP Sites 1, 4, 5, 6, 7 and 8 occurred between 1990 and 2000. This section discusses these activities and evaluates the current nature and extent of remaining contamination compared to current applicable screening criteria, as outlined in Section 1.2.

#### 3.5.2.1 Former "Current" Fire Training Area (Site 1)

The analytical results that were reviewed for ERP Site 1, along with figures showing sample locations, are provided in **Appendix A**. The results reviewed include:

- Soil samples were collected from nine locations during the 1990 SI and reported in the 1992 SI Report (ES, 1992a). These results were presented in **Appendix A** as **Table B1-1** and **Figure B1-1**.
- Soil samples were collected prior to the remedial effort to determine the limits of contamination. These results are presented in **Appendix A** as **Table B1-2** and **Figure B1-2**.
- Groundwater samples were collected from two monitoring wells (1-MW1 and 1-MW2) during the 1996 RI (HAZWRAP, 1997). These results are presented in **Appendix A** as **Table B1-3** and **Figures B1-3** and **B1-4**.
- A screening-level pre-remediation soil gas survey was conducted during the 1990 SI. This information is included in **Appendix A** as **Table B1-4** and **Figure B1-5**.
- A summary of the groundwater data collected at ERP Site 1 is included in **Table 3.2**, which also includes a comparison to current applicable screening criteria, as outlined in **Section 1.2**.

### Soil

A total of 13 soil samples were collected from 9 soil borings (1-SB1 through 1-SB9) and analyzed through the EPA contract laboratory program (CLP) for VOCs, SVOCs, metals, and TPHs. **Appendix A, Table B1-1** summarizes the detections.

In general, the pre-excavation results were non-detect or within inorganic background concentration ranges calculated during the SI and presented as **Table 3.2** in the SI Report (ES, 1992a). Analytes that exceeded the screening criterion were toluene, ethyl benzene, xylene, 2-

methylnaphthalene, fluoranthene, and pyrene. Barium exceeded current screening criteria but was within Site background concentrations at all locations. TPHs were analyzed as total and cannot be directly compared to the current direct-contact Montana Risk Based Screening Levels (RBSLs). The TPH data was converted to EPH fraction data using information on **MDEQ Table E**, assuming the initial source was in the kerosene and jet fuel category. Using this distribution, 30 percent TPHs is C11-C22 aromatics and 70 percent is C9-C18 aliphatics (MDEQ, 2018a). The TPHs concentration in the sample collected at Soil Boring 1-SB7(1') (120,000 mg/kg at 1 footbgs, exceeded the commercial direct contact RBSL for both C11-C22 aromatics (3,900 mg/kg) and C9-C18 aliphatics (540 mg/kg), as well as the leaching to groundwater RBSL (>20 ft to groundwater) for both C11-C22 aromatics (2,000 mg/kg) and C9-C18 aliphatics (540 mg/kg).

The limits of contamination for soil removal were further established based on field screening results for TPHs by EPA Method 418.1, modified as part of the removal action during 1994 (**Appendix A, Table B1- 2**). The extent of the excavation is shown on **Appendix A, Figure B1-2**. **Figure B1-2** shows that soil from 1-SB7(1') has been removed and that TPHs concentrations remaining outside of the excavated area are generally below the direct contact commercial RBSLs for C11-C22 aromatics (3,900 mg/kg) and C9-C18 aliphatics (540 mg/kg), and the leaching to groundwater RBSLs (>20 ft to groundwater) for C11-C22 aromatics (2,000 mg/kg) and C9-C18 aliphatics (540 mg/kg); there are exceptions at two locations south of the excavation and outside the fence line, with TPHs concentrations of 7,196 mg/kg (5,037 mg/kg C9-C18 aliphatics; 2,159 mg/kg C11-C22 aromatics) and 6,371 mg/kg (4,460 mg/kg C9-C18 aliphatics; 1,911 mg/kg C11-C22 aromatics) at samples 1-SB28(1') and 1-SB29(1.5'), respectively.

The highest "final" TPHs result, representative of materials being returned to the excavation, was 640 mg/kg at Phase II location W-13. However, as 70 percent of total TPHs is C9-C18 (Table E, MDEQ 2018), the adjusted value for the Phase II location W-13 is 448 mg/kg, less than the current direct-contact commercial, direct-contact construction, and leaching criteria >20 ft RBSLs of 540 mg/kg, 900 mg/kg, and 270,000 mg/kg, respectively.

Though not discussed in detail in the report text, lead analytical results from post-excavation samples were presented in **Appendix D** of the 1995 Summary Report Bioremediation of Contaminated Soil (AGI, 1995). The highest detected concentration of lead in the 43 post-excavation samples was 31 mg/kg in 2 samples, well below the current MDEQ construction worker screening level of 656 mg/kg, commercial industrial worker screening level of 923 mg/kg (MDEQ, 2021).

### **Soil Gas**

During the 1990 SI, a screening-level soil gas survey was completed on a grid pattern to delineate the extent of contamination in the vicinity of the FTAs (**Appendix A, Table B1-4**, and **Figure B1-5**). The survey was conducted prior to the remedial action, and the results are not considered representative of current conditions.

### **Groundwater**

One groundwater sample was collected during the SI from Monitoring Well 1-MW1. Due to uncertainty of the downgradient position of this well, another well was installed (1-MW2). Both wells were sampled with results reported in the Remedial Investigation of Groundwater Report (HAZWRAP, 1997). Samples were analyzed through the EPA CLP program for VOCs, SVOCs and priority pollutant metals, plus barium. Analysis of TPHs, including gasoline, diesel oil, and JP-4 fractions, were performed according to EPA method 8015. A summary of detected results is shown on **Appendix A, Table B1-3**, and well locations and general groundwater flow direction are shown on Appendix A, **Figures B1-3, and B1-4**, respectively.

**Table B1-3** shows that several results were rejected (R qualified) during the validation process. Rejected results are not considered a concern, since data from a second sampling event was available for Monitoring Well 1-MW1.

Downgradient Monitoring Well 1MW-2 had low-level concentrations of the VOCs benzene, toluene, and 1,4-dichlorobenzene. SVOCs (phthalates) were present in both wells at low concentrations and were considered laboratory contaminants. Petroleum hydrocarbons as diesel-range organics (at a maximum qualified value of 360 micrograms per liter [ $\mu\text{g/L}$ ]) were present in both rounds of sampling at 1-MW1. The metals arsenic, barium, beryllium, chromium, copper, lead, nickel, and zinc were also detected, but at levels below screening criteria. None of the detected results exceed current DEQ-7 standards, Tier-1 RBSLs, or EPA RSLs.

In June 2006, ANG proposed to abandon both 1-MW1 and 1-MW2, given that historical groundwater sampling results were below screening criteria and MDEQ issued a NFA letter for Site 1 in 1995 (SAIC, 2006e). With concurrence from MDEQ, these wells were abandoned in July 2006 (SAIC, 2006a).

#### **3.5.2.2 ERP Site 4**

The following conclusions are based on the review of the analytical data from soil, soil gas, and groundwater from 1990 through April 2022. Summaries of detected soil analytical results are provided on **Table 3-1** and groundwater analytical results from October 2020 through April 2022 are provided on **Tables 3-2, 3-3, 3-4, and 3-5**.

### **Soil**

Concentrations of barium in two soil samples 1,190 milligrams per kilogram (mg/kg) at 4-SB4(7') and 859 mg/kg at SB8(6.5') are greater than the MDEQ RBCA screening level of 421 mg/kg and MDEQ background threshold value of 429 mg/kg. Historic FTA activities at ERP Site 4 are not consistent with typical barium compound sources, which include paints, bricks, ceramics, glass, rubber, rodenticides, lubricating oils, and fireworks. Considering all other barium samples collected at Site 4 are below the MDEQ risk-based corrective action (RBCA) screening levels and no other RCRA metals are present above MDEQ RBCA screening levels, it is assumed that elevated concentrations of barium are due to the presence of historic fill and not FTA activities. A study done on the adjacent ERP Site 5 determined, conservatively, the minimum length of

time it would take barium to leach to groundwater is 75 years, with the most likely scenario being 1,119+ years based on Site conditions (Leidos, 2014a).

Converted concentrations of C9-C18 aliphatics are present greater than direct-contact commercial and direct-contact construction RBSLs of 540 mg/kg and 900 mg/kg, respectively, in one soil sample, the duplicate sample from 4-SB2(1'), at a concentration of 1,050 mg/kg. The parent sample contained concentrations of C9-C18 aliphatics at 60 mg/kg (Table 3-7). C9-C18 aliphatics were detected at concentrations below risk-based screening levels (RBSLs) in the deeper sample at this location, 4-SB2 (3.5'). 4-SB2 was advanced within the footprint of the former FTA. Petroleum-related hydrocarbons were either not detected or detected below applicable RBSLs in surrounding borings (**Figure 3-1**).

### **Soil Gas**

VI is not considered a risk at ERP Site 4 given that site is primarily an open field, with an area partially paved over during construction of the nearby Building 71 "Hush House". Reportedly, some soils within the Site 4 area were removed during construction activities and replaced with clean material (SAIC, 2004b). Additionally, the only nearby inhabited structure, the Building 71 "Hush House", is used for the testing of aircraft systems, including jet propulsion engines.

### **Groundwater**

- Benzene, 1,1,2-Trichloroethane, 1,2,4-Trimethylbenzene (1,2,4-TMB), and 1,3,5-TMB concentrations were present above DEQ-7 Standards or EPA RSLs at one or more of the Monitoring Well 4-MW3A and 4-MW5 samples collected over the last two years. However, trends of these VOCs have been stable over the last five years and consistent with historical concentrations.
- Both C5-C8 aliphatics and C9-C10 aromatics were present above Tier 1 RBSLs in Monitoring Well 4-MW5 in October 2021. Well 4-MW5 was not sampled in April 2022 due to insufficient water volume. Trends of these COCs are stable over the last five years.
- Concentrations of EPH fractions C9-C18 aliphatics, C11-C22 aromatics, and C19-C36 aliphatics are potentially increasing in Monitoring Well 4-MW5 over the last five years. All other Site 4 wells show stable to decreasing trends of EPHs.
- LNAPL is present at Monitoring Wells 4-MW3A, 4-MW4, and 4-MW5. Each of the three wells are screened from 10 to 30 ft bgs in the perched groundwater zone. Between February 2020 and April 2022, the following observations were made:
  - 4-MW3A: LNAPL detected as a sheen (<0.01 ft) in one of ten events.
  - 4-MW4: LNAPL detected as a sheen (<0.01 ft) in one of ten events.
  - 4-MW5: LNAPL detected in seven of ten events, ranging from a sheen (<0.01 ft) to 0.11 ft thickness.

- Absorbent socks are used within 4-MW5 and periodically changed as a remedial measure.
- To date, no analytical samples have been collected from Monitoring Well 4-MW4 during semiannual LTM events since its installation in September 2017 due to insufficient water volume or the presence of LNAPL. It is likely this well contains elevated concentrations of petroleum-related contaminants due to the presence of LNAPL in the well.
- While there is LNAPL present in the perched groundwater zone at Site 4, LNAPL has not been detected in deep Monitoring Wells 4-MW2 and 4-MW3 (screened 45 to 65 ft bgs) to date, and historical analytical data from these locations are below applicable DEQ-7 standards, EPA RSLs and Tier-1 RBSLs.

ERP Site 4 was added to the long-term groundwater monitoring program during February 2012 (Tetra Tech, 2019). Groundwater sampling and gauging for LNAPL is conducted semiannually to monitor the extent of dissolved-phase hydrocarbons in groundwater beneath the Site. Results of these activities will continue to be reported in semi-annual groundwater monitoring and remedial action progress reports.

### 3.5.2.3 ERP Site 5

The following conclusions are based on the review of the analytical data from soil, soil gas, and groundwater from 1990 through April 2022. Summaries of detected soil analytical results are provided on **Table 3-6** and groundwater analytical results from December 2018 through November 2019 are provided on **Table 3-7**.

#### **Soil**

Concentrations of barium in six soil samples, 437 mg/kg at 5-SB4(3.5'), 678 mg/kg at 5-SB5(4'), 594 mg/kg at 5-SB6(5'), 1,120 mg/kg at 5-SB7(5.5'), 489 mg/kg at 5-SB9(1'), and 517 mg/kg at 5-SB10(5.5'), are greater than the MDEQ RBCA screening level of 421 mg/kg and MDEQ background threshold value of 429 mg/kg. Historic FTA activities at ERP Site 5 are not consistent with typical barium compound sources, which include paints, bricks, ceramics, glass, rubber, rodenticides, lubricating oils, and fireworks. As with ERP Site 4, it is assumed that elevated concentrations of barium are due to the presence of historic fill and not FTA activities. A leaching study conducted at Site 5 determined, conservatively, the minimum length of time it would take barium to leach to groundwater is 75 years, with the most likely scenario being 1,119+ years based on Site conditions (Leidos, 2014a).

#### **Soil Gas**

VI is not considered a risk at ERP Site 5, given that no VOCs, EPHs, or VPHs are present at concentrations greater than screening criteria in either soil or groundwater, and the Site is located in a grass field.

### **Groundwater**

Results of two groundwater sampling events at Monitoring Well 5-MW1 during the SI indicated the presence of TPHs at a concentration of 4,000 µg/L in 5-MW1 during the first sampling event. TPHs were not detected the second sampling event. Following changes to MDEQ RBCA screening levels in 1999, two rounds of confirmation sampling were performed at 5-MW1 in April and July 2000. Neither EPHs nor VPHs were detected in either event (SAIC, 2004c).

A decision document for ERP Site 5 was prepared, recommending no further action (SAIC, 2004c), and Monitoring Well 5-MW1 was abandoned in July 2006.

In 2009, MDEQ requested additional characterization be performed at ERP Site 5 (SAIC, 2006a). Monitoring Wells 5-MW2 and 5-MW3 were installed in October 2010 and sampled three times between October 2010 and May 2011. Petroleum-related hydrocarbons, VOCs, SVOCs, and metals were either not detected or detected below applicable screening criteria in these three events. These wells were added to the overall Site LTM program as gauging points.

A trace (<0.01 ft) amount of LNAPL was detected in both Monitoring Wells 5-MW2 and 5-MW3 during the April 2017, October 2017, and June 2018 LTM events (Tetra Tech, 2019). Prior to these observations, LNAPL had not been observed in either well in semiannual gauging events since installation in October 2010. In addition, LNAPL has not been detected since the June 2018 LTM event.

Samples were collected from both Monitoring Wells 5-MW2 and 5-MW3 in November 2019 and analyzed for VOCs, VPHs, and EPHs (AECOM, 2021). Neither well contained concentrations of VOCs, EPHs, or VPHs greater than applicable DEQ-7 standards, EPA RSLs, or MDEQ Tier 1 RBSLs. Groundwater sampling was discontinued at ERP Site 5 following the November 2019 semiannual sampling event, as sampling results from the November 2019 event confirmed that no contamination above regulatory standards was present and LNAPL had not been detected since June 2018 (AECOM, 2021).

Semi-annual water level and LNAPL gauging are performed as part of the ongoing LTM program. Results of these activities will continue to be reported in semi-annual groundwater monitoring and remedial action progress reports.

#### **3.5.2.4 ERP Site 6**

The following conclusions are based on the review of the analytical data from soil, soil gas, and groundwater from 1990 through April 2022. Summaries of detected soil analytical results are provided on **Table 3-8** and groundwater analytical results from December 2018 through November 2019 are provided on **Tables 3-9, 3-10, 3-11, and 3-12**.

### **Soil**

Converted concentrations of C9-C10 aromatics are present greater than the direct-contact commercial, direct-contact construction, and leaching criteria >20 ft RBSLs of 1,000 mg/kg, 1,000 mg/kg, and 720 mg/kg, respectively, in five subsurface soil samples, 7,300 mg/kg at 6-

DW1(4.1'-4.6'), 1,700 mg/kg at 6-DW1(7.3'-7.6'), 2,600 mg/kg at 6-SB17(0.5'-2.5'), 17,000 mg/kg at 6-SB17(4.5'-5.8'), and 2,900 mg/kg at 6-SB17(9.5'-9.9').

Converted concentrations of C9-C18 aliphatics are present greater than direct-contact commercial and direct-contact construction RBSLs of 540 mg/kg and 900 mg/kg, respectively, in eight soil samples, 2,310 mg/kg at 6-SB3(5.5'), 5,670 mg/kg at 6-SB4(5'), 9,100 mg/kg at 6-SB11(1.3'), 750 mg/kg at 6DW-1(4.1'-4.6'), 1,070 mg/kg at 6DW-1(7.3'-7.6'), 917 mg/kg at 6-SB17(0.5'-2.5'), 6,580 mg/kg at 6-SB17(4.5'-5.8'), and 2,096 mg/kg at 6-SB17(9.5'-9.9').

Converted concentrations of C11-C22 aromatics are present greater than the direct-contact commercial, direct-contact construction, and leaching criteria >20 ft RBSLs of 3,900 mg/kg, 3,900 mg/kg, and 2,000 mg/kg, respectively in two samples, 12,850 mg/kg at 6-DW1(4.1'-4.6') and 5,420 mg/kg at 6-SB17(4.5'-5.8'). C11-C22 aromatics are present above the leaching criteria >20 ft RBSL of 2,000 mg/kg in three samples, 2,430 mg/kg at 6-SB4(5'), 3,900 mg/kg at 6-SB11(1.5'), and 2,294 mg/kg at 6-SB17(9.5'-9.9').

Concentrations of naphthalene are present greater than the revised direct-contact commercial RBSL of 9.5 mg/kg for naphthalene in two samples, 11 mg/kg at 6-DW1(4.1'-4.6'), and 13 mg/kg at 6-SB17(4.5'-5.8').

Concentrations of barium are present greater than the MDEQ RBCA screening level of 421 mg/kg and MDEQ background threshold value of 429 mg/kg in three samples: 464 mg/kg at 6-SB9(1'), 468 mg/kg at 6-SB15(0.5'-2.5') and 444 mg/kg at 6-SB17(0.5'-2.5').

These impacts are primarily located near the location of the former dry well, with Borings 6-SB3, 6-SB4, 6-SB17, and 6-DW1 all located near the former dry well location (**Figure 3-2**). The extent of soil impacts is broadly horizontally delineated, and the dry well was pumped out and removed in July 1996.

All soil samples at ERP Site 6 were collected prior to implementation of any remedial activities (dry well removal, passive LNAPL removal, bioventing/vapor extraction, and injection activities).

### *Sediment*

Converted concentrations of C9-C18 aliphatics at each of the sediment sample locations 6-SED1, 6-SED2, and 6-SED3 were greater than the direct-contact commercial and direct-contact construction RBSLs of 540 mg/kg and 900 mg/kg, respectively. C9-C18 aliphatics were detected at the following converted concentrations: 1,190 mg/kg at 6-SED1, 2,100 mg/kg at 6-SED2, and 1,750 mg/kg at 6-SED3.

Converted concentrations of C11-C22 aromatics in one sample, 4,240 mg/kg at 6-SED1, are greater than the direct-contact commercial, direct-contact construction, and leaching criteria >20 ft RBSLs of 3,900 mg/kg, 3,900 mg/kg, and 2,000 mg/kg.

Cadmium was detected at concentrations ranging from 4.3 to 21 mg/kg in each of the three samples across two sampling events, greater than the current MDEQ RBCA Screening Level for cadmium of 3.8 mg/kg. Lead was detected at a concentration of 529 mg/kg and 758 mg/kg in two events at 6-SED2, greater than the current MDEQ RBCA Screening Level for Lead of 140

mg/kg. Other metals analyzed were not detected at concentrations greater than current screening criteria.

The Preliminary Risk Evaluation (PRE) included in the 1997 RI report indicated that, except for benzo(a)pyrene, detected contaminant concentrations in sediment at ERP Site 6 were less than the PRE criteria. Detected concentrations of benzo(a)pyrene exceeded existing EPA Preliminary Remediation Goals by less than 1.5 times, within the established range of values that do not pose an unacceptable human health risk (HAZWRAP, 1997).

### *Soil Gas*

Building 25, located adjacent to ERP Site 6, was part of a VI investigation conducted in March 2018, which included the collection of both indoor air and sub-slab soil gas samples within the footprint of Building 25. Analytical results indicated that one sub-slab soil gas location exceeded PALs for ethylbenzene and m, p-xylene. This sub-slab location was located beneath the tool crib. The VI investigation concluded that the VI pathway is not impacting human receptors within the building (EA, 2019).

PALs used during the VI investigation were reviewed and compared to current standards. No updates have been made to EPA residential air RSLs, EPA industrial air RSLs, or MDEQ non-smoking residential air standards for the contaminants of potential concern (COPCs) sampled and investigated as part of the VI investigation since the *Final Supplemental Vapor Intrusion Study Technical Memorandum* was finalized. The conclusions and recommendations of the VI investigation remain protective of human health and the environment.

### *Groundwater*

Both 1,1-DCA and cis-1,2-DCE were detected at concentrations greater than either DEQ-7 Standards or EPA RSLs at one monitoring well (6-MW1), over the last two years, with a potentially increasing trend observed since June 2020. Detected VOCs in other Site 6 wells are below applicable criteria and are either stable or decreasing.

VPHs were not detected above Tier-1 RBSLs in ERP Site 6 monitoring wells over the last two years.

Concentrations of EPH fraction C19-C36 aliphatics are potentially increasing in Monitoring Well 6-MW5. While fractions of EPHs have not yet been detected above Tier-1 RBSLs, concentrations of total EPHs are also potentially increasing in Well 6-MW2.

LNAPL was not detected in Site 6 wells in any gauging events between February 2020 and April 2022.

ERP Site 6 was added to the long-term groundwater monitoring program in 2008 (Tetra Tech, 2019). Groundwater sampling and gauging for LNAPL is conducted semiannually to monitor the extent of dissolved-phase hydrocarbons in groundwater beneath the Site. Results of these activities will continue to be reported in semi-annual groundwater monitoring and remedial action progress reports.

### 3.5.2.5 ERP Site 7

The following conclusions are based on the review of the analytical data from soil, soil gas, and groundwater from 1990 through April 2022. Summaries of detected soil analytical results are provided on **Table 3-13** and groundwater analytical results from December 2018 through November 2019 are provided on **Tables 3-14, 3-15, 3-16, and 3-17**.

#### Soil

Converted concentrations of C9-C18 aliphatics are present greater than direct-contact commercial and direct-contact construction RBSLs of 540 mg/kg and 900 mg/kg, respectively, in six subsurface soil samples, 3,300 mg/kg at 7-SB3(3.5'), 9,800 mg/kg at 7-SB3(5.5'), 841 mg/kg at 7-SB5(4.5'-5.4'), 575 mg/kg at 7-SB5(8'-8.6'), 689 mg/kg at 7-SB6(7.2'-8'), and 985 mg/kg at 7-SB7(6'-8.3').

Converted concentrations of C11-C22 aromatics are present greater than the direct-contact commercial, direct-contact construction, and leaching criteria >20 ft RBSLs of 3,900 mg/kg, 3,900 mg/kg, and 2,000 mg/kg, respectively in six samples, 5,700 mg/kg at 7-SB3(3.5'), 4,200 mg/kg at 7-SB3(5.5'), 8,499 mg/kg at 7-SB5(4.5'-5.4'), 4,265 mg/kg at 7-SB5(8'-8.6'), 9,581 mg/kg at 7-SB6(7.2'-8'), and 9,165 mg/kg at 7-SB7(6'-8.3').

Converted concentrations of C9-C10 aromatics are present greater than the direct-contact commercial, direct-contact construction, and leaching criteria >20 ft RBSLs of 1,000 mg/kg, 1,000 mg/kg, and 720 mg/kg, respectively, in four subsurface soil samples, 1,200 mg/kg at 7-SB5(4.5'-5.4'), 760 mg/kg at 7-SB5(8'-8.6'), 960 mg/kg at 7-SB6(7.2'-8'), and 1,700 mg/kg at 7-SB7(6'-8.3').

Concentrations of benzene (2.6 J mg/kg) and 2-methylnaphthalene (42 mg/kg) in 7-SB3(3.5') are greater than the leaching criteria >20 ft RBSLs of 0.33 mg/kg, and 35 mg/kg, respectively. Concentrations of toluene (140 mg/kg) in 7-SB3(5.5') exceed the leaching criteria >20 ft RBSL of 100 mg/kg.

Concentrations of naphthalene are present greater than the revised direct-contact commercial RBSL of 9.5 mg/kg for naphthalene in two samples, 22 mg/kg at 7-SB3(3.5'), and 13 mg/kg at 7-SB3(5.5').

Concentrations of lead are present greater than the MDEQ RBCA screening level of 140 mg/kg in two samples, 443 mg/kg at 7-SB3(3.5') and 167 mg/kg at 7-SB3(5.5').

Concentrations of barium are present greater than the MDEQ RBCA screening level of 421 mg/kg and MDEQ background threshold value of 429 mg/kg in one sample, 729 mg/kg at 7-SB7(8.0-8.3').

The soil analytical results from the POL Area soil investigation in February 2005 and June 2006 indicated that no petroleum hydrocarbons were present at concentrations greater than applicable RBSLs (SAIC, 2007a).

These impacts are primarily near the location of the former dry well, with borings 7-SB3, 7-SB5, and 7-SB7 all located near the former dry well location. However, the extent of soil impacts is not horizontally delineated (**Figure 3-3**).

All soil samples at ERP Site 7 were collected prior to implementation of any remedial activities (dry well removal, passive LNAPL removal, bioventing/vapor extraction, and injection activities). ANG is in the process of conducting additional soil sampling at Site 7 in order to horizontally delineate impacted soil in the area. Results of the soil sampling are documented in the Technical Memorandum Site 7 Soil Investigation Results (AECOM, 2024).

### *Soil Gas*

No permanent, inhabited structures exist near ERP Site 7 and the POL Area. Building 25, located adjacent to ERP Site 6 and south of ERP Site 7, was part of a VI investigation conducted in March 2018, which included the collection of both indoor air and sub-slab soil gas samples within the footprint of Building 25. Analytical results indicated that one sub-slab soil gas location exceeded PALs for ethylbenzene and m, p-xylene. This sub-slab location was located beneath the tool crib. The VI investigation concluded that the VI pathway is not impacting human receptors within the building (EA, 2019).

PALs used during the VI investigation were reviewed and compared to current standards. No updates have been made to EPA residential air RSLs, EPA industrial air RSLs, or MDEQ non-smoking residential air standards for the COPCs sampled and investigated as part of the VI investigation since the Final Supplemental Vapor Intrusion Study Technical Memorandum was finalized. The conclusions and recommendations of the VI investigation remain protective of human health and the environment.

### *Groundwater*

One or more of 1,1,2-TCA, 1,2,4-TMB, benzene, carbon tetrachloride, or TCE were detected at concentrations greater than either DEQ-7 Standards or EPA RSLs at Monitoring Wells 7-MW6, 7-MW12, 7-MW17, 7-MW7, 7-MW28, 7-MW29, and 7-MW35 between October 2020 and April 2022, with trends either stable or decreasing. Detected VOCs in other ERP Site 7 wells are below applicable criteria and are either stable or decreasing.

Between October 2020 and April 2022, VPH fraction C5-C8 aliphatics were detected at concentrations greater than the Tier-1 RBSL of 650 µg/L at Monitoring Wells 7-MW6, 7-MW18, 7-MW19, 7-MW22, 7-MW29, and 7-MW35, and VPH fraction C9-C10 aromatics were detected at concentrations greater than the Tier-1 RBSL of 1,100 µg/L at monitoring wells 7-MW19, 7-MW29 and 7-M35, with trends either stable or decreasing. Detected VPH fractions in other ERP Site 7 wells are below applicable criteria and are either stable or decreasing.

Between October 2020 and April 2022, EPH fraction C9-C18 aliphatics were detected at concentrations greater than the Tier-1 RBSL of 1,400 µg/L at Monitoring Wells 7-MW1, 7-MW12, 7-MW18, 7-MW19, 7-MW22, 7-MW29, and 7-MW35, EPH fraction C19-C36 aliphatics were detected at concentrations greater than the Tier-1 RBSL of 1,000 µg/L at Monitoring Wells 7-MW18, and EPH fraction C11-C22 aromatics were detected at concentrations greater than the Tier-1 RBSL of 1,100 µg/L at Monitoring Wells 7-MW12, 7-MW19, and 7-MW35.

Total EPHs were detected at concentrations greater than the fractionation trigger value of 1,000 µg/L at Monitoring Wells 7-MW1, 7-MW6, 7-MW12, 7-M15, 7-MW18, 7-MW19, 7-MW20, 7-MW22, 7-MW29, 7-MW35, and 7-MW36. EPHs concentration trends are potentially increasing at Monitoring Wells 7-MW1, 7-MW12, 7-MW18, 7-MW20, 7-MW22, 7-MW29, and 7-MW35, while trends at other ERP Site 7 wells are either stable or decreasing.

Between February 2020 and April 2022, LNAPL was observed at five ERP Site 7 Monitoring Wells, 7-MW1, 7-MW19, 7-MW22, 7-MW29, and 7-MW35, which range in depth from 57.5 ft bgs (7-MW19) to 73 ft bgs (7-MW1). Ranges of LNAPL thicknesses are presented below.

- 7-MW1: LNAPL detected as a sheen (<0.01 ft) in 1 of 5 events.
- 7-MW19: LNAPL detected in nine of ten events, decreasing from a thickness of 0.48 ft in February 2020 to a sheen (<0.01 ft) since July 2020. Absorbent socks are used within 7-MW19 and periodically changes as a remedial measure.
- 7-MW22: LNAPL detected in three of four events, ranging in thickness from 0.02 ft to 0.36 ft. Absorbent socks are used within 7-MW22 and periodically changed as a remedial measure.
- 7-MW29: LNAPL detected in four of ten events, ranging in thickness from a sheen (<0.01 ft) to 0.07 ft. Absorbent socks are used within 7-MW29 and periodically changed as a remedial measure.
- 7-MW35: LNAPL detected as a sheen (<0.01 ft) in four of ten events.
- ERP Site 7 was added to the long-term groundwater monitoring program in 2008 (Tetra Tech, 2019). Groundwater sampling and gauging for LNAPL is conducted semiannually to monitor the extent of dissolved-phase hydrocarbons in groundwater beneath the Site. Results of these activities will continue to be reported in groundwater monitoring and remedial action progress reports.

### 3.5.2.6 ERP Site 8

The following conclusions are based on the review of the analytical data from soil, soil gas, and groundwater from 1990 through April 2022. Summaries of detected soil analytical results are provided on **Table 3-18** and groundwater analytical results from December 2018 through November 2019 are provided on **Tables 3-19, 3-20, 3-21, and 3-22**.

### Soil

Converted concentrations of C9-C10 aromatics in only one soil sample, 1,200 mg/kg at Soil Boring 8-SB8(9.5'-10.5'), were greater than the current MDEQ direct-contact commercial, direct-contact construction, and leaching criteria >20 ft RBSLs of 1,000 mg/kg, 1,000 mg/kg, and 720 mg/kg, respectively. 8-SB8 was completed near the location of the former dry well. Due to the depth of the sample interval (9.5 ft to 10.5 ft bgs), this contamination is most likely indicative of contamination in the sandstone bedrock at this location (**Figure 3-4**).

No other soil samples contain concentrations of VOCs, SVOCs, EPHs, VPHs, or metals detected greater than applicable screening criteria.

### *Soil Gas*

Buildings 30 and 32, located adjacent to ERP Site 8, were part of a VI investigation conducted in January 2017 which included the collection of both indoor air and sub-slab soil gas samples within the footprints of both buildings (EA, 2017). Follow up work was completed in Building 30 in March 2018. Building 32 was removed from further evaluation during the second mobilization due to a pending demolition. The building was removed in June 2018. The VI investigation at Building 30 concluded that the VI pathway is not impacting human receptors within the building (EA, 2019). PALs used during the VI investigation were reviewed and compared to current standards. No updates have been made to EPA residential air RSLs, EPA industrial air RSLs, or MDEQ non-smoking residential air standards for the COPCs sampled and investigated as part of the VI investigation since the Final Supplemental Vapor Intrusion Study Technical Memorandum was finalized. The conclusions and recommendations of the VI investigation remain protective of human health and the environment.

### *Groundwater*

One or more of TCE, cis-1,2-DCE, and vinyl chloride (VC) were detected at concentrations greater than applicable standards at Monitoring Wells 8-MW1, 8-MW2, 8-MW3, 8-MW4, 8-MW7, 8-MW8, 8-MW13, and 8-MW14 between October 2020 and April 2022. Concentration trends are either stable or decreasing in all wells, except for 8-MW3, where concentrations of TCE, cis-1,2-DCE, and VC are potentially increasing over the last two years. Other detected VOCs in Site 8 wells are below applicable criteria and are either stable or decreasing.

LNAPL has not been detected in ERP Site 8 wells over the last three years.

The preferred remedial alternative for the ERP Sites 4, 5, 6, 7, and 8 are applicable to their respective Sites based on the findings of the Human Health and Ecological Risk Assessments presented in **Sections 6.1.1 and 6.1.2**, respectively, as well as the historical results as outlined in **Section 3.5**. The final long-term remedy for Sites 4, 6, 7 and 8 will encompass LUCs for groundwater and/or soil, MNA, and periodic LTM in order to be protective of human health and the environment. Site 5 does not exceed any regulatory criteria and is proposed for NFA. Remedial alternatives were not developed for Inactive ERP Sites 2 and 3 as these Sites warranted closure by MDEQ with conditions, based on remedial actions completed. The conditions set forth in MDEQ's closure letters remain protective and thus these sites remain closed. ANG seeks only to complete the PP/ROD process and obtain the required ANG approval for Sites 2 and 3. Site 1 has been re-opened due to offsite contamination migration concerns.

Site 1 groundwater has been informally investigated using fence line monitoring wells, and sampling of the influent at Property 1 and an outside drinking water faucet at Property 2. Also, a supplemental remedial investigation project is planned for award in FY 2024. Preliminary groundwater data collected at Site 1 indicates earlier remedial actions were effective and that groundwater contamination is below all DEQ -7 listed contaminants. All data collected at the Site will be included in the supplemental remedial investigation report when it is prepared. A cumulative human health risk assessment addressing all contaminants in groundwater will be included in the upcoming PFAS RI report in accordance with proper guidance from EPA, USAF, the Office of the Secretary of Defense (OSD). A separate PP and ROD will be developed for Site 1 at the appropriate time.

Note: Offsite groundwater is used as a drinking water source. However, perfluorinated compounds are the contaminant of concerns and an interim removal action has been implemented where required and the impacted residents have been placed on an operation and maintenance program for the ANG installed point of entry treatment system and/or sampling program.

## 5.1 LAND USES

The Great Falls International Airport is an industrial site that is dominated by buildings, mowed landscapes, and paved surfaces. Great Falls International Airport is bordered on the west by agricultural land and on the north and northwest by agricultural and sparse residential areas. The area south of the airport is designated industrial and commercial, and an open area southwest of the airport is used for active outdoor recreation (SAIC, 2006d). Two residences exist approximately 2,000 ft downgradient of the northwestern property boundary.

## 5.2 GROUNDWATER AND SURFACE WATER USES

The water supply for the MANGB Great Falls is provided by the Great Falls Department of Public Works. A recent survey indicated that there are two potable wells (Property 1 and Property 2) located within 1 mile of the Site (Wood 2021). Based on preliminary data collected at FT001 for legacy contaminants, the fence line wells and drinking water wells indicate that legacy (i.e. non-PFAS) contaminants have not impacted the two down gradient off-site drinking water wells.

Based on a PFAS exceedance at Property 1, a POET system has been installed. This system will also provide treatment of legacy contaminants at Property 1. Property 2 has preliminary results which the drinking water well is not impacted by legacy contamination. As previously mentioned, a Supplemental PFAS RI is planned for FY24 and will verify the preliminary results that drinking water is not impacted by legacy contaminants.

No natural or significant surface water bodies, navigable waterways, or wetlands are present at MANGB Great Falls. Seasonal surface water may appear in the drainage ditch associated with Stormwater Outfall 001 depending on precipitation events (HMTTC, 1988). Surface water flow is dictated by the Base's man-made surface drainage system. Stormwater is captured by drainage ditches located throughout the property and directed southwest off-Base (Leidos, 2018). The confluence of the Sun River and Missouri River is approximately 2 miles northeast of the Base (Leidos, 2019).

## 6.1 HUMAN HEALTH AND SCREENING LEVEL ECOLOGICAL RISK ASSESSMENTS

The following sections provide a summary of ecologic screening level assessment and the human health risk assessment (HHRA) conducted for the active ERP Sites except for Site 1. The complete ecological risk assessment and HHRA are provided in **Appendix B** and include the screening of surface soil (0 to 2 ft bgs), sub-surface soils (>2 ft bgs), and sediment for hypothetical future resident and commercial/industrial worker scenarios.

## 6.2 ECOLOGIC SCREENING LEVEL ASSESSMENT

The preliminary ecological risk evaluation for all sites is provided in **Section 4.3** of the 1992 SI Report (ES, 1992a). Additional discussion of ecological risks are provided in several subsequent documents, including **Section 8.3** of the Final Remedial Investigation Report, **Section 3.3** of the Final Decision Document Site 3 – North Disposal and Fire Training Pit, **Section 3.2** of the Final Decision Document Site 2 – Drainage Ditch Off Old Power Check Pad, **Section 3.2** of the Final Decision Document Site 4 – Former Fire Training Area 1, **Section 3.2** of the Final Decision Document Site 5 – Former Fire Training Area 2, and **Section 8** of the Final Phase II Remedial Investigation Report (HAZWRAP, 1997; SAIC, 2000a, 2004a, 2004b, 2004c, 2006c).

The ecological screening assessment concluded that given the location of the Sites within the Great Falls International Airport, an industrial site that is dominated by buildings, mowed landscapes, and paved surfaces, no sensitive ecological habitats were identified either within the facility or the immediate vicinity of the facility.

The ecologic assessments concluded that:

- There were no sensitive ecological receptors identified for soil.
- No sediment dwelling ecological receptors were assumed to be present within drainage ditches.
- No ecological receptors were identified for groundwater discharging into surface water.

## 6.3 HEALTH SCREENING ASSESSMENT

The objective of this HHRA is to provide a screening level evaluation of soil and sediment data and recent (October 2020 through April 2022) groundwater monitoring data to evaluate whether there is a potentially unacceptable risk/hazard to current and potential future human receptors for soil/sediment, groundwater and vapors.

### 6.3.1 Summary of Human Health Risk Assessment

The risk assessment includes a screening level HHRA, conducted in accordance with EPA risk assessment guidance. The HHRA includes a qualitative pathway evaluation of current and potential future ecological receptors.

Current/future Commercial/Industrial Worker

Exposure to site soil via direct contact (incidental ingestion, dermal contact, and inhalation of particulates/volatiles). Under a current scenario, exposure was considered potentially complete for surface soil (0 to 2 ft bgs) only. However, the potential for future redevelopment of the Base may result in deeper soils being brought to the surface. Thus, under a future scenario, commercial/industrial workers may be exposed to subsurface soil (greater than [ $>$ ] 2 ft bgs).

Exposure to sediment in the concrete-lined drainage ditch via direct contact (incidental ingestion, and dermal contact). Sediments present in the drainage ditch periodically dry out; thus, inhalation of particulates/volatiles was a potentially complete exposure pathway.

Potential On-site Resident

Exposure to soil via direct contact (incidental ingestion, dermal contact, and inhalation of particulates/volatiles) within surface soils (0 to 2 ft bgs) and subsurface soils ( $>$  2 ft bgs).

Exposure to sediment in the concrete-lined drainage ditch via direct contact (incidental ingestion and dermal contact). Sediments in the drainage ditch may periodically dry out; thus, inhalation of particulates is a potentially complete exposure pathway.

Exposure to site groundwater via direct contact (ingestion, dermal contact, and inhalation of vapors) if the Base is redeveloped.

Current/future Construction Worker

Exposure to site soil via direct contact (incidental ingestion, dermal contact, and inhalation of particulates/volatiles) with surface (0 to 2 ft bgs) and subsurface soils ( $>$  2 ft bgs).

Exposure to site sediment in the concrete-lined drainage ditch via direct contact (incidental ingestion and dermal contact). Sediments present in the drainage ditch periodically dry out; thus, inhalation of particulates/volatiles is a potentially complete exposure pathway.

Groundwater

Under current and anticipated future Site use conditions, ingestion, dermal contact, and inhalation of volatiles present in on-site groundwater (as drinking water) are incomplete exposure pathways due to the depth of groundwater and the fact that on-site groundwater is not currently used as a drinking water source, nor is it anticipated to be in the future. However, two private drinking water wells were identified approximately 2,000 ft downgradient of the northwestern property boundary near Site 1, where groundwater is used as drinking water. One well was located on an inhabited property, and the other was located on a periodically leased property. Samples from these wells indicated the presence of PFAS at concentrations greater than DoD screening levels in the well at the inhabited property. To mitigate against potential PFAS exposure, the NGB installed POET system at this property in 2021. Provisions are in place to install a POET system at the periodically leased, should it become inhabited and the PFAS concentrations exceed the are the DoD screening levels or a newly promulgated standard accepted by the OSD. Preliminary fence line well groundwater data collected from perimeter

monitoring wells as well as groundwater data collected at the influent of Property 1 and a hose bib at Property 2 indicate that legacy contaminants have not migrated offsite or are no longer present. Preliminary groundwater data indicates that NFA is warranted at Site 1. A supplemental RI is planned in FY 2024 to verify preliminary findings pertaining to offsite migration of legacy contamination. Any additional future activities will meet applicable or relevant and appropriate requirements (ARARs).

A hypothetical future on-site residential (unrestricted use) scenario, including use of groundwater as a source of drinking water or other potable use, was evaluated in this screening level HHRA to inform risk management decisions. Depth to groundwater is approximately 57 ft bgs; thus, direct contact with potential receptors (construction worker in an excavation trench) is an incomplete exposure pathway. A shallow perched groundwater bearing zone of limited extent is present at Site 4. Wells completed in the shallow perched groundwater are at depths ranging from 28.8 to 30.5 ft bgs.

#### Soil Vapor

A VI evaluation was conducted during 2017 and found no potential unacceptable human health risks associated with soil and groundwater vapors migrating into indoor air for current commercial/industrial workers in the vicinity of the active ERP Sites. Therefore, the VI pathway was not assessed in this HHRA. PALs used during the VI investigation were reviewed and compared to current standards. No updates have been made to EPA residential air RSLs, EPA industrial air RSLs, or MDEQ non-smoking residential air standards for the COPCs sampled and investigated as part of the VI investigation since the Final Supplemental Vapor Intrusion Study Technical Memorandum was finalized (EA, 2019). The conclusions and recommendations of the VI investigation remain protective of human health and the environment.

#### Soil

The results of the screening level HHRA identified TPHs as the primary risk driver in surface and subsurface soils and sediments. TPHs data were available as whole product (gasoline, diesel, etc.) and bulk TPHs. Screening and potential cumulative risks and hazards were evaluated using surrogates for aged petroleum mixtures in agreement with MDEQ guidance (MDEQ, 2018a, 2020).

Estimated potential risks/hazards associated with exposure to COPCs in site media exceeds USEPA's target risk range and/or target HI level, respectively, for a current/future commercial worker scenario at Site 6 (subsurface soil). No potential unacceptable risks/hazards were identified for Site 4 (surface and subsurface soil), Site 5 (surface and subsurface soil), Site 6 (surface soil and sediment), Site 7 (surface and subsurface soil), and Site 8 (surface and subsurface soil).

The screening level HHRA results indicate the estimated potential risks/hazards associated with exposure to COPCs in site media exceeds USEPA's target risk range and/or target HI level, respectively, for a hypothetical future residential scenario at Site 6 (surface and subsurface soil), Site 7 (subsurface soil), and Site 8 (subsurface soil).

#### Summary

The findings of the HHRA will be used to develop and or optimize remedies for the ERP Sites as follows:

- No sensitive ecological habitats were identified within the facility or the immediate vicinity. Even if the pavements/buildings were removed or not maintained, quality habitat would not exist at the Sites.
- Under current and anticipated future Site use conditions, ingestion, dermal contact, and inhalation of volatiles present in on-site groundwater (as drinking water) are incomplete exposure pathways due to the depth of groundwater and the fact that groundwater is not currently used as an on-site drinking water source, nor is it anticipated to be in the future.
- Two private drinking water wells were identified approximately 2,000 ft downgradient of the northwestern property boundary near Site 1, where groundwater is used as drinking water. One well was located on an inhabited property, and the other was located on a vacant property. Samples from these wells indicated the presence of PFAS at concentrations greater than DoD screening levels in the well at the inhabited property, a property which is periodically leased. To mitigate against potential PFAS exposure the installation installed a POET system at this property in 2021. Provisions are in place to install a POET system at the periodically leased property, should it become inhabited and the PFAS concentrations exceed concentrations greater than the DoD screening levels for PFAS or greater than the current health advisory levels or a newly promulgated standard accepted by the OSD. Preliminary fence line well groundwater data collected from perimeter monitoring wells as well as groundwater data collected at the influent of Property 1 and a drinking water well faucet at Property 2 indicate that legacy contaminants have not migrated offsite or are no longer present. Preliminary groundwater data indicates that NFA is warranted at Site 1. A supplemental RI is planned in FY24 to verify preliminary finding pertaining to offsite migration of legacy contamination.
- The VI pathway was not assessed in the HHRA, but a vapor intrusion evaluation conducted in 2017 found no potential unacceptable human health risks associated with groundwater vapors migrating into indoor air for current commercial/industrial workers in the vicinity of the active Sites. The only changes in EPA Industrial Air RSLs or MDEQ non-smoking residential air standards for the COPCs sampled and investigated as part of the VI investigation since the Final Supplemental Vapor Intrusion Study Technical Memorandum (EA, 2019) was finalized included the establishment of an Industrial Air RSL of 18 for both cis-1,2-dichloroethylene and trans-1,2-dichloroethylene. According to **Tables 4-2b and 4-3b** of the 2017 Final Vapor Intrusion Technical Memorandum and **Tables 6a and 6b** of the 2019 Final Supplemental Vapor Intrusion Study Technical Memorandum, the highest detected concentration of cis-1,2-dichloroethylene was an estimated 0.92  $\mu\text{g}/\text{m}^3$ , and the highest detected concentration of trans-1, 2-dichloroethylene was 2.9  $\mu\text{g}/\text{m}^3$ , less than the current EPA Industrial Air RSL of 18  $\mu\text{g}/\text{m}^3$ . Therefore, the conclusions and recommendations of the VI investigation remain protective of human health and the environment.

- The results of the screening level HHRA identified TPHs as the primary risk driver in surface and subsurface soils and sediments.
- Estimated potential risks/hazards associated with exposure to COPCs in site media exceeds USEPA's target risk range and/or target HI level, respectively, for a current/future commercial worker scenario at Site 6 (subsurface soil) and Site 7 subsurface soil (based on recent sample results). No potential unacceptable risks/hazards were identified for Site 4 (surface and subsurface soil), Site 5 (surface and subsurface soil), Site 6 (surface soil and sediment), Site 7 (surface soil), and Site 8 (surface and subsurface soil).
- The screening level HHRA results indicate the estimated potential risks/hazards associated with exposure to COPCs in site media exceeds USEPA's target risk range and/or target HI level, respectively, for a potential residential scenario at Site 6 (surface and subsurface soil), Site 7 (subsurface soil), and Site 8 (subsurface soil).
- A cumulative human health risk assessment addressing all contaminants (both legacy contaminants and PFAS) in groundwater will be included in the upcoming PFAS RI report in accordance with proper guidance from EPA, (USAF, and the OSD).

## 7.1 REMEDIAL ACTION OBJECTIVE AND REMEDIATION GOALS

The Code of Federal Regulations (CFR) in Title 40, Section 300.430(e)(2)(i) specifies that Remedial Action Objectives (RAOs) be developed to address; (1) COCs, (2) media of concern, (3) potential exposure pathways, and (4) preliminary remediation levels. RAOs are defined to determine the effectiveness of the remedial actions.

The primary RAOs for groundwater and soil at the ERP Sites are provided in the sections below. ERP Site 5 is not included as soil and groundwater contamination currently present at the Site do not exceed regulatory standards.

### 7.1.1 Soil RAOs

The following are RAOs for soil contamination at active ERP Sites 4, 6, 7 and 8.

- Provide final long-term remedial alternative for soil that is protective of human health and the environment and exposure to contaminants of concern in subsurface soils the primary risk driver in surface and subsurface soils and sediments.
- The soil RAO is applicable to active ERP Sites 4, 6, 7, and 8. Contaminants identified in soil include petroleum and petroleum-related compounds for Sites 1, 4, 6, 7, and 8.

### 7.1.2 Groundwater

The following are RAOs for groundwater contamination at ERP Sites 4, 6, 7 and 8.

- Provide final long-term remedial alternative for groundwater that is protective of human health and the environment and prevents migration of COCs in subsurface groundwater from other Sites.
- This remedial action objective is applicable to active ERP Sites 4, 6, 7, and 8. Contaminants identified in groundwater include petroleum and petroleum-related compounds for Sites 4, 6, and 7 and CVOCs for Site 8. Even though these Sites were not carried forward in the HHRA, contaminants at these Sites exceed regulatory standards and will be required by MDEQ to be monitored going forward. A RI will be conducted at Site 1 in FY 2024 which will include all data collected at the Site. A cumulative human health risk assessment addressing all contaminants in groundwater will be included in the upcoming PFAS RI report in accordance with proper guidance from EPA, USAF, the OSD.

## 8.1 DETAILED ANALYSIS OF ALTERNATIVES

This section summarizes the Focused Feasibility Study that was completed for soil and groundwater at ERP Sites 4, 6, 7, and 8. Remedial options were limited for soils and groundwater due to the presence of shallow fractured bedrock (3 to 55 ft bgs) across the site which prevents the effective remediation of the vadose zone between the top of bedrock and the top of groundwater. To the extent practicable and pending the effectiveness of current remedies, ANG will consider remediating LNAPL using various technologies, including MPE, passive absorption, and in-situ chemical oxidation, as appropriate. The final long-term remedy will encompass LUCs, MNA, and periodic LTM. A detailed discussion of the Focused Feasibility Study can be found in Final Supplemental Remedial Investigation/Focused Feasibility Study Sites 4, 5, 6, 7, and 8 Report (AECOM 2023).

No alternatives were developed for inactive Sites 2 and 3. Since Sites 2 and 3 previously warranted closures with conditions, and the conditions for closure remain protective, these sites are included in this section for completeness. No additional actions are planned at Sites 2 and 3 unless the conditions cited in the MDEQ's closure letters are no longer protective.

Site 1 will be addressed separately in the future based on the results of the Supplemental Remedial Investigation.

Technologies applicable to the ERP Sites were evaluated to identify the most viable alternatives for the remediation of impacted soil. **Table 8-1** discusses a summary of the technology screening process for the remedial alternatives for soil and groundwater at ERP Sites 4, 6, 7, and 8. ERP Site 5 was not carried forward, as no compounds were identified in groundwater in excess of screening levels. In addition, only barium at one location was detected in soils. This Site has previously been recommended for NFA. Based on the assessment, five remedial alternatives were identified for the ERP Sites.

## 8.2 DEVELOPMENT OF REMEDIAL ALTERNATIVES

The purpose of this section is to develop remedial alternatives for the ERP Sites by combining the viable remedial technologies listed in **Table 8-1**. The objective of alternatives development is to provide an appropriate range of remedial alternatives and sufficient information with which to adequately analyze and compare them to one another. In accordance with the NCP requirements, no action is retained as an alternative. Further, in accordance with USAF guidance, a LUC alternative was also retained.

Based on this assessment, five remedial alternatives were identified for the ERP Sites and are discussed in the following sections.

### 8.2.1 No Action (Alternative 1)

The no action alternative is evaluated to satisfy the NCP requirement as a baseline against which other alternatives may be compared. Under this alternative the existing monitoring wells would be sealed, treatment systems would be decommissioned and removed from the ERP

Sites and no future LTM would be conducted. In addition, no LUCs would be put in place that would limit activities or future uses of the Sites.

### 8.2.2 Land Use Control (Alternative 2)

The LUC alternative evaluated assumes that LUCs are put in place to restrict ERP Site activities and future use. The ANG is not the property owner and leases the property from the Great Falls International Airport. The ANG would have to partner with the Airport and both entities would have to approve of the LUCs and their implementation.

The LUCs considered for ERP Sites include:

- Subsurface excavation would be prohibited in the specific area defined under the LUC. Exceptions would require approval and oversight by ANG and/or Great Falls International Airport.
- Extraction of groundwater prohibited for all uses.
- Future residential use of the property prohibited.
- At Sites 6 and 7 where soil contamination above DEQ RBSLs remediation has taken place, additional soil confirmation sampling may be considered to determine if soil based LUCs are still required based on contamination remaining at the Sites. It is anticipated that this sampling will take place every 10 years for a period of 30 years starting in 2034.
- LUCs may be combined with interim remedial actions and/or LTM/MNA (Alternative 3).

### 8.2.3 Long-term Monitoring/MNA (Alternative 3)

LTM/MNA is used to determine if the nature and extent of a contaminant groundwater plume is stable and/or decreasing. Natural physical, chemical, and/or biological processes reduce the mass, toxicity, mobility, volume, and concentration of contaminants without human intervention allowing for RAOs to be met over time as contaminant concentrations decrease. These natural processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization or destruction of contaminants. The LTM program requires that a list of COCs be monitored at fixed monitoring well locations. A periodic schedule is established for sample collection and reporting. The LTM program should be flexible over the life of the program to compensate for changes observed to ERP Site conditions and may require the installation of additional monitoring points. No LTM is considered in this LTM/MNA alternative for media other than groundwater.

LTM has been on-going at the ERP Sites 6 and 7 since 2008 and ERP Sites 4, 5 and 8 since 2013. The LTM program has included MNA parameters to assess the aquifer characteristics relative to the natural attenuation processes. The LTM program has shown that the groundwater plumes are generally stable and generally decreasing; however, contaminant concentrations remain above the MDEQ cleanup standards.

### 8.2.4 In-situ Treatment (Alternative 4)

The main advantage of in-situ treatment is that groundwater can be treated without being brought to the surface, resulting in significant cost savings. However, in-situ treatment generally requires longer time periods and there is less certainty about the uniformity of treatment because of the variability in aquifer characteristics. In-situ treatments can generally be broken into two types; biological and physical/chemical. Physical/chemical in-situ treatment are not being considered in this alternative.

Biological in-situ techniques are destruction techniques directed toward stimulating the microorganisms to grow and use the contaminants as a food and energy source by creating a favorable environment for the microorganisms. Generally, this means providing some combination of oxygen and/or nutrients. Although not all organic compounds are amenable to biodegradation, bioremediation techniques have been successfully used to remediate groundwater contaminated by petroleum hydrocarbons, solvents, and other organic chemicals (FRTR, 2020).

Several in-situ treatment technologies have been employed at the ERP Sites as IRAs since no RODs have been finalized for the facility. A summary of the of the in-situ treatment technologies are provided in the following sections for hydrocarbon and chlorinated solvent impacts. Currently, no in-situ treatment is on-going at the Sites.

#### 8.2.4.1 *Enhanced Bioremediation with EVO (carbon substrate) or Magnesium Sulfate (Alternative 4a)*

Both magnesium sulfate and emulsified vegetable oil (EVO) have been used at the ERP Sites to enhance the biodegradation of COCs at various Sites. Magnesium sulfate was used at ERP Sites 4, 6 and 7 to enhance the anaerobic degradation of petroleum hydrocarbon compounds. Anaerobic degradation is the dominant driving force in natural attenuation of petroleum contamination in the subsurface. Magnesium sulfate enhances natural processes to speed the rate of degradation would by providing alternative electron acceptors to speed anaerobic degradation of petroleum compounds.

EVO injections have been used at Site 8. EVO is primarily used to treat chlorinated hydrocarbons by produce reducing conditions that will facilitate the reductive dechlorination process by creating the conditions necessary for the microbes that reduce TCE to its daughter products to thrive. These conditions are generated by the addition of organic carbon into the aquifer in the form of EVO. The natural order in which the electron acceptors are used up in the microbial process is as follows dissolved oxygen (DO) ► Nitrate ► Ferric Iron ► Sulfate ► Carbon Dioxide. After sulfate is reduced the chlorinated solvents are then reduced producing daughter products including methane, ethane and ethene. Sufficient carbon must be added to the aquifer to create the strongly reducing conditions needed to drive the reduction of TCE through its end phase daughter products.

## 8.2.5 LNAPL Recovery (Alternative 5)

### 8.2.5.1 Surfactant flushing (Alternative 5a)

Surfactant flushing is a LNAPL-removal technology involving the injection and subsequent extraction of chemicals to mobilize LNAPL in the formation. The surfactant chemicals are generally injected into a system of wells positioned with the LNAPL source area within the aquifer. The surfactant solubilizes/mobilizes the LNAPL which is then extracted from the same wells the injections were conducted.

A surfactant flushing event was completed at ERP Sites 6 and 7 during the period of May 30 through June 1, 2013 (Leidos, 2014a).

### 8.2.5.2 Passive In-Well Collection (Alternative 5b)

Passive in-well collection systems include skimmers absorbent socks. These methods are effective at removing mobile product with the radius of influence (ROI). Since significant product is typically immobile and the ROI is limited since passive collection systems create minimal draw down, the systems have very limited area of influence. Therefore, these methods generally are not very effective to recover significant LNAPL, but these technologies may be appropriate when dictated by local regulations, aesthetic concerns, or emergency response actions (ITRC, 2009).

Absorbent socks have also been used at several wells where LNAPL has been observed. Typically, absorbent socks are used in association with a monitoring program where they can be inspected on a periodic basis and changed out as required. The socks remove minimal product but are an indicator of the presence or absence of product and may remove adequate product to allow for sampling of dissolved phase constituents in the aquifer.

### 8.2.5.3 Natural Source Zone Depletion (Alternative 5c)

Natural source zone depletion (NSZD) is a combination of natural processes that reduce the mass of LNAPL in the subsurface. These processes include dissolution of LNAPL constituents into groundwater and volatilization of LNAPL constituents into the vadose zone. In turn, LNAPL constituents dissolved to groundwater and volatilized to the vadose zone can be biodegraded by microbial and/or enzymatic activity. The rates of biodegradation are dependent on the type and availability of electron acceptors (oxygen, nitrate, sulfate, ferrous iron, manganese, and methane) in the subsurface soils and groundwater.

In general, increases in dissolved-phase hydrocarbon concentrations between up- and downgradient monitoring wells are evidence that dissolution is occurring. Decreases in dissolved oxygen, nitrate, sulfate and increases in ferrous iron, manganese between up and downgradient wells are evidence that biodegradation is occurring.

### 8.3 DETAILED ANALYSIS OF ALTERNATIVES

This section describes the detailed analysis of alternatives based on the nine CERCLA evaluation criteria.

#### 8.3.1 Description of Evaluation Criteria

The nine CERCLA evaluation criteria are categorized in NCP [40 CFR Section 300.430(e)(9)(iii)] as follows:

- **Threshold Criteria** are requirements that each alternative must meet to be eligible for selection as the preferred alternative. There is little flexibility in meeting the threshold criteria, e.g., the alternative must meet the criteria, or it is unacceptable. The two threshold criteria are:
  - **Overall Protection of Human Health and the Environment** – This criterion assesses whether each alternative provides adequate protection of human health and the environment and relies on evaluation of the other criteria, especially long-term effectiveness and permanence, short-term effectiveness and compliance with ARARs.
  - **Compliance with ARARs** – This criterion will be used to determine whether each alternative will meet the identified ARARs.
- **Balancing Criteria** are used to weigh the tradeoffs among alternatives. They are the main technical criteria used in the detailed evaluation and comparative analysis of the alternatives. The balancing criteria are defined as follows:
  - **Short-Term Impacts and Effectiveness** – This criterion will evaluate the effects that the alternative will have on human health and the environment during its construction and implementation phase.
  - **Long-Term Effectiveness and Permanence** – This criterion will evaluate the results of the remedial action in terms of the risk remaining at the Site after response objectives have been met.
  - **Reduction of Toxicity, Mobility, or Volume** – This criterion addresses the regulatory preference for selecting removal or remedial actions that employ treatment technologies permanently and significantly reducing the toxicity, mobility, or volume of the contaminants.
- **Implementability** – This criterion evaluates the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required to construct and provide O&M.
- **Cost** – Each alternative will have a detailed cost estimate prepared. The estimate will include estimates of capital and O&M costs. Costs developed as part of the PP are expected to provide an accuracy of +/- 30 percent.

**Modifying Criteria** consist of State/Agency acceptance and community acceptance and will be completed after the Proposed Plan and public comment period on the plan in the DD.

ARARS were identified in the Final Supplemental Remedial Investigation/Focused Feasibility Study Sites 4, 5, 6, 7 and 8 Report (AECOM, 2023). All Specific ARARS will be listed in the ROD.

### **8.3.2 Individual Analysis of Alternatives**

#### **8.3.2.1 No Action (Alternative 1 – All Sites)**

Under this alternative, the existing monitoring wells would be abandoned and no future LTM would be conducted. In addition, no LUCs would be put in place that would limit activities or future uses of the ERP Sites.

#### ***Overall Protection of Human Health and the Environment***

Since the contaminants are in the subsurface and there are no production wells identified within 1,500 ft of any of the ERP Sites and the plumes are naturally attenuating, there is not a complete pathway for exposure to the contaminants for the current use of the Sites. However, since there would be no restrictions on Site use, subsurface excavation and/or future development of impacted aquifers as a groundwater resource could result in an exposure pathway and would be unprotective of human health. Exposure to volatilized contaminants could occur but a VI assessment, published in 2019, concluded there were no immediate threats to human receptors from the VI pathway (EA, 2019).

Unsealed monitoring wells are not protective of the environment and represent a pathway for contaminants to enter the subsurface from surface spills and for cross contamination between stratigraphic units. Thus, the monitoring wells would be sealed once they are no longer required for monitoring purposes.

#### ***Compliance with Applicable or Relevant and Appropriate Requirements***

A no action alternative would not comply with ARARs since screening levels are exceeded in soil and groundwater.

#### ***Long-Term Effectiveness and Permanence***

The long-term effectiveness and permanence are unknown. Since no LUCs are in place, use of the facility could change and there could be higher potential for exposure to subsurface contamination. Reduction of contaminants from natural process will occur over time, but residual impacts over clean-up standards will exist long-term.

#### ***Reduction of Toxicity, Mobility, or Volume through Treatment***

The no action alternative includes no treatment actions that would reduce the mobility or volume of contaminants at the ERP Sites. Natural processes will result in the reduction of toxicity, mobility, and volume through attenuation and biodegradation of the organic compounds.

However, the compounds are considered stable and the significant transfer to other media on- or off-site is not anticipated.

### ***Short-Term Effectiveness***

Since no changes in operations at the ERP Sites are anticipated, the no action alternative is effective in the short-term, assuming no significant subsurface disturbances or development of groundwater resources.

### ***Implementability***

No action would result in no technical feasibility issues. However, its administrative feasibility is considered low since ARARs are not met.

### ***Costs***

The only costs associated with this alternative include the sealing of all monitoring wells and injection wells on ERP Sites. During 2022 there were 132 injection and monitoring wells associated with the Sites at the facility with depths ranging from approximately 15 to 93 ft bgs (AECOM, 2023).

#### ***8.3.2.2 Land Use Controls (Alternate 2 - All Sites)***

Under this alternative, the existing monitoring wells, injection wells and extraction wells would be abandoned, unless they are being used for ongoing groundwater monitoring. LUCs would be put in place that would limit activities or future uses of the ERP Sites. LUCs would likely include restrictions on subsurface excavation and/or future development of impacted aquifers, as a groundwater resource could result in an exposure pathway and would be unprotective of human health. At Sites where significant soil remediation has taken place, additional soil confirmation sampling may be considered to determine if soil based LUCs are still required based on contamination remaining at the Sites. It is anticipated that this sampling will take place every 10 years for a period of 30 years starting in 2034. In the event where COC concentrations are below regulatory criteria for the future land use scenario, no further action will be pursued for soils at that Site and no restrictions would be placed upon the soils.

### ***Overall Protection of Human Health and the Environment***

Since impacts that present a potential human health risk are limited to the subsurface and the extent of impacts are generally known for all ERP Sites, LUCs to prevent an exposure pathway to humans provides a high level of protection to human health assuming the controls are properly implemented.

### ***Compliance with Applicable or Relevant and Appropriate Requirements***

The LUC alternative would comply with ARARs and has been utilized at other ERP Sites at MANGB Great Falls.

***Long-Term Effectiveness and Permanence***

The LUC alternative would provide long-term effectiveness and permanence as long as the LUCs remain in effect. For purposes of this PP, a 30-year period is assumed.

***Reduction of Toxicity, Mobility, or Volume through Treatment***

The LUCs alternative includes no treatment actions that would reduce the mobility or volume of contaminants at the ERP Sites. Natural processes will result in the reduction of toxicity, mobility and volume through attenuation and biodegradation of the organic compounds.

***Short-Term Effectiveness***

The LUC alternative is effective in the short-term. The controls would limit human exposure and no current threats to the environment or human health have been observed.

***Implementability***

The LUC alternative would result in no technical feasibility issues. However, its administrative feasibility is considered moderate since the ANG is not the property owner and an agreement with the Great Falls International Airport would be required. The ANG has the infrastructure in-place to implement and over-see the LUCs.

***Costs***

The costs to implement the LUCs alternative are considered low. Most of the costs are up-front costs to put the LUCs in place and abandon any unused subsurface infrastructure. Since no O&M activities are anticipated, aside from annual ERP Site inspections (e.g., periodic inspections of barriers such as fencing) and CERCLA required Five Year reviews, long-term costs are minimal. If LUCs were implemented with LTM/MNA, all monitoring and injection wells not being used to monitor groundwater would be sealed. During 2017, there were 132 injection and monitoring wells associated with the ERP Sites at the facility with depths ranging from approximately 15 to 93 ft bgs (MANG, 2017).

***8.3.2.3 Long-Term Monitoring/Monitored Natural Attenuation (Alternative 3 – All Sites)***

Under this alternative, the existing monitoring wells, and possibly new wells, would be chosen for long-term monitoring and MNA to show that organic groundwater contaminants are attenuating (chemically and/or biologically) due to natural causes and that the groundwater plumes are stable (e.g., not expanding in vertical or horizontal extent). Wells not part of the LTM/MNA program would be abandoned. It is proposed that semi-annual monitoring be conducted through spring of 2024 and annual sampling through 2029 when the first CERCLA required Five Year review occurs. The sampling frequency may change based on recommendations in the Five Year Review but for costing purposes it will be assumed 35 monitoring wells annually for a 30-year period. For costing purposes Five Year reviews would also be conducted for a 30-year period. Monitoring would be conducted until groundwater contaminant concentrations fell below regulatory standards.

***Overall Protection of Human Health and the Environment***

Since impacts that present a potential human health risk are limited to the subsurface and the extent of impacts are generally defined for all ERP Sites, continued LTM/MNA would be protective of the human health and the environment by documenting that groundwater impacts are stable and are decreasing with time. LTM/MNA would not be protective of potential exposure to impacted soil, as there would be no restrictions on Site use, subsurface excavation and/or future development. However, additional soil sampling data will be collected as part of ongoing remedial action activities that may allow for NFA on soils at this Site and make LTM/MNA a viable alternative. Additional soil data will be collected every 10 years at active Sites with soil exceedances.

***Compliance with Applicable or Relevant and Appropriate Requirements***

The LTM/MNA alternative would comply with ARARs and has previously been implemented at the ERP Sites.

***Long-Term Effectiveness and Permanence***

LTM/MNA would provide long-term effectiveness and permanence, as long as LTM/MNA remained in effect or adequate data, such as groundwater modeling, became available to show that the groundwater plumes were stable/declining and that LTM/MNA was no longer required. However, due to the slow rate of MNA, it is likely that groundwater will remain in place, which does not meet State and Federal water standards. LTM/MNA would not provide long-term effectiveness and permanence with regards to potential exposure to impacted soils in the subsurface. Therefore, LUCs would likely be necessary if ERP Site-use ever changed.

***Reduction of Toxicity, Mobility, or Volume through Treatment***

The LTM/MNA alternative includes no treatment actions that would reduce the mobility or volume of contaminants at the ERP Sites, other than natural processes that will result in the reduction of toxicity, mobility, and volume through attenuation and biodegradation of the organic compounds.

***Short-Term Effectiveness***

The LTM/MNA alternative is effective in the short-term in that it documents the stability of the plumes, that areas outside of the MANGB Great Falls are not impacted, and there is no on-Site use of groundwater resources. LTM/MNA does not address any potential exposures to soil as contaminant degradation in soil is not monitored as part of this process.

***Implementability***

The LTM/MNA alternative would result in no technical feasibility issues. The MANG has the infrastructure in-place to implement and over-see LTM/MNA.

***Costs***

The costs to implement the LTM/MNA alternative are moderate. The monitoring well network that is currently in place will be used to conduct LTM/MNA going forward. Long-term costs are high due to the extended period over which monitoring occurs. For estimation purposes it is estimated that 35 monitoring wells will be required to be monitored annually through at ERP Sites 4, 6, 7 and 8 through 2054. Monitoring will be terminated once all RAO's have been achieved for a Site. Monitoring frequency and number of wells sampled may be changed during the Five Year Review evaluations.

#### ***8.3.2.4 In-situ Treatment (Alternative 4)***

Under this alternative, in situ treatment/bioaugmentation in the form of the addition of biostimulants, such as oxygen or carbon substrate (EVO) to enhance/accelerate the biological degradation of groundwater contaminants remaining at the ERP Sites. The alternative would use existing infrastructure and include the injection of EVO at ERP Site 8 and the potential addition of magnesium sulfate at ERP Sites 4, 6 and 7.

#### ***Overall Protection of Human Health and the Environment***

The addition of bio stimulants to the ERP Site 4, 6, 7 and 8 plumes would speed up the degradation of the residual contamination remaining at these Sites and decrease the overall LTM/MNA required. This alternative would be protective of the human health and the environment by increasing the rate at which MNA occurs and documenting that groundwater impacts are decreasing with time. In situ biostimulation would not be protective of potential exposure to impacted soil as there would be no restrictions on Site use, subsurface excavation and/or future development.

#### ***Compliance with Applicable or Relevant and Appropriate Requirements***

The alternative would comply with ARARs and has previously been implemented at the ERP Sites.

#### ***Long-Term Effectiveness and Permanence***

The in-situ treatment alternative would provide long-term effectiveness and permanence as long as LTM/MNA remained in effect or adequate data, such as groundwater modeling, became available to show that the groundwater plumes were stable/declining and that LTM/MNA was no longer required. The increased rate of natural attenuation would shorten the overall amount of LTM that is required to achieve contaminant concentration levels at which LTM could be discontinued. However, there is some question due to the size of the plumes whether entire plumes could effectively be treated and the overall time LTM would be required would likely be driven by naturally occurring MNA rates in the distal portion of the plumes.

#### ***Reduction of Toxicity, Mobility, or Volume through Treatment***

The increased rate of natural attenuation would reduce the mobility/volume of contaminants at the ERP Site resulting in the reduction of toxicity, mobility, and volume through attenuation and biodegradation of the organic compounds.

***Short-Term Effectiveness***

The in-situ alternative is effective in the short-term, in that it decreases contaminant mass within the plume by stimulating the biodegradation of contaminants. Reducing the mass of contaminants within the plume leads to increased plume stability and over time the reduction of the overall contaminant plume footprint.

***Implementability***

In-situ bio stimulation has previously been used at the ERP Sites and is an accepted remedial alternative. There is also existing infrastructure in place at ERP Sites 4, 6, 7 and 8. Additional infrastructure would need to be added to address changing plume morphology since in-situ was last implemented at the Sites. Therefore, some additional infrastructure would need to be installed in mission critical areas with more stringent access restrictions.

***Costs***

The costs to implement in-situ bio stimulation is considered moderate to high due the additional infrastructure that may need to be added to adequately address the plume. In addition, more than one event/addition of biostimulation may be required to address the remaining residual contamination at the ERP Sites.

***8.3.2.5 Passive LNAPL Monitoring Removal (Alternative 5 – Sites 4 and Site 7)***

Under this alternative, ongoing monitoring and passive removal of LNAPL with absorptive socks would be conducted in monitoring wells identified as having LNAPL thicknesses greater than 0.01 ft.

***Overall Protection of Human Health and the Environment***

Since impacts that present a potential human health risk are limited to the subsurface and the extent of impacts are generally known for all ERP Sites, continued monitoring of LNAPL thickness and passive removal with absorptive sorbent socks would be protective of the human health and the environment by documenting that LNAPL impacts are stable and/or are decreasing with time.

***Compliance with Applicable or Relevant and Appropriate Requirements***

LNAPL monitoring and recovery is required by MDEQ under their Montana Light Non-Aqueous Phase Liquid Recovery and Monitoring Guidance Document (MDEQ 2013) at ERP Sites where LNAPL product thickness exceeds 0.01 ft.

***Long-Term Effectiveness and Permanence***

LNAPL monitoring and recovery would provide long-term effectiveness and permanence, as long as the monitoring remained in effect or data indicated that LNAPL was no longer present at the ERP Sites 4 and 7 at thicknesses greater than 0.01 ft.

***Reduction of Toxicity, Mobility, or Volume through Treatment***

The passive recovery of free product (LNAPL) with absorptive socks removes LNAPL from the subsurface, but it is likely to have *de minimis* effect on overall LNAPL, due to the areal extent of the plume and limited thickness of the LNAPL.

***Short-Term Effectiveness***

The LUC alternative is effective in the short-term in that it documents the stability of the LNAPL plumes at the ERP Sites and recovers LNAPL, as required by MDEQ.

***Implementability***

This approach is currently being used at the ERP Sites as part of the ongoing LTM activities being conducted at the Sites.

***Costs***

The costs are considered low as LNAPL is only present in three to five monitoring wells. Monitoring and recovery activities would be conducted in conjunction with groundwater sampling with the data and field activities being reported in the semiannual/annual remedial progress report. It is anticipated that LNAPL monitoring and recovery will be required through 2054.

## **8.4 RECOMMENDED ALTERNATIVES**

The selected remedy at ERP Site 4, 6, 7 and 8 consists of the placement of a LUC on the Sites to prevent exposure pathways related to soil and groundwater and LTM/MNA for groundwater. Sites 4 and 7 will also include ongoing passive LNAPL removal with absorptive socks in monitoring wells identified as having LNAPL thicknesses greater than 0.01 ft. In Addition to these Alternatives, a basewide LUCIP (Land use Control Implementation Plan) will also be put into place and shared with the civilian portion of the facility and referenced pending any proposed construction plans that may affect the proposed LUC. Detailed cost breakdowns are included in **Appendix C**. ERP Site 5 does not have any contamination associated with it. Costs associated with abandoning the monitoring wells are also included in **Appendix C**.

### **8.4.1.1 ERP Site 4**

***Chosen Alternative***

The selected remedy at ERP Site 4 consists of the placement of a LUC on groundwater at the Site, ongoing passive LNAPL removal with absorptive socks in monitoring wells identified as having LNAPL thicknesses greater than 0.01 ft and LTM/MNA for groundwater. The proposed LUC on groundwater is shown on **Figure 8-1** and is combined into one groundwater LUC for Sites 4, 6, 7 and 8 for ease of management due to the proximity of the Sites to each other.

***Conceptual Design***

A LUC will be placed on the ERP Site to restrict the use of groundwater to prevent any exposure pathways. LUC inspections will be conducted on a yearly basis to ensure compliance with the LUCs and documented in an annual report, which also includes the other Sites that are having LUCs placed upon them.

LNAPL would continue to be gauged and removed in monitoring wells identified as having LNAPL thicknesses greater than 0.01 ft. Currently, three monitoring wells meet this criterion based on the amount of LNAPL in the wells, sorptive capacity (~1 gallon) of the socks and the thickness of the product (~0.01 ft). It is anticipated that the adsorptive socks can be changed out in conjunction with groundwater sampling events.

LTM/MNA groundwater sampling is proposed to be conducted on a semiannual basis through 2024 and then be stepped down to annual events until 2029 at which time the sampling frequency may be evaluated. During 2029, if the data shows ongoing stable and/or decreasing trends, a petition may be made to conduct sampling at a two to five year frequency. Groundwater sampling currently consists of the sampling of two to five monitoring wells for VOCs, VPH, and EPH. The number of monitoring wells to be sampled will vary depending on data recommendations made in the previous semi-annual progress and remedial action progress reports and in conjunction with MDEQ guidance documents (MDEQ 2013). For the purpose of the cost estimate, the number of monitoring wells in the existing groundwater sampling program was carried forward. Semi-annual sampling will be conducted through spring of 2024 and annually thereafter until 2054. Groundwater sampling will be terminated once RAOs have been met.

### **Cost Estimate**

The Labor Costs, Other Direct Costs (ODC), Travel and total costs for each alternative are presented in **Table 8-2**.

**Table 8-2**  
**Comparison of Estimated Costs for Alternatives Site 4**

Comparison Feature	1	2	3*	4a	4b
Labor Costs	\$38,285	\$85,278	\$253,278	\$69,150	\$86,089
ODC and Travel Costs	\$42,797	\$25,036	\$178,636	\$56,568	\$71,460
30 year NPV (3% inflation)	\$69,494	\$69,670	\$273,796	\$117,709	\$144,164

Notes:

Alternative 1 = No Action (includes well abandonment)

Alternative 2 = LUCs

Alternative 3 = LUCs with LTM/MNA and Passive LNAPL Removal

Alternative 4a = Enhanced Bioremediation

Alternative 4b = Biosparging and Venting

NPV – net present value\* = selected remedy

**8.4.1.2 ERP Site 6****Chosen Alternative**

The selected remedy at ERP Site 6 consists of the placement of a LUC on the Site and LTM/MNA for groundwater.

**Conceptual Design**

A LUC will be placed on the ERP Site to prohibit invasive work as well as restrict the use of groundwater to prevent any exposure pathways. LUC inspections will be conducted on a yearly basis to ensure compliance with the LUCs and reported in an annual report also includes the other Sites that are having LUCs placed upon them. Soil sampling for VPH, EPH, VOCs, SVOCs and metals will be conducted at five locations in 2034, 2044 and 2054 to verify that soil contamination exceeding Montana RBSLs still remains at the Site.

Semi-annual sampling will be conducted through 2024, at which time sufficient data will be available to support a decrease in sampling frequency from semiannual to annual sampling through 2029. During 2029, if the data shows ongoing stable and/or decreasing trends, a petition may be made to conduct sampling at a two year frequency. Groundwater sampling currently consists of the sampling of two to five monitoring wells for VOCs, VPH, and EPH. The number of monitoring wells to be sampled will vary depending on data recommendations made in the previous semi-annual progress and remedial action progress reports and in conjunction with MDEQ guidance documents (MDEQ, 2013). For the purpose of the cost estimate the number of monitoring wells in the existing groundwater sampling program was carried forward. Semi-annual sampling will be conducted through spring of 2024 and annually thereafter until 2054. Groundwater sampling will be terminated one RAOs have been achieved. The annual sampling may include an increased number of monitoring wells.

**Cost Estimate**

The capital, O&M, and total costs for each alternative are presented in **Table 8-3**.

**Table 8-3**  
**Comparison of Estimated Costs for Alternatives Site 6**

Comparison Feature	1	2	3*	4a	4b
Labor Costs	\$43,071	\$95,938	\$284,938	\$103,725	\$129,134
ODC and Travel Costs	\$48,146	\$428,165	\$200,965	\$84,851	\$107,190
30 year NPV (3% inflation)	\$78,181	\$78,379	\$308,0204	\$176,564	\$216,246

Notes:

Alternative 1 = No Action (includes well abandonment)

Alternative 2 = LUCs

Alternative 3 = LUCs with LTM  
Alternative 4a = Enhanced Bioremediation  
Alternative 4b = Biosparging and Venting  
\* = selected remedy

### 8.4.1.3 ERP Site 7

#### **Chosen Alternative**

The selected remedy at ERP Site 7 consists of the placement of a LUC on the Site and LTM/MNA for groundwater. This alternative is listed as Alternative 3 in **Table 8-4** for cost comparison purposes.

#### **Conceptual Design**

A LUC will be placed on the ERP Site to prohibit invasive work, as well as restrict the use of groundwater to prevent any exposure pathways. LUC inspections will be conducted on a yearly basis to ensure compliance with the LUCs and documented in an annual report, which also includes the other Sites that are having LUCs placed upon them. Soil sampling for VPH, EPH, VOCs, SVOCs and metals will be conducted at five locations in 2034, 2044 and 2054 to verify that soil contamination exceeding Montana RBSLs remains at the Site.

LNAPL would continue to be gauged and removed in monitoring wells identified as having LNAPL thicknesses greater than 0.01 ft. Currently four wells meet this criterion based on the amount of LNAPL in the wells, sorptive capacity (~1 gallon) of the socks and the thickness of the product (~0.01 ft). It is anticipated that the adsorptive socks can be changed out in conjunction with groundwater sampling events.

LTM/MNA groundwater sampling is proposed to be conducted on a semiannual basis through 2024 and then stepped down to annual events until 2029. During 2029, if the data shows ongoing stable and/or decreasing trends, a petition may be made to conduct sampling at a year frequency. Groundwater sampling currently consists of the sampling of two to five monitoring wells for VOCs, VPH, and EPH. The number of monitoring wells to be sampled will vary depending on data recommendations made in the previous semi-annual progress and remedial action progress reports and in conjunction with MDEQ guidance documents (MDEQ, 2013). For the purpose of the cost estimate the number of monitoring wells in the existing groundwater sampling program was carried forward. Semi-annual sampling will be conducted through spring of 2024 and annually thereafter until 2054. Groundwater sampling will be terminated once RAOs have been achieved.

#### **Cost Estimate**

The capital, O&M, and total costs for each alternative are presented in **Table 8-4**.

**Table 8-4  
Comparison of Estimated Costs for Alternatives Site 7**

Comparison Feature	1	2	3*	4a	4b
Labor Costs	\$110,071	\$245,175	\$728,175	\$345,749	\$430,446
ODC and Travel Costs	\$123,041	\$171,980	\$513,580	\$282,838	\$357,299
30 year NPV (3% inflation)	\$1,199,796	\$200,302	\$787,163	\$588,547	\$720,819

Notes:

Alternative 1 = No Action (includes well abandonment)

Alternative 2 = LUCs

Alternative 3 = LUCs with LTM and Passive LNAPL Removal

Alternative 4a = Enhanced Bioremediation

Alternative 4b = Biosparging and Venting

\* = selected remedy

#### 8.4.1.4 ERP Site 8

##### **Chosen Alternative**

The selected remedy at ERP Site 8 consists of the placement of a LUC on the Site and LTM/MNA for groundwater. This alternative is listed as Alternative 3 in **Table 8-5** for cost comparison purposes.

##### **Conceptual Design**

A LUC will be placed on the ERP Site to restrict the use of groundwater to prevent any exposure pathways. LUC inspections will be conducted on a yearly basis to ensure compliance with the LUCs and documented in an annual report, which includes the other sites that are having LUCs placed upon them.

Semi-annual sampling will be conducted through 2024, at which time sufficient data will be available to support a decrease in sampling frequency from semiannual to annual sampling. The annual sampling may include an increased number of monitoring wells. During 2029, if the data shows ongoing stable and/or decreasing trends, a petition may be made to conduct sampling at a two year frequency. Groundwater sampling currently consists of the sampling of two to five monitoring wells for VOCs, VPH, and EPH. The number of monitoring wells to be sampled will vary depending on data recommendations made in the previous semi-annual

progress and remedial action progress reports and in conjunction with MDEQ guidance documents (MDEQ, 2013). For the purpose of the cost estimate the number of monitoring wells in the existing groundwater sampling program was carried forward. Semi-annual sampling will be conducted through spring of 2024 and annually thereafter until 2054. Groundwater sampling will be terminated once RAOs have been achieved.

### Cost Estimate

The capital, O&M, and total costs for each alternative are presented in **Table 8-5**.

**Table 8-5**  
**Comparison of Estimated Costs for Alternatives Site 8**

Comparison Feature	1	2	3*	4a	4b
Labor Costs	\$47,856	\$106,598	\$316,598	\$124,743	\$172,178
ODC and Travel Costs	\$53,496	\$31,296	\$223,296	\$110,287	\$142,920
30 year NPV (3% inflation)	\$86,868	\$87,088	\$342,245	\$222,435	\$288,327

Notes:

Alternative 1 = No Action (includes well abandonment)

Alternative 2 = LUCs

Alternative 3 = LUCs with LTM/MNA

Alternative 4a = Enhanced Bioremediation

Alternative 4b = Biosparging and Venting

\* = selected remedy

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**Administrative Record (AR)** - The body of documents that forms the basis for selection of a particular response at a site. A copy of the non-confidential portion of the AR is available as part of the information repository.

**Aquifer** - An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be used for drinking or other purposes. The water contained in the aquifer is called groundwater.

**Contaminant of Concern (COC)** - Chemicals that were identified as the human health or ecological risk drivers at a site that may pose a health threat to the workers, residents, or wildlife based on risk calculations and comparisons to remediation goals.

**Contaminant of Potential Concern/Contaminant of Potential Ecological Concern (COPC/COPEC)** - A chemical evaluated in the human health or ecological risk assessments before the risk drivers are identified.

**Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA)** - The federal law for evaluating and cleaning up sites contaminated with hazardous substances, pollutants and contaminants. It is codified at 42 U.S.C. §§ 9601 to 9675.

**Conceptual Site Model** - A visual tool or description used to identify the source of the contamination, the ways a worker or resident may be exposed to the contamination, the media such as soil or groundwater where the contamination is present, and the type of worker or resident that might be exposed to the contamination at a site.

**Exposure** - Contact made between a chemical, physical, or biological agent and the outer boundary of an organism. Exposure is quantified as the amount of an agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut).

**Exposure Point Concentration** - A conservative statistical estimate of the concentration of a chemical in the soil, groundwater, sediment or surface water where workers or residents may be exposed.

**Feasibility Study** - A study completed to evaluate remedial alternatives for cleanup of contamination.

**Groundwater** - Underground water that fills pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

**Hazard Index (HI)** - The hazard index is generated by adding the hazard quotients (HQs) for all contaminants of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. A hazard index less than or equal to 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. A hazard index greater than 1 indicates that site-related exposures may present a risk to human health.

**Hazard Quotient (HQ)** - The ratio of exposure to toxicity. A HQ less than or equal to 1 indicates that a receptor's dose of a single contaminant is less than the reference dose and that toxic non-carcinogenic effects from that chemical are unlikely.

**Integrated Exposure Biokinetic Uptake Model** - A USEPA model that evaluates the risks associated with exposure of the child resident to lead in groundwater and soil. The model estimates blood lead concentrations in a child based on site-specific soil and groundwater concentrations input into the model.

**Monitoring** - Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action. For example, monitoring wells drilled to different depths at the site would be used to detect any migration of the plume.

**National Oil and Hazardous Substances Pollution Contingency Plan (NCP)** - The federal regulations that guide the CERCLA cleanup program. These regulations can be found at 40 Code of Federal Regulations, Part 300.

**Preliminary Assessment** - A study of the site and its surrounding area to determine whether a site poses little or no threat to human health and the environment which involves records reviews, interviews, visual inspections, and limited field sampling.

**Proposed Plan (PP)** - The document that describes the preferred alternative for cleanup of contamination and is presented for public review and comment.

**Qualitative** – Refers to information based on a quality or characteristic as opposed to a quantity or measurable value (i.e., attributing the known qualities of a COC without assessing overall concentrations of that COC).

**Quantitative** – Refers to information based on quantifiable data (e.g., mathematical, numerical, computational) gathered and analyzed through systematic empirical methods.

**Record of Decision (ROD)** - The decision document in which the lead agency selects the remedy and explains the basis for selection.

**Remediation Goals (RGs)** - Cleanup goals that are protective of human health and the environment and comply with state and federal requirements. RGs include calculated risk-based concentrations or other conventional and regulatory criteria.

**Remedial Investigation** - A study of the source, nature and extent of contamination.

**Risk** - The probability of adverse health effects resulting from exposure to an environmental agent or chemicals.

**Sediment** - Naturally occurring material that is broken down by processes of weathering and erosion and often settles out of slow-moving or standing water. Samples were collected within drainageways located within the site and downstream of the site where water may be present throughout the year or infrequently during rain events.

**Semi-Volatile Organic Compound (SVOC)** - Organic compounds, such as phenols and polynuclear aromatic hydrocarbons, which have a boiling point higher than water and may vaporize when exposed to temperatures above room temperature.

**Site Investigation** - An investigation of the site that tests the hypotheses developed during the Preliminary Assessment. The investigation includes the collection of environmental and waste samples to determine what hazardous substances are present at a site.

**Superfund** - The federal environmental program established under CERCLA to address abandoned hazardous waste sites.

**Subsurface Soil** - Soil located 1 foot or more bgs.

**Surface Soil** - Soil located between 0 and 1 foot bgs.

**Surface Water** - Water collected on the ground surface or in a stream, river, lake, wetland, or ocean. Samples were collected downstream of culverts located on-site.

**Suspended Solids** - Small solid particles which remain in suspension in water.

**Threshold** - The dose or exposure below which no harmful effect is expected to occur.

**Toxicity** - A measure of degree to which a substance is harmful to human and animal life.

**Volatile Organic Compound (VOC)** - Organic compounds, present in glues, solvents, paints or gasoline which readily volatilize at room temperature and atmospheric pressure. Some volatile organic compounds can cause cancer.

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**Table 3-7: ERP Site 4 Detected Soil Analytical Results Summary**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Boring ID							4-SB1		4-SB2		4-SB3		4-SB4		4-SB5	
	Sample Depth (ft bgs)							1.1	5.5	1.0	3.5	3.0	7.0	1.5	7.0	1.5	3.5
	Sample Date							Sep-90	Sep-90	Sep-90	Sep-90	Sep-90	Sep-90	Sep-90	Sep-90	Sep-90	Sep-90
	CASRN	Screening Level					Units										
MDEQ Tier-1 RBSL <sup>A</sup>				EPA RSL <sup>B</sup>													
	DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	Industrial Soil												
<b>VOCs</b>																	
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	ND	<b>0.140</b>	ND [ND]	ND [ND]	<b>0.16 J</b>	ND	ND	ND	ND	<b>0.052 J</b>
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	ND	ND	ND [ND]	ND [ND]	<b>0.006 J</b>	ND	ND	ND	ND	ND
<b>SVOCs</b>																	
Bis(2 ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	ND	<b>0.240 J</b>	ND [ND]	ND [ND]	<b>0.12 J</b>	ND	ND	ND	ND	ND
Butylbenzophthalate	85-68-7	--	--	--	--	1,200	mg/kg	ND	<b>0.410</b>	ND [ND]	ND [ND]	<b>1.4</b>	ND	ND	ND	ND	ND
Diethylphthalate	84-66-2	--	--	--	--	66,000	mg/kg	ND	ND	ND [ND]	ND [ND]	ND	ND	ND	<b>1.7</b>	ND	ND
<b>Metals</b>																	
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>6.5</b>	<b>3.9</b>	<b>7.4 [5]</b>	<b>3.8 [5.3]</b>	<b>7.9</b>	<b>3.6</b>	<b>6.3</b>	<b>4.5</b>	<b>6.3</b>	<b>7</b>
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>214</b>	<b>219</b>	<b>219 [170]</b>	<b>165 [214]</b>	<b>290</b>	<b>138</b>	<b>238</b>	<b>1,190</b>	<b>260</b>	<b>205</b>
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>9.8</b>	<b>10.5</b>	<b>17 [9.3]</b>	<b>6.4 [11.6]</b>	<b>8.4</b>	<b>9.6</b>	<b>12.4</b>	<b>10.6</b>	<b>13.6</b>	<b>20.6</b>
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	<b>10.6</b>	<b>10.9</b>	<b>15.1 [7.4]</b>	<b>11.8 [10.1]</b>	<b>7.8</b>	<b>7</b>	<b>14.2</b>	<b>34.9</b>	<b>18.5</b>	<b>16.1</b>
Lead	7439-92-1	--	--	--	140	800	mg/kg	<b>10.5</b>	<b>10.6</b>	<b>16.7 [9.3]</b>	<b>8.7 [7.6]</b>	<b>10.2</b>	<b>9.1</b>	<b>13.8</b>	<b>7.5</b>	<b>12.2</b>	<b>15.4</b>
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	<b>8.4</b>	ND	<b>13.8 [ND]</b>	<b>7.5 [8.4]</b>	<b>9</b>	ND	ND	ND	<b>7.1</b>	<b>12.1</b>
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	<b>35.8</b>	<b>47.4</b>	<b>48.4 [34.3]</b>	<b>36 [36.5]</b>	<b>47.5</b>	<b>48.8</b>	<b>38.8</b>	<b>47.1</b>	<b>45.4</b>	<b>46.8</b>
<b>Petroleum Hydrocarbons</b>																	
TPH	--	--	--	--	--	--	mg/kg	<b>83</b>	ND	<b>86 [1,500]</b>	<b>600 [230]</b>	ND	ND	<b>88</b>	ND	<b>140</b>	ND
EPH	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--
<b>EPH/VPH Fractions (Converted)</b>																	
C9 C18 aliphatics	--	540	900	270,000	--	--	mg/kg	<b>58</b>	ND	<b>60 [1,050]</b>	<b>420 [161]</b>	ND	ND	<b>62</b>	ND	<b>98</b>	ND
C11 C22 aromatics	--	3,900	3,900	2,000	--	--	mg/kg	<b>25</b>	ND	<b>26 [450]</b>	<b>180 [69]</b>	ND	ND	<b>26</b>	ND	<b>42</b>	ND

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.

Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.

Results in brackets represent blind duplicate results.

<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).

<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).

<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

mg/kg = Milligrams per kilogram.

ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%

**Table 3-7: ERP Site 4 Detected Soil Analytical Results Summary  
Montana Air National Guard Base - Great Falls International Airport  
Great Falls, Montana**

Analyte	Boring ID							4-SB6		4-SB7		4-SB8		4-SB9		4-SB10	
	Sample Depth (ft bgs)							1.0	6.0	1.0	6.25	1.25	6.5	1.0	6.0	1.0	6.0
	Sample Date							Oct-10		Oct-10		Oct-10		Oct-10		Oct-10	
	CASRN	Screening Level					Units										
MDEQ Tier-1 RBSL <sup>A</sup>					EPA RSL <sup>B</sup>												
	DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	Industrial Soil												
<b>VOCs</b>																	
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
<b>SVOCs</b>																	
Bis(2 ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzophthalate	85-68-7	--	--	--	--	1,200	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	84-66-2	--	--	--	--	66,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
<b>Metals</b>																	
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>12.6</b>	ND	<b>13.6</b>	ND	<b>13.3</b>	<b>5.39</b>	<b>7.21</b>	ND	<b>6.44</b>	ND
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>137</b>	<b>175</b>	<b>173</b>	<b>177</b>	<b>133</b>	<b>859</b>	<b>220</b>	<b>172</b>	<b>205</b>	<b>309</b>
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>11.3</b>	ND	<b>10.5</b>	<b>7.81</b>	<b>9.15</b>	<b>9.06</b>	<b>9.35</b>	ND	ND	ND
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	--	--	--	--	--	--	--	--	--	--
Lead	7439-92-1	--	--	--	140	800	mg/kg	ND	ND	ND	ND	<b>9.46</b>	ND	ND	ND	ND	ND
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	--	--	--	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	--	--	--	--	--	--	--	--	--	--
<b>Petroleum Hydrocarbons</b>																	
TPH	--	--	--	--	--	--	mg/kg	--									
EPH							mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	<b>210</b>	ND
<b>EPH/VPH Fractions (Converted)</b>																	
C9 C18 aliphatics	--	540	900	270,000	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	<b>147</b>	ND
C11 C22 aromatics	--	3,900	3,900	2,000	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	<b>63</b>	ND

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.

Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.

Results in brackets represent blind duplicate results.

<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).

<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).

<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

mg/kg = Milligrams per kilogram.

ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%

**Table 3-7: ERP Site 4 Detected Soil Analytical Results Summary  
Montana Air National Guard Base - Great Falls International Airport  
Great Falls, Montana**

Analyte	Boring ID							4-SB11			4-SB12		4-SB13	
	Sample Depth (ft bgs)							0.5	2.0	6.0	1.0	3.5	1.0	5.5
	Sample Date							Oct-10			Oct-10		Oct-10	
	CASRN	Screening Level					Units							
MDEQ Tier-1 RBSL <sup>A</sup>				EPA RSL <sup>B</sup>										
	DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	Industrial Soil									
<b>VOCs</b>														
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	ND	ND	ND	ND	ND	ND	ND
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	ND	ND	ND	ND	ND	ND	ND
<b>SVOCs</b>														
Bis(2 ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	ND	ND	ND	ND	ND	ND	ND
Butylbenzophthalate	85-68-7	--	--	--	--	1,200	mg/kg	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	84-66-2	--	--	--	--	66,000	mg/kg	ND	ND	ND	ND	ND	ND	ND
<b>Metals</b>														
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>8.42 [9.23]</b>	<b>6.34</b>	ND	<b>5.92</b>	ND	<b>7.9</b>	ND
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>201 [176]</b>	<b>275</b>	<b>147</b>	<b>238</b>	<b>128</b>	<b>208</b>	<b>184</b>
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>9.25 [8.71]</b>	ND	ND	<b>7.92</b>	ND	<b>8.99</b>	ND
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	--	--	--	--	--	--	--
Lead	7439-92-1	--	--	--	140	800	mg/kg	<b>8.83 [ND]</b>	ND	ND	ND	ND	ND	ND
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	--	--	--	--	--	--	--
<b>Petroleum Hydrocarbons</b>														
TPH	--	--	--	--	--	--	mg/kg							
EPH							mg/kg	ND	<b>235</b>	ND	ND	ND	ND	ND
<b>EPH/VPH Fractions (Converted)</b>														
C9 C18 aliphatics	--	540	900	270,000	--	--	mg/kg	ND	<b>165</b>	ND	ND	ND	ND	ND
C11 C22 aromatics	--	3,900	3,900	2,000	--	--	mg/kg	ND	<b>70</b>	ND	ND	ND	ND	ND

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.

Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.

Results in brackets represent blind duplicate results.

<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).

<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).

<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

mg/kg = Milligrams per kilogram.

ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%

**Table 3-8: ERP Site 4 Detected Groundwater Analytical Results - October 2020**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			4-MW2A	4-MW3	4-MW3A	4-MW5
	Screen Depth (ft bgs)			10 - 30	45 - 65	10 - 30	10 - 30
	Sample Date			Oct-20	Oct-20	Oct-20	Oct-20
	CASRN	Screening Level	Units				
<b>VOCs</b>							
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	<b>3.4</b>	<b>0.21 J</b> [ $< 0.40$ ]	<b>320</b>	<b>430</b>
1,3,5-Trimethylbenzene	108-67-8	60 <sup>B</sup>	µg/L	<b>0.83 J</b>	$< 0.40$ [ $< 0.40$ ]	<b>140</b>	<b>91</b>
Acetone	67-64-1	1,400 <sup>B</sup>	µg/L	$< 6.4$	$< 6.4$ [ $< 6.4$ ]	<b>43</b>	$< 26$
Benzene	71-43-2	5 <sup>A</sup>	µg/L	$< 0.40$	$< 0.40$ [ $< 0.40$ ]	<b>5.5</b>	<b>9.2</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	$< 0.40$	$< 0.40$ [ $< 0.40$ ]	<b>70</b>	<b>190 J-</b>
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	<b>0.39 J</b>	$< 0.40$ [ $< 0.40$ ]	<b>18</b>	<b>50</b>
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	<b>1.2 J</b>	$< 0.80$ [ $< 0.80$ ]	<b>400</b>	<b>430</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	<b>0.31 J</b>	$< 0.80$ [ $< 0.80$ ]	<b>54</b>	<b>52</b>
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	$< 0.80$	$< 0.80$ [ $< 0.80$ ]	$< 1.6$	<b>15 J-</b>
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	<b>0.65 J</b>	$< 0.40$ [ $< 0.40$ ]	<b>18</b>	<b>77</b>
o-Xylene	95-47-6	10,000 <sup>A</sup>	µg/L	$< 0.40$	$< 0.40$ [ $< 0.40$ ]	<b>1.1 J</b>	<b>1.2 J</b>
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	<b>0.64 J</b>	$< 0.40$ [ $< 0.40$ ]	<b>12</b>	<b>40</b>
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	$< 0.40$	$< 0.40$ [ $< 0.40$ ]	<b>1.6 J</b>	<b>1.8 J</b>
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	$< 0.40$	$< 0.40$ [ $< 0.40$ ]	$< 0.80$	<b>0.90 J</b>
<b>EPH</b>							
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	--	--	<b>1,000</b>	<b>180,000</b>
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	--	--	<b>390</b>	<b>28,000</b>
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	--	--	<b>300</b>	<b>47,000</b>
Total EPH	--	1,000 <sup>C</sup>	µg/L	--	--	<b>1,700</b>	<b>260,000</b>
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	$< 290$	$< 300$ [ $< 290$ ]	<b>4,100</b>	<b>240,000 J</b>
<b>VPH</b>							
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	$< 20$ UJ	$< 20$ UJ [ $< 20$ UJ]	<b>220 J-</b>	<b>380 J</b>
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>27 J</b>	$< 20$ UJ [ $< 20$ UJ]	<b>570 J-</b>	<b>910 J</b>
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	$< 20$ UJ	$< 20$ UJ [ $< 20$ UJ]	<b>540 J-</b>	<b>1,000 J</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	$< 0.50$ UJ	$< 0.50$ UJ [ $< 0.50$ UJ]	<b>4.0 J-</b>	<b>19 J</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	$< 0.50$ UJ	$< 0.50$ UJ [ $< 0.50$ UJ]	<b>45 J-</b>	<b>290 J</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	$< 2.0$ UJ	$< 2.0$ UJ [ $< 2.0$ UJ]	<b>29 J-</b>	<b>74 J</b>
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	$< 1.0$ UJ	$< 1.0$ UJ [ $< 1.0$ UJ]	<b>310 J-</b>	<b>800 J</b>

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

$<$  = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J- noted if low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

**Table 3-9: ERP Site 4 Detected Groundwater Analytical Results - April 2021**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			4-MW2A	4-MW3	4-MW5
	Screen Depth (ft bgs)			10 - 30	45 - 65	10 - 30
	Sample Date			Apr-21	Apr-21	Apr-21
	CASRN	Screening Level	Units			
<b>VOCs</b>						
1,1,2-Trichloroethane	79-00-5	3 <sup>A</sup>	µg/L	< 0.80	< 0.80 [ $< 0.80$ ]	<b>6.8</b>
1,2,4-Trichlorobenzene	120-82-1	70 <sup>A</sup>	µg/L	< 0.80	<b>0.21 J</b> [ $< 0.80$ ]	< 0.80
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	< 0.40	< 0.40 [ $< 0.40$ ]	<b>110</b>
1,3,5-Trimethylbenzene	108-67-8	60 <sup>B</sup>	µg/L	< 0.40	< 0.40 [ $< 0.40$ ]	<b>6.4</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.40	< 0.40 [ $< 0.40$ ]	<b>5.6</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	< 0.40	< 0.40 [ $< 0.40$ ]	<b>45</b>
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	< 0.40	< 0.40 [ $< 0.40$ ]	<b>5.2</b>
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	< 0.80	< 0.80 [ $< 0.80$ ]	<b>88</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 0.80	<b>0.42 J</b> [ $< 0.80$ ]	<b>13</b>
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	< 0.40	< 0.40 [ $< 0.40$ ]	<b>6.1</b>
o-Xylene	95-47-6	10,000 <sup>A</sup>	µg/L	< 0.40	< 0.40 [ $< 0.40$ ]	<b>0.94 J</b>
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	< 0.40	< 0.40 [ $< 0.40$ ]	<b>5.6</b>
<b>EPH</b>						
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	--	--	<b>700</b>
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	--	--	<b>540</b>
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	--	--	<b>390</b>
Total EPH	--	1,000 <sup>C</sup>	µg/L	--	--	<b>1,600</b>
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	< 300	< 290 [ $< 290$ ]	<b>3,100</b>
<b>VPH</b>						
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	< 20 UJ	< 20 UJ [ $< 20 UJ$ ]	<b>270 J-</b>
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	< 20 UJ	<b>1.2 J</b> [ <b>0.63 J</b> ]	<b>700 J</b>
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	< 20 UJ	< 20 U [ $< 20 U$ ]	<b>410</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.50 UJ	< 0.50 [ $< 0.50$ ]	<b>5.9</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	< 0.50 UJ	< 0.50 [ $< 0.50$ ]	<b>45</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 2.0 UJ	< 2.0 UJ [ $< 2.0 UJ$ ]	<b>15 J-</b>
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	< 1.0 UJ	< 1.0 [ $< 1.0$ ]	<b>87</b>

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J- noted if low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

Table 3-10: ERP Site 4 Detected Groundwater Analytical Results - October 2021  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	Well ID			4-MW2	4-MW2A	4-MW3A	4-MW5
	Screen Depth (ft bgs)			45 - 65	10 - 30	45 - 65	10 - 30
	Sample Date			10/4/2021	10/4/2021	10/4/2021	10/4/2021
	CASRN	Screening Level	Units				
<b>VOCs</b>							
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	< 0.40	<b>0.45 J</b>	<b>30</b>	<b>590 [610]</b>
1,3,5-Trimethylbenzene	108-67-8	60 <sup>B</sup>	µg/L	< 0.40	<b>0.16 J</b>	<b>75</b>	<b>130 [130]</b>
Acetone	67-64-1	1,400 <sup>B</sup>	µg/L	< 6.4	< 6.4	<b>27</b>	< 32 [ <b>&lt; 32</b> ]
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.40	< 0.40	<b>0.59 J</b>	<b>8.7 [8.6]</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	< 0.40	< 0.40	<b>1.2</b>	<b>230 [240]</b>
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	< 0.40	< 0.40	<b>1.1</b>	<b>65 [64]</b>
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	< 0.80	<b>0.15 J</b>	<b>44</b>	<b>610 [630]</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 0.80	< 0.80	<b>14</b>	<b>64 [67]</b>
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	< 0.80	< 0.80	< 0.80	<b>16 [18]</b>
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	< 0.40	< 0.40	< 0.40	<b>93 [94]</b>
o-Xylene	95-47-6	10,000 <sup>A</sup>	µg/L	< 0.40	< 0.40	<b>0.53 J</b>	<b>1.6 J [<b>&lt; 2.0</b>]</b>
sec-Butylbenzene	135-98-8	2000 <sup>B</sup>	µg/L	< 0.40	< 0.40	< 0.40	<b>41 [43]</b>
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	< 0.40	< 0.40	< 0.40	<b>1.9 J [<b>2.0 J</b>]</b>
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.40	< 0.40	< 0.40	<b>0.98 J [<b>1.0 J</b>]</b>
<b>EPH</b>							
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	--	--	<b>480</b>	<b>61,000 J [11,000 J]</b>
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	--	--	<b>630</b>	<b>10,000 J [2,400 J]</b>
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	--	--	< 270 U	<b>34,000 J [6,000 J]</b>
Total EPH	--	1,000 <sup>C</sup>	µg/L	--	--	<b>1,400</b>	<b>110,000 J [19,000 J]</b>
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	< 310	< 310	<b>3,200</b>	<b>110,000 J [20,000 J]</b>
<b>VPH</b>							
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	< 20 U	< 20	<b>400</b>	<b>910 J+ [710 J+]</b>
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	< 20	<b>2.9 J</b>	<b>730</b>	<b>2,300 J+ [2,000 J+]</b>
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>24</b>	< 20 U	<b>410</b>	<b>900 J+ [830 J+]</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.50	< 0.50	<b>1.2</b>	<b>7.7 J+ [7.3 J+]</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	< 0.50	< 0.50	<b>1.5</b>	<b>160 J+ [150 J+]</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 2.0	< 2.0	<b>33</b>	<b>26 J+ [26 J+]</b>
Methyl tert-Butyl Ether	1634-04-4	14.0 <sup>B</sup>	µg/L	< 2.0	< 2.0	<b>0.40 J</b>	< 2.0 [ <b>&lt; 2.0</b> ]
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.50	< 0.50	<b>0.23 J</b>	<b>0.35 J+ [0.36 J+]</b>
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	< 1.0	< 1.0	<b>39</b>	<b>400 J+ [390 J+]</b>

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTPVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+ noted if high bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

**Table 3-11: ERP Site 4 Detected Groundwater Analytical Results - April 2022**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			4-MW2	4-MW2A	4-MW3
	Screen Depth (ft bgs)			45 - 65	10 - 30	45 - 65
	Sample Date			Apr-22	Apr-22	Apr-22
	CASRN	Screening Level	Units			
<b>VOCs</b>						
1,2-Dichloroethane	107-06-2	5 <sup>A</sup>	µg/L	<b>0.13 J</b>	<b>0.15 J</b>	< 0.40
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	<b>4.3 J+</b>	< 0.40	< 1.0 U

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTPVP, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+ noted if high bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

EPH fractionation was not performed during the April 2022 sampling event.

**Table 3-12: ERP Site 5 Detected Soil Analytical Results Summary  
Montana Air National Guard Base - Great Falls International Airport  
Great Falls, Montana**

Analyte	Boring ID							5-SB1		5-SB2	5-SB3		5-SB4	5-SB5		
	Sample Depth (ft bgs)							3.5	7.5	1.0	1.5	5.0	3.5	1.75	4.0	6.0
	Sample Date							Sep-90		Sep-90	Sep-90	Sep-90	Sep-90	Oct-10		
	CASRN	Screening Level					Units									
MDEQ Tier-1 RBSL <sup>A</sup>				EPA RSL <sup>B</sup>												
	DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	Industrial Soil											
<b>VOCs</b>																
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	ND	<b>0.120</b>	ND	ND	<b>0.14</b>	<b>0.017 J</b>	ND	ND	ND
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	<b>0.01</b>	ND	ND	ND	<b>0.006 J</b>	ND	ND	ND	ND
<b>Metals</b>																
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>22.5</b>	<b>3.1</b>	<b>6.5</b>	<b>7</b>	<b>7.3</b>	<b>4.2</b>	<b>17.6</b>	<b>7.2</b>	ND
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>155</b>	<b>187</b>	<b>218</b>	<b>258</b>	<b>285</b>	<b>437</b>	<b>105</b>	<b>678</b>	ND
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>16.3</b>	<b>9.5</b>	<b>12.7</b>	<b>12</b>	<b>22.8</b>	<b>9.7</b>	<b>9.62</b>	ND	ND
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	<b>31.6</b>	<b>5.7</b>	<b>11.5</b>	<b>31</b>	<b>14.8</b>	<b>8.7</b>	--	--	--
Lead	7439-92-1	--	--	--	140	800	mg/kg	<b>12.7</b>	<b>5.2</b>	<b>9.5</b>	<b>7.5</b>	<b>11.4</b>	<b>5.4</b>	<b>8.89</b>	ND	ND
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	ND	ND	<b>9.4</b>	<b>9.7</b>	<b>16.1</b>	ND	--	--	--
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	ND	ND	ND	<b>0.29</b>	ND	ND	--	--	--
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	<b>61.2</b>	<b>40.7</b>	<b>38.8</b>	<b>47</b>	<b>50.6</b>	<b>26.4</b>	--	--	--
<b>Petroleum Hydrocarbons</b>																
TPH	--	--	--	--	--	--	mg/kg	ND	ND	ND	<b>160</b>	ND	ND	--	--	--
EPH							mg/kg	--	--	--	--	--	--	ND	ND	ND
<b>EPH/VPH Fractions (Converted)</b>																
C9 C18 aliphatics	--	540	900	270,000	--	--	mg/kg	ND	ND	ND	<b>112</b>	ND	ND	ND	ND	ND
C11 C22 aromatics	--	3,900	3,900	2,000	--	--	mg/kg	ND	ND	ND	<b>48</b>	ND	ND	ND	ND	ND

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.

Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.

Results in brackets represent blind duplicate results.

<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).

<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).

<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

mg/kg = Milligrams per kilogram.

ND = Not detected.

Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%

**Table 3-12: ERP Site 5 Detected Soil Analytical Results Summary  
Montana Air National Guard Base - Great Falls International Airport  
Great Falls, Montana**

Analyte	Boring ID							5-SB6		5-SB7		5-SB8		5-SB9		
	Sample Depth (ft bgs)							1.0	5.0	1.0	5.5	1.5	9.0	1.0	2.0	5.5
	Sample Date							Oct-10		Oct-10		Oct-10		Oct-10		
	CASRN	Screening Level					Units									
MDEQ Tier-1 RBSL <sup>A</sup>				EPA RSL <sup>B</sup>												
	DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	Industrial Soil											
<b>VOCs</b>																
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
<b>Metals</b>																
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>6.66</b>	ND	<b>14</b>	<b>7.66</b>	<b>16.1</b>	ND	ND	<b>6.55</b>	<b>5.96</b>
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>177</b>	<b>594</b>	<b>158</b>	<b>1,120</b>	<b>139</b>	<b>154</b>	<b>489</b>	<b>140</b>	<b>209</b>
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>10.8</b>	ND	<b>9.59</b>	<b>9.86</b>	<b>10.8</b>	<b>12.7</b>	<b>10.2</b>	<b>12.6</b>	ND
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	--	--	--	--	--	--	--	--	--
Lead	7439-92-1	--	--	--	140	800	mg/kg	ND	ND	<b>10.9</b>	ND	ND	ND	ND	ND	ND
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	--	--	--	--	--	--	--	--	--
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	--	--	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	--	--	--	--	--	--	--	--	--
<b>Petroleum Hydrocarbons</b>																
TPH	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--
EPH							mg/kg	ND	ND	ND	ND	ND	ND	<b>378</b>	ND	ND
<b>EPH/VPH Fractions (Converted)</b>																
C9 C18 aliphatics	--	540	900	270,000	--	--	mg/kg	ND	ND	ND	ND	ND	ND	<b>265</b>	ND	ND
C11 C22 aromatics	--	3,900	3,900	2,000	--	--	mg/kg	ND	ND	ND	ND	ND	ND	<b>113</b>	ND	ND

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.

Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.

Results in brackets represent blind duplicate results.

<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).

<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).

<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

mg/kg = Milligrams per kilogram.

ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%

**Table 3-12: ERP Site 5 Detected Soil Analytical Results Summary  
Montana Air National Guard Base - Great Falls International Airport  
Great Falls, Montana**

Analyte	Boring ID							5-SB10		5-SB11	
	Sample Depth (ft bgs)							1.0	5.5	1.5	5.5
	Sample Date							Oct-10		Oct-10	
	CASRN	Screening Level				EPA RSL <sup>B</sup>	Units				
MDEQ Tier-1 RBSL <sup>A</sup>				Industrial Soil							
	DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals							
<b>VOCs</b>											
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	ND [ND]	ND	ND	ND
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	ND [ND]	ND	ND	ND
<b>Metals</b>											
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>20.9 [19.2]</b>	ND	<b>17.7</b>	ND
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>153 [157]</b>	<b>517</b>	<b>142</b>	<b>359</b>
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>10.8 [10.7]</b>	<b>8.28</b>	<b>10.1</b>	<b>7.82</b>
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	--	--	--	--
Lead	7439-92-1	--	--	--	140	800	mg/kg	ND [ND]	ND	<b>9.42</b>	ND
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	--	--	--	--
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	--	--	--	--
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	--	--	--	--
<b>Petroleum Hydrocarbons</b>											
TPH	--	--	--	--	--	--	mg/kg	--	--	--	--
EPH							mg/kg	ND [ND]	ND	ND	ND
<b>EPH/VPH Fractions (Converted)</b>											
C9 C18 aliphatics	--	540	900	270,000	--	--	mg/kg	ND [ND]	ND	ND	ND
C11 C22 aromatics	--	3,900	3,900	2,000	--	--	mg/kg	ND [ND]	ND	ND	ND

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.

Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.

Results in brackets represent blind duplicate results.

<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).

<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).

<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

mg/kg = Milligrams per kilogram.

ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%

**Table 3-13: ERP Site 5 Detected Groundwater Analytical Results Summary**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			5-MW1		5-MW2				5-MW3			
	Screen Depth (ft bgs)			34 - 54		45 - 65				45 - 65			
	Sample Date			Oct-90	Feb-91	Oct-10	Oct-10	May-11	Nov-19	Oct-10	Oct-10	May-11	Nov-19
	CASRN	Screening Level	Units										
<b>VOCs</b>													
1,2,4-Trimethylbenzene	95-63-6	5.6 <sup>A</sup>	µg/L	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	0.15 J
Acetone	67-64-1	1,800 <sup>A</sup>	µg/L	ND	ND	ND	ND	ND	ND	ND [ND]	ND	2.3 J	ND
<b>SVOCs</b>													
Naphthalene	91-20-3	100 <sup>B</sup>	µg/L	ND	ND	ND	ND	0.53 J	ND	ND [ND]	ND	0.46 J	ND
<b>Metals (Total)</b>													
Barium	7440-39-3	1,000 <sup>C</sup>	µg/L	46 J	44.9	ND	180	ND	--	ND	120	ND	--
Lead	7439-92-1	15 <sup>C</sup>	µg/L	4.6 J	4.2 J	ND	10	ND	--	ND	ND	ND	--
Selenium	7782-49-2	50 <sup>C</sup>	µg/L	8.1	3.5	ND	ND	ND	--	ND	ND	ND	--
Zinc	7440-66-6	2,000 <sup>C</sup>	µg/L	51 J	13.4	--	--	--	--	--	--	--	--
<b>Petroleum Hydrocarbons</b>													
TPH	--	1,000 <sup>B</sup>	µg/L	4,000	ND	--	--	--	--	--	--	--	--
<b>EPH/VPH Fractions</b>													
C5-C8 Aliphatics	--	650 <sup>B</sup>	µg/L	--	--	ND	ND	ND	2.7 J	ND	ND	ND	ND
C9-C10 Aromatics	--	1,100 <sup>B</sup>	µg/L	--	--	ND	ND	ND	0.38 J	ND	ND	ND	ND
C9-C12 Aliphatics	--	1,400 <sup>B</sup>	µg/L	--	--	ND	ND	ND	1.9 J	ND	ND	ND	1.3 J
C9-C18 Aliphatics	--	1,400 <sup>B</sup>	µg/L	2,800	ND	ND	ND	ND	ND	ND	ND	ND	ND
C11-C22 Aromatics	--	1,100 <sup>B</sup>	µg/L	1,200	ND	ND	ND	ND	ND	ND	ND	ND	ND

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Results in brackets represent blind duplicate results.

A = EPA RSLs for Tap Water (EPA, 2023).

<sup>B</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

<sup>C</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

µg/L = Micrograms per liter.

ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%

Table 3-14: ERP Site 6 Detected Soil Analytical Results Summary  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	CASRN	Boring ID		6-SB1		6-SB2		6-SB3	6-SB4	6-SB5	6-SB6	6-SB7	6-SB8	6-SB9	6-SB10	6-SB11	6-SB12	6-SB13	6-SB14	6-DW1					
		Sample Depth (ft bgs)		1.5	3.5	1.5	7.0	5.5	5.0	3.5	3.5	1.0	1.5	1.0	1.5	1.3	3.5	1.0	5.5	4.1-4.6	7.3-7.6				
		Sample Date		Sep-90		Sep-90		Sep-90	Sep-90	Sep-90	Sep-90	Sep-90	Sep-90	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90	Oct-90	Apr-96				
		Screening Level					Units																		
MDEQ Tier-1 RBSL <sup>A</sup>																									
DC Comm.		DC Const.	Leaching >20 ft	RCRA Metals	EPA RSL <sup>B</sup> Industrial Soil																				
<b>VOCs</b>																									
2-Butanone	78-93-3	--	--	--	--	19,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
2-Hexanone	591-78-6	--	--	--	--	130	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
4-Methyl-2-Pentanone	108-10-1	--	--	--	--	14,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	<b>0.52 D</b>	<b>0.57 D</b>	ND	<b>0.099 J</b>	ND	ND	ND	ND [ND]	ND	<b>0.17</b>	ND	<b>0.1</b>	<b>0.2</b>	<b>0.18</b>	<b>0.066 J</b>	ND		
Carbon Disulfide	75-15-0	--	--	--	--	350	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Chloroform	67-66-3	--	--	--	--	1.4	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Ethylbenzene	100-41-4	28	1,300	130	--	25	mg/kg	ND	ND	ND	ND	<b>1.6 J</b>	<b>0.77</b>	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>5.9 J</b>		
Methylene Chloride	75-09-2	--	--	--	--	320	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>0.25 J</b>		
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	<b>4 J</b>	<b>5 J</b>	ND	ND	<b>17 J</b>	<b>4 J</b>	ND	ND	ND [ND]	ND	ND	ND	ND	ND	<b>0.007</b>	<b>60 J</b>		
Trichloroethylene	79-01-6	--	--	--	--	1.9	mg/kg	ND	ND	ND	ND	<b>4 J</b>	<b>4 J</b>	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>0.26 J</b>		
m/p-Xylene	--	310	610	1,600	--	240	mg/kg	ND	ND	ND	ND	<b>7.9 J</b>	<b>4.2 J</b>	ND	ND	ND	ND	ND	ND	ND	ND	ND	--		
o-Xylene	95-47-6	310	610	1,600	--	280	mg/kg	ND	ND	ND	ND	<b>2.6 J</b>	<b>2.3 J</b>	ND	ND	ND	ND	ND	ND	ND	ND	ND	--		
Xylenes (Total)	1330-20-7	310	610	1,600	--	250	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<b>37</b>		
<b>SVOCS</b>																									
2-Methylnaphthalene	91-57-6	250	250	35	--	300	mg/kg	ND	ND	ND	ND	<b>2.7 J</b>	<b>2.6 J</b>	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>12</b>		
Benzo(a)pyrene	50-32-8	2.4	39	12	--	2.1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Benzo(b)fluoranthene	205-99-2	24	390	120	--	21	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
bis(2-Ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>2.9 J</b>		
Crysene	218-01-9	2,400	39,000	3,500	--	2,100	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>0.19 J</b>		
Di-n-butylphthalate	84-74-2	--	--	--	--	66,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>0.22 J</b>		
Di-n-octylphthalate	117-84-0	--	--	--	--	820	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Fluoranthrene	206-44-0	2,500	2,500	440	--	3,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Fluorene	86-73-7	2,500	2,500	180	--	3,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>0.04 J</b>		
Indeno(1,2,3-cd)pyrene	193-39-5	24	390	380	--	21	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Naphthalene	91-20-3	9.5	140	62	--	8.6	mg/kg	ND	ND	ND	ND	<b>3 J</b>	<b>2.1 J</b>	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>11</b>		
Pyrene	129-00-0	1,900	1,900	430	--	2,300	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
<b>Metals</b>																									
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>6.2</b>	<b>4.5</b>	<b>4.4</b>	<b>3.4</b>	<b>3.2</b>	<b>2.6</b>	<b>2.2</b>	<b>2.1</b>	<b>5.9 [4.5]</b>	<b>3.6</b>	<b>7.2</b>	<b>3.8</b>	<b>3</b>	<b>4.3</b>	<b>4.8</b>	<b>2.4</b>	<b>3.9</b>	
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>187</b>	<b>189</b>	<b>155</b>	<b>73</b>	<b>145</b>	<b>164</b>	<b>261</b>	<b>333</b>	<b>267 [132]</b>	<b>152</b>	<b>464</b>	<b>171</b>	<b>165</b>	<b>168</b>	<b>140</b>	<b>108</b>	<b>273</b>	
Beryllium	7440-41-7	--	--	--	--	230	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	ND	ND	ND	ND	<b>0.33 J</b>		
Cadmium	7440 43 9	--	--	--	3.8	10	mg/kg	ND	ND	ND	ND	<b>0.41</b>	ND	ND	ND	ND [ND]	ND	ND	ND	<b>0.35</b>	ND	ND	ND		
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>12.2</b>	<b>10.4</b>	<b>12.3</b>	<b>7.7</b>	<b>18.3</b>	<b>8.1</b>	<b>9.5</b>	<b>11.5</b>	<b>12.9 [14.4]</b>	<b>10.3</b>	<b>11.3</b>	<b>7.9</b>	<b>9.5</b>	<b>16.7</b>	<b>7.2</b>	<b>8.9</b>		
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	<b>18.5</b>	<b>14.4</b>	<b>12.3</b>	<b>4.2</b>	<b>7.4</b>	<b>8.5</b>	<b>4.7</b>	<b>6.1</b>	<b>43.4 [15.2]</b>	<b>5.6</b>	<b>16.7</b>	<b>11.2</b>	<b>26.3</b>	<b>13.5</b>	<b>9.1</b>	<b>10</b>		
Lead	7439-92-1	--	--	--	140	800	mg/kg	<b>11.7</b>	<b>12.6</b>	<b>28.3</b>	<b>14.7</b>	<b>52.3</b>	<b>12</b>	<b>7.5</b>	<b>7.6</b>	<b>9.5 [9.6]</b>	<b>2.5</b>	<b>8.2</b>	<b>4.9</b>	<b>6.1</b>	<b>4.6</b>	<b>4.7</b>	<b>4.3</b>		
Mercury	7439-97-6	--	--	--	1	4.6	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	ND	ND	ND	ND	ND		
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	<b>10.4</b>	ND	ND	ND	ND	11	ND	7.7	ND [12.4]	ND	7.3	ND	9	9.6	ND	8.6		
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	ND	<b>0.37</b>	<b>0.35</b>	ND	ND		
Silver	7440-22-4	--	--	--	--	580	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	ND	ND	ND	ND	ND		
Thallium	7440-28-0	--	--	--	--	1.2	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	ND	ND	ND	ND	ND		
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	<b>51.1</b>	<b>38.5</b>	<b>36.8</b>	<b>10.1</b>	<b>33.7</b>	<b>35.8</b>	<b>17.7</b>	<b>15.6</b>	<b>60.8 [43.1]</b>	<b>36.6</b>	<b>42.1</b>	<b>38.7</b>	<b>48.4</b>	<b>45.7</b>	<b>27.7</b>	<b>53.7</b>		
<b>Petroleum Hydrocarbons</b>																									
TPH	--	--	--	--	--	--	mg/kg	<b>12</b>	ND	<b>120</b>	ND	<b>3,300</b>	<b>8,100</b>	<b>12</b>	<b>52</b>	<b>310 [ND]</b>	<b>170</b>	<b>650</b>	<b>130</b>	<b>13,000</b>	<b>16</b>	<b>60</b>	ND		
DRO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<b>1,900</b>		
GRO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<b>7,300 J</b>		
JP-4	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<b>5,700</b>		
ORO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<b>10,000</b>		
<b>EPH/VPH Fractions (Converted)</b>																									
C9-C10 Aromatics	--	1,000	1,000	720	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<b>7,300</b>		
C9 C18 Aliphatics	--	540	900	270,000	--	--	mg/kg	<b>8.4</b>	ND	<b>84</b>	ND	<b>2,310</b>	<b>5,670</b>	<b>8.4</b>	<b>36.4</b>	<b>217 [ND]</b>	<b>119</b>	<b>455</b>	<b>91</b>	<b>9,100</b>	<b>11.2</b>	<b>42</b>	ND		
C11 C22 Aromatics	--	3,900	3,900	2,000	--	--	mg/kg	<b>3.6</b>	ND	<b>36</b>	ND	<b>990</b>	<b>2,430</b>	<b>3.6</b>	<b>15.6</b>	<b>93 [ND]</b>	<b>51</b>	<b>195</b>	<b>39</b>	<b>3,900</b>	<b>4.8</b>	<b>18</b>	ND		

Notes:  
**Bolded** value indicates the analyte was detected above the limit of detection (LOD).  
Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.  
 Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.  
 Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.  
 Results in brackets represent blind duplicate results.  
<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).  
<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).  
<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).  
 CASRN = Chemical Abstracts Service Registration Number  
 -- = Not available/not analyzed.  
 D = Result from a dilution.  
 ft bgs = Feet below ground surface.  
 J = Indicates the result is an estimated value.  
 mg/kg = Milligrams per kilogram.  
 ND = Not detected.

Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%
Diesel-Range Organics (DRO)	--	40.00%	60.00%
Gasoline-Range Organics (GRO)	100.00%	--	--
Oil-Range Organics (ORO)	--	--	100.00%
Jet Propellant 4 (JP-4)	--	70.00%	30.00%

Table 3-14: ERP Site 6 Detected Soil Analytical Results Summary  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	CASRN	Boring ID					Units	6-SB15			6-SB16			6-SB17			6-SB18		
		Sample Depth (ft bgs)						0.5-2.5	2.5-4.0	7.7-8.1	0.9-3.9	3.9-4.5	8.5-9.5	0.5-2.5	4.5-5.8	9.5-9.9	0.5-2.5	6.4-7.3	8.0-8.3
		Sample Date						Apr-96			Apr-96			Apr-96			Apr-96		
		Screening Level						EPA RSL <sup>B</sup>	Industrial Soil										
DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	MDEQ Tier-1 RBSL <sup>A</sup>															
<b>VOCs</b>																			
2-Butanone	78-93-3	--	--	--	--	19,000	mg/kg	<b>0.043 J</b>	<b>0.008 J</b>	<b>0.007 J</b>	<b>0.008 J</b>	<b>0.009 J</b>	ND	ND	ND	ND	<b>0.009 J</b>	<b>0.005 J</b>	<b>0.025 J</b>
2-Hexanone	591-78-6	--	--	--	--	130	mg/kg	ND	<b>0.004 J</b>	ND	<b>0.005 J</b>	<b>0.005 J</b>	ND	ND	ND	ND	<b>0.004 J</b>	ND	ND
4-Methyl-2-Pentanone	108-10-1	--	--	--	--	14,000	mg/kg	ND	ND	ND	<b>0.011 J</b>	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	<b>1.6 J</b>	<b>0.18 J</b>	<b>1.3 J</b>	<b>0.13</b>	<b>0.14</b>	<b>2</b>	ND	<b>1.8</b>	ND	ND	<b>2.6 J</b>	<b>2.1 J</b>
Carbon Disulfide	75-15-0	--	--	--	--	350	mg/kg	ND	ND	<b>0.002 J</b>	ND	ND	ND	ND	ND	ND	<b>0.001 J</b>	<b>0.002 J</b>	<b>0.002 J</b>
Chloroform	67-66-3	--	--	--	--	1.4	mg/kg	ND	ND	ND	<b>0.001 J</b>	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	100-41-4	28	1,300	130	--	25	mg/kg	<b>0.002 J</b>	ND	ND	ND	ND	<b>0.1 J</b>	<b>3.6</b>	<b>0.64 J</b>	<b>1.2 J</b>	ND	ND	ND
Methylene Chloride	75-09-2	--	--	--	--	320	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	ND	ND	ND	ND	ND	ND	<b>19</b>	<b>6.4</b>	<b>5.1</b>	ND	ND	ND
Trichloroethylene	79-01-6	--	--	--	--	1.9	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m/p-Xylene	--	310	610	1,600	--	240	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	95-47-6	310	610	1,600	--	280	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Xylenes (Total)	1330-20-7	310	610	1,600	--	250	mg/kg	<b>0.005 J</b>	ND	ND	ND	ND	<b>0.51 J</b>	<b>26</b>	<b>4.6</b>	<b>8.1</b>	ND	ND	ND
<b>SVOCS</b>																			
2-Methylnaphthalene	91-57-6	250	250	35	--	300	mg/kg	ND	ND	ND	ND	ND	<b>0.17 J</b>	<b>0.11 J</b>	<b>12</b>	<b>1.3</b>	ND	ND	ND
Benzo(a)pyrene	50-32-8	2.4	39	12	--	2.1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	205-99-2	24	390	120	--	21	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	ND	ND	<b>0.058 J</b>	<b>0.28 J</b>	<b>0.56 J</b>	<b>0.19 J</b>	ND	<b>1.2 J</b>	<b>0.16 J</b>	<b>0.059 J</b>	<b>0.09 J</b>	<b>0.051 J</b>
Crysene	218-01-9	2,400	39,000	3,500	--	2,100	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	84-74-2	--	--	--	--	66,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	<b>0.12 J</b>	ND	ND	ND
Di-n-octylphthalate	117-84-0	--	--	--	--	820	mg/kg	ND	ND	ND	<b>0.019 J</b>	<b>0.05 J</b>	ND	ND	ND	ND	ND	ND	ND
Fluoranthrene	206-44-0	2,500	2,500	440	--	3,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	86-73-7	2,500	2,500	180	--	3,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	24	390	380	--	21	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	91-20-3	9.5	140	62	--	8.6	mg/kg	ND	ND	ND	ND	ND	<b>0.2</b>	<b>0.42</b>	<b>13</b>	<b>2</b>	ND	ND	ND
Pyrene	129-00-0	1,900	1,900	430	--	2,300	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
<b>Metals</b>																			
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>5.4</b>	<b>2.7</b>	<b>5.2 J</b>	<b>15.2</b>	<b>7.2</b>	<b>3.1</b>	ND	ND	ND	<b>5.9</b>	<b>5.7</b>	<b>3.7</b>
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>468</b>	<b>116</b>	<b>145</b>	<b>199</b>	<b>250</b>	<b>115</b>	<b>444</b>	<b>186</b>	<b>119</b>	<b>258</b>	<b>248</b>	<b>306</b>
Beryllium	7440-41-7	--	--	--	--	230	mg/kg	<b>0.28 J</b>	<b>0.25 J</b>	<b>0.23 J</b>	<b>0.52 J</b>	<b>0.37 J</b>	<b>0.23 J</b>	ND	ND	ND	<b>0.46 J</b>	<b>0.27 J</b>	<b>0.24 J</b>
Cadmium	7440 43 9	--	--	--	3.8	10	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>11.3</b>	ND	<b>11</b>	<b>10.4</b>	<b>12</b>	<b>10.5</b>	<b>9.2</b>	<b>7.1</b>	<b>7.8</b>	<b>10.5</b>	<b>9.8</b>	<b>12.9</b>
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	<b>17.1</b>	<b>13.7</b>	<b>9.9</b>	<b>41.7</b>	<b>17.6</b>	<b>8.8</b>	<b>10.7</b>	<b>13.4</b>	<b>15.3</b>	<b>16.9</b>	<b>32.7</b>	<b>9.6</b>
Lead	7439-92-1	--	--	--	140	800	mg/kg	<b>5.8</b>	<b>6.3</b>	<b>5</b>	<b>14.8</b>	<b>8.5</b>	<b>4.6</b>	<b>4.4</b>	<b>8.8</b>	<b>5.9</b>	<b>8.7</b>	<b>6.9</b>	<b>5.1</b>
Mercury	7439-97-6	--	--	--	1	4.6	mg/kg	ND	ND	ND	<b>0.09</b>	ND	ND	ND	ND	ND	<b>0.11</b>	ND	ND
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	<b>8.9</b>	<b>8.2</b>	<b>8.4</b>	<b>10.7</b>	<b>9.4</b>	<b>5.6 J</b>	<b>9.4</b>	<b>8.2</b>	<b>11.9</b>	<b>11.3</b>	<b>8.7</b>	<b>8.9</b>
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	7440-22-4	--	--	--	--	580	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	7440-28-0	--	--	--	--	1.2	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	<b>0.34</b>	<b>0.42</b>	ND
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	<b>36.6</b>	<b>47.9</b>	<b>40.2</b>	<b>64.2</b>	<b>40.6</b>	<b>34.9</b>	<b>32.8</b>	<b>38.9</b>	<b>38.7</b>	<b>49.4</b>	<b>52.3</b>	<b>33.2</b>
<b>Petroleum Hydrocarbons</b>																			
TPH	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
DRO	--	--	--	--	--	--	mg/kg	ND	ND	<b>290</b>	ND	<b>17</b>	<b>130</b>	<b>18 J</b>	<b>2,800</b>	<b>690</b>	ND	<b>20</b>	<b>71</b>
GRO	--	--	--	--	--	--	mg/kg	ND	ND	ND	ND	<b>460 J</b>	<b>2,600 J</b>	<b>17,000 J</b>	<b>2,900</b>	ND	ND	<b>110</b>	
JP-4	--	--	--	--	--	--	mg/kg	ND	ND	<b>95</b>	ND	<b>270</b>	<b>1,300</b>	<b>7,800</b>	<b>2,600</b>	ND	<b>50</b>	<b>76</b>	
ORO	--	--	--	--	--	--	mg/kg	ND	ND	<b>79</b>	ND	ND	<b>300</b>	ND	<b>14,000</b>	<b>1,100</b>	ND	<b>89</b>	ND
<b>EPH/VPH Fractions (Converted)</b>																			
C9-C10 Aromatics	--	1,000	1,000	720	--	--	mg/kg	ND	ND	ND	ND	ND	<b>460</b>	<b>2,600</b>	<b>17,000</b>	<b>2,900</b>	ND	ND	<b>110</b>
C9 C18 Aliphatics	--	540	900	270,000	--	--	mg/kg	ND	ND	183	ND	<b>6.8</b>	<b>241</b>	<b>917</b>	<b>6,580</b>	<b>2,096</b>	ND	43	<b>81.6</b>
C11 C22 Aromatics	--	3,900	3,900	2,000	--	--	mg/kg	ND	ND	281	ND	<b>10.2</b>	<b>459</b>	<b>401</b>	<b>5,420</b>	<b>2,294</b>	ND	116	<b>65.4</b>

Notes:  
**Bolded** value indicates the analyte was detected above the limit of detection (LOD).  
Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.  
 Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.  
 Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.  
 Results in brackets represent blind duplicate results.  
<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).  
<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).  
<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).  
 CASRN = Chemical Abstracts Service Registration Number  
 -- = Not available/not analyzed.  
 D = Result from a dilution.  
 ft bgs = Feet below ground surface.  
 J = Indicates the result is an estimated value.  
 mg/kg = Milligrams per kilogram.  
 ND = Not detected.

Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%
Diesel-Range Organics (DRO)	--	40.00%	60.00%
Gasoline-Range Organics (GRO)	100.00%	--	--
Oil-Range Organics (ORO)	--	--	100.00%
Jet Propellant 4 (JP-4)	--	70.00%	30.00%

Table 3-14: ERP Site 6 Detected Soil Analytical Results Summary  
Montana Air National Guard Base - Great Falls International Airport  
Great Falls, Montana

Analyte	CASRN	Boring ID						6-SED1		6-SED2		6-SED3	
		Sample Depth (ft bgs)						--	0.0-1.0	--	0.0-1.0	--	0.0-1.0
		Sample Date						Oct-90	Jul-96	Oct-90	Jul-96	Oct-90	Jul-96
		Screening Level						Units					
DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	EPA RSL <sup>B</sup> Industrial Soil									
<b>VOCs</b>													
2-Butanone	78-93-3	--	--	--	--	19,000	mg/kg	ND	ND	ND	ND	ND	ND
2-Hexanone	591-78-6	--	--	--	--	130	mg/kg	ND	<b>0.002 J</b>	ND	<b>0.006 J</b>	ND	<b>0.008 J</b>
4-Methyl-2-Pentanone	108-10-1	--	--	--	--	14,000	mg/kg	ND	ND	ND	<b>0.005 J</b>	ND	ND
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	ND	ND	ND	ND	ND	ND
Carbon Disulfide	75-15-0	--	--	--	--	350	mg/kg	ND	ND	ND	ND	ND	<b>0.001 J</b>
Chloroform	67-66-3	--	--	--	--	1.4	mg/kg	ND	ND	ND	ND	ND	ND
Ethylbenzene	100-41-4	28	1,300	130	--	25	mg/kg	ND	ND	ND	ND	ND	ND
Methylene Chloride	75-09-2	--	--	--	--	320	mg/kg	ND	<b>0.003 J</b>	ND	<b>0.003 J</b>	ND	<b>0.003 J</b>
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	ND	ND	ND	ND	ND	ND
Trichloroethylene	79-01-6	--	--	--	--	1.9	mg/kg	ND	ND	ND	ND	ND	ND
m/p-Xylene	--	310	610	1,600	--	240	mg/kg	ND	ND	ND	ND	ND	ND
o-Xylene	95-47-6	310	610	1,600	--	280	mg/kg	ND	ND	ND	ND	ND	ND
Xylenes (Total)	1330-20-7	310	610	1,600	--	250	mg/kg	--	ND	--	ND	--	ND
<b>SVOCS</b>													
2-Methylnaphthalene	91-57-6	250	250	35	--	300	mg/kg	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	50-32-8	2.4	39	12	--	2.1	mg/kg	ND	ND	ND	<b>0.38 J</b>	ND	ND
Benzo(b)fluoranthene	205-99-2	24	390	120	--	21	mg/kg	ND	<b>0.54 J</b>	ND	<b>0.66 J</b>	ND	<b>0.17 J</b>
bis(2-Ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	ND	ND	ND	ND	ND	ND
Crysene	218-01-9	2,400	39,000	3,500	--	2,100	mg/kg	ND	<b>0.49 J</b>	ND	ND	ND	<b>0.24 J</b>
Di-n-butylphthalate	84-74-2	--	--	--	--	66,000	mg/kg	ND	<b>0.13 J</b>	ND	ND	ND	ND
Di-n-octylphthalate	117-84-0	--	--	--	--	820	mg/kg	ND	ND	ND	ND	ND	ND
Fluoranthrene	206-44-0	2,500	2,500	440	--	3,000	mg/kg	ND	<b>0.19 J</b>	ND	<b>0.22 J</b>	ND	ND
Fluorene	86-73-7	2,500	2,500	180	--	3,000	mg/kg	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	24	390	380	--	21	mg/kg	ND	<b>0.11 J</b>	ND	ND	ND	ND
Naphthalene	91-20-3	9.5	140	62	--	8.6	mg/kg	ND	ND	ND	ND	ND	ND
Pyrene	129-00-0	1,900	1,900	430	--	2,300	mg/kg	ND	<b>0.49 J</b>	ND	<b>0.28 J</b>	ND	<b>0.13 J</b>
<b>Metals</b>													
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>6.3</b>	<b>6 J</b>	<b>4.9 [5.9]</b>	<b>7.6 J</b>	<b>5.3</b>	<b>6.8 J</b>
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>294</b>	<b>370 J</b>	<b>269 [344]</b>	<b>458 J</b>	<b>311</b>	<b>276 J</b>
Beryllium	7440-41-7	--	--	--	--	230	mg/kg	ND	<b>0.55 J</b>	ND [ND]	<b>0.66 J</b>	ND	<b>0.49 J</b>
Cadmium	7440 43 9	--	--	--	3.8	10	mg/kg	<b>5.4</b>	<b>4.3</b>	<b>6.4 [6.0]</b>	<b>11.9</b>	<b>5.9</b>	<b>21</b>
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>43.2</b>	<b>83.1 J</b>	<b>57.1 [53.4]</b>	<b>80.5 J</b>	<b>58.8</b>	<b>19.1 J</b>
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	<b>34.6</b>	<b>38.9</b>	<b>34.8 [42.3]</b>	<b>63.4</b>	<b>48.5</b>	<b>26.3</b>
Lead	7439-92-1	--	--	--	140	800	mg/kg	<b>236</b>	<b>173</b>	<b>529 [211]</b>	<b>758</b>	<b>284</b>	<b>327</b>
Mercury	7439-97-6	--	--	--	1	4.6	mg/kg	ND	ND	<b>0.061 [0.06]</b>	ND	<b>0.061</b>	ND
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	<b>18.9</b>	<b>14.2</b>	<b>15.6 [16.7]</b>	<b>24.5</b>	<b>17.1</b>	<b>12.8</b>
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	<b>0.41</b>	ND	ND [ND]	ND	ND	ND
Silver	7440-22-4	--	--	--	--	580	mg/kg	ND	ND	ND [ND]	<b>1.6 J</b>	ND	ND
Thallium	7440-28-0	--	--	--	--	1.2	mg/kg	ND	ND	ND [ND]	ND	ND	ND
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	<b>238</b>	<b>235</b>	<b>284 [251]</b>	<b>368</b>	<b>249</b>	<b>184</b>
<b>Petroleum Hydrocarbons</b>													
TPH	--	--	--	--	--	--	mg/kg	<b>1,700</b>	--	<b>3,000 [2,600]</b>	--	<b>2,500</b>	--
DRO	--	--	--	--	--	--	mg/kg	--	<b>900 J</b>	--	<b>1,100 J</b>	--	<b>680 J</b>
GRO	--	--	--	--	--	--	mg/kg	--	ND	--	ND	--	ND
JP-4	--	--	--	--	--	--	mg/kg	--	ND	--	ND	--	ND
ORO	--	--	--	--	--	--	mg/kg	--	<b>3,700 J</b>	--	<b>500 J</b>	--	<b>1,300 J</b>
<b>EPH/VPH Fractions (Converted)</b>													
C9-C10 Aromatics	--	1,000	1,000	720	--	--	mg/kg	--	--	--	--	--	--
C9 C18 Aliphatics	--	540	900	270,000	--	--	mg/kg	<b>1,190</b>	<b>360</b>	<b>2,100 [1,820]</b>	<b>440</b>	<b>1,750</b>	<b>272</b>
C11 C22 Aromatics	--	3,900	3,900	2,000	--	--	mg/kg	<b>510</b>	<b>4,240</b>	<b>900 [780]</b>	<b>1,160</b>	<b>750</b>	<b>1,708</b>

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.

Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.

Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.

Results in brackets represent blind duplicate results.

<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).

<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).

<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

D = Result from a dilution.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

mg/kg = Milligrams per kilogram.

ND = Not detected.

Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%
Diesel-Range Organics (DRO)	--	40.00%	60.00%
Gasoline-Range Organics (GRO)	100.00%	--	--
Oil-Range Organics (ORO)	--	--	100.00%
Jet Propellant 4 (JP-4)	--	70.00%	30.00%

**Table 3-15: ERP Site 6 Detected Groundwater Analytical Results - October 2020**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			6-MW1	6-MW2	6-MW4	6-MW6
	Screen Depth (ft bgs)			44 - 64	41 - 61	44 - 64	40 - 60
	Sample Date			Oct-20	Oct-20	Oct-20	Oct-20
	CASRN	Screening Level	Units				
<b>VOCs</b>							
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	<b>1.2</b>	<b>0.47 J-</b>	< 0.80 UJ	<b>0.80 J-</b>
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	< 0.40	<b>2.6 J-</b>	< 0.40 UJ	< 0.40 UJ
1,2-Dichloropropane	78-87-5	5 <sup>A</sup>	µg/L	<b>0.52 J</b>	< 0.40 UJ	< 0.40 UJ	< 0.40 UJ
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>0.24 J</b>	< 0.40 UJ	< 0.40 UJ	< 0.40 UJ
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	< 0.40	< 0.40 UJ	<b>2.0 J</b>	< 0.40 UJ
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	<b>31</b>	<b>0.77 J-</b>	< 0.40 UJ	<b>8.2 J-</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>0.16 J</b>	< 0.40 UJ	< 0.40 UJ	< 0.40 UJ
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	<b>1.3</b>	<b>1.1 J-</b>	< 0.40 UJ	< 0.40 UJ
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	< 0.80	<b>0.17 J-</b>	<b>0.15 J-</b>	< 0.80 UJ
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	< 0.80	<b>0.44 J-</b>	< 0.80 UJ	<b>0.20 J-</b>
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	< 0.40	<b>0.55 J-</b>	< 0.40 UJ	< 0.40 UJ
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	<b>1.5</b>	<b>5.5 J-</b>	< 0.40 UJ	<b>1.8 J-</b>
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	< 0.40	<b>0.44 J-</b>	< 0.40 UJ	< 0.40 UJ
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.40	< 0.40 UJ	<b>0.19 J-</b>	< 0.40 UJ
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	< 1.0 U	0.57 U	< 1.0 U	< 1.0 U
<b>EPH</b>							
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	< 280	<b>540</b>	< 300	< 290
<b>VPH</b>							
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>34 J</b>	<b>41</b>	< 20 U	< 20 U
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	< 20 U	<b>50 J+</b>	< 20	< 20 U
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	< 20 U	<b>53 J+</b>	< 20 U	< 20 U
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.50 J	<b>0.91</b>	< 0.50	< 0.50
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 2.0 J	<b>4.7 J+</b>	< 2.0	< 2.0
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.50 J	<b>0.80 J+</b>	< 0.50	< 0.50

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+/J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

**Table 3-16: ERP Site 6 Detected Groundwater Analytical Results - April 2021**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			6-MW1	6-MW2	6-MW5	6-MW6
	Screen Depth (ft bgs)			44 - 64	41 - 61	42 - 62	40 - 60
	Sample Date			Apr-21	Apr-21	Apr-21	Apr-21
	CASRN	Screening Level	Units				
<b>VOCs</b>							
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	<b>5.0</b>	< 0.80	< 0.80	< 0.80
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	< 0.40	< 1.0 U	< 0.40	<b>0.93 J</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>0.47 J</b>	< 0.40	< 0.40	< 0.40
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	<b>100</b>	<b>0.73 J</b>	< 0.40	<b>1.9</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>0.24 J</b>	< 0.40	< 0.40	< 0.40
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	<b>3.0</b>	<b>0.30 J</b>	< 0.40	<b>0.26 J</b>
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	<b>0.66 J</b>	< 0.80	< 0.80	<b>0.41 J</b>
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	<b>2.0</b>	< 0.40	< 0.40	< 0.40
o-Xylene	95-47-6	10,000 <sup>A</sup>	µg/L	< 0.40	<b>0.24 J</b>	< 0.40	< 0.40
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	<b>2.8</b>	<b>1.9</b>	< 0.40	<b>1.3</b>
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	<b>1.5</b>	<b>0.60 J</b>	< 0.40	< 0.40
<b>VPH</b>							
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>110 J</b>	<b>29 J+</b>	< 20 UJ	--
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>32</b>	<b>36</b>	<b>12 J</b>	--
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>24 J+</b>	<b>33</b>	< 20 U	--
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>0.69</b>	< 0.50	< 0.50	--
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 2.0	<b>2.9 J+</b>	< 2.0 UJ	--

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+ noted if high bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

**Table 3-17: ERP Site 6 Detected Groundwater Analytical Results - October 2021**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			6-MW1	6-MW5	6-MW6
	Screen Depth (ft bgs)			44 - 64	42 - 62	40 - 60
	Sample Date			Oct-21	Oct-21	Oct-21
	CASRN	Screening Level	Units			
<b>VOCs</b>						
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	<b>2.0 [2.1]</b>	< 0.80	<b>1.0</b>
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	<b>0.39 J [0.15 J]</b>	< 0.40	< 0.40
Acetone	67-64-1	1,400 <sup>B</sup>	µg/L	<b>2.8 J [2.7 J]</b>	< 6.4	< 6.4
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>0.64 J [0.69 J]</b>	< 0.40	< 0.40
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	<b>52 [53]</b>	< 0.40	<b>13</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>1.8 [1.7]</b>	< 0.40	< 0.40
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	<b>14 [14]</b>	< 0.40	< 0.40
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	<b>0.67 J [0.29 J]</b>	< 0.80	< 0.80
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	<b>0.82 J [0.88 J]</b>	< 0.80	< 0.80
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	<b>4.5 [4.7]</b>	< 0.40	< 0.40
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	<b>12 [12]</b>	< 0.40	<b>1.7</b>
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	<b>0.87 J [0.86 J]</b>	< 0.40	< 0.40
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	<b>0.93 J [0.94 J]</b>	<b>0.16 J</b>	<b>0.24 J</b>
<b>EPH</b>						
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	--	<b>540</b>	--
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	--	<b>1,300 J+</b>	--
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	--	<b>250 J</b>	--
Total EPH	--	1,000 <sup>C</sup>	µg/L	--	<b>2,000</b>	--
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	<b>410 J+ [420 J+]</b>	<b>1,300 J+</b>	< 310
<b>VPH</b>						
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>130 J+ [120 J+]</b>	< 20 U	< 20 U
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>100 J+ [87 J+]</b>	<b>23</b>	<b>12 J</b>
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>57 J+ [60 J+]</b>	<b>30 J+</b>	< 20 U
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>0.83 J+ [0.83 J+]</b>	<b>0.15 J</b>	<b>0.15 J</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>2.0 J+ [1.6 J+]</b>	<b>0.30 J</b>	< 0.50
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	<b>5.6 J+ [1.9 J+]</b>	< 2.0	< 2.0
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	<b>1.3 J+ [&lt; 1.0]</b>	<b>0.45 J</b>	< 1.0

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

µg/L = Micrograms per liter.

J = Indicates the result is an estimated value. J+ noted if high bias is suspected.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

**Table 3-18: ERP Site 6 Detected Groundwater Analytical Results - April 2022**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			6-MW1	6-MW2	6-MW5	6-MW6
	Screen Depth (ft bgs)			44 - 64	41 - 61	42 - 62	40 - 60
	Sample Date			Apr-22	Apr-22	Apr-22	Apr-22
	CASRN	Screening Level	Units				
<b>Volatile Organic Compounds</b>							
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	<b>5.8</b>	< 0.80 [<< 0.80]	< 0.80	<b>0.31 J</b>
1,2-Dichloroethane	107-06-2	5 <sup>A</sup>	µg/L	<b>0.54 J</b>	< 0.40 [<< 0.40]	< 0.40	< 0.40
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	<b>130</b>	<b>0.41 J [0.40 J]</b>	< 0.40	<b>1.3</b>
sec-Butylbenzene	135-98-8	200 <sup>B</sup>	µg/L	<b>1.1</b>	<b>1.4 [1.6]</b>	< 0.40	<b>1.5</b>
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	<b>1.7</b>	< 0.40 [ <b>0.25 J</b> ]	< 0.40	< 0.40
<b>EPH</b>							
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	--	<b>1,300 [1,200]</b>	<b>630</b>	--
<b>VPH</b>							
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	--	<b>34 [37]</b>	< 20 U	--
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	--	<b>31 J [51 J]</b>	< 20 U	--
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	--	<b>32 J+ [45]</b>	< 20 U	--
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	--	<b>0.24 J [&lt;&lt; 0.50]</b>	< 0.50	--
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	--	<b>1.0 J+ [&lt;&lt; 1.0]</b>	< 1.0	--

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

J = Indicates the result is an estimated value. J+J- noted if high/low bias is suspected.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

µg/L = Micrograms per liter.

EPH fractionation was not performed during the April 2022 sampling event.

Table 3-19: ERP Site 7 Detected Soil Analytical Results Summary  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	CASRN	Boring ID					Units	7-SB1	7-SB2	7-SB3		7-SB4	7-DW1		7-SB5		7-SB6			7-SB7						
		Sample Depth (ft bgs)								1.5	1.0		3.5	5.5	5.0	1.2-3.2	3.2-4.2	1.0-3.0	4.5-5.4	8.0-8.6	0.0-2.0	3.5-5.5	7.2-8.0	1.0-3.0	3.4-5.2	8.0-8.3
		Sample Date								Sep-90	Sep-90		Sep-90		Sep-90	Apr-96		Apr-96		Apr-96			Apr-96			
		Screening Level								MDEQ Tier-1 RBSL <sup>A</sup>			EPA RSL <sup>B</sup>													
DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	Industrial Soil																						
<b>VOCs</b>																										
1,1,2-Trichloroethane	79-00-5	--	--	--	--	1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.5				
2-Butanone	78-93-3	--	--	--	--	19,000	mg/kg	ND	ND	ND	ND	ND	0.002 J	0.015	0.057 J	ND	ND	0.006 J	0.005 J	ND	0.012 J	0.005 J	ND			
2-Hexanone	591-78-6	--	--	--	--	130	mg/kg	ND	ND	ND	ND	ND	0.007 J	ND	ND	ND	ND	0.001 J	ND	ND	ND	ND				
4-Methyl-2-Pentanone	108-10-1	--	--	--	--	14,000	mg/kg	ND	ND	ND	ND	ND	0.019	ND												
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	ND	ND	ND	ND	0.1 J	0.82 J	0.820 J	0.85 J	0.92 J	ND	0.81 J	0.13 J	1.4 J	1.4	1.8	1.7			
Benzene	71-43-2	230	8,900	0.25	--	5.1	mg/kg	ND	ND	2.6 J	ND	ND	ND	ND	0.005 J	ND	0.83 J	ND	ND	ND	ND	ND				
Carbon Disulfide	75-15-0	--	--	--	--	350	mg/kg	ND	ND	ND	ND	ND	0.001 J	ND	0.002 J	ND										
Chlorobenzene	108-90-7	--	--	--	--	130	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
Chloroform	67-66-3	--	--	--	--	1.4	mg/kg	ND	ND	ND	ND	ND	0.001 J	ND	ND	ND	0.73 J	ND	0.001 J	ND	ND	ND				
Ethylbenzene	100-41-4	28	1,300	130	--	25	mg/kg	ND	ND	13	24	ND	ND	ND	0.19 J	13	ND	ND	0.5 J	ND	ND	0.14 J				
Methylene Chloride	75-09-2	--	--	--	--	320	mg/kg	ND	ND	ND	ND	ND	0.026 J	ND												
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	ND	ND	76	140	ND	ND	ND	0.006 J	ND	5.7	ND	ND	1.1 J	ND	ND				
trans-1,2-Dichloroethene	156-60-5	--	--	--	--	30	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.18 J				
Trichloroethylene	79-01-6	--	--	--	--	1.9	mg/kg	ND	ND	ND	ND	ND	ND	ND	0.004 J	ND										
Xylenes (Total)	1330-20-7	310	610	1,600	--	250	mg/kg	ND	ND	119	159	ND	ND	ND	0.004 J	1.6	80	0.001 J	ND	3.3	ND	ND				
<b>SVOCs</b>																										
2-Methylnaphthalene	91-57-6	250	250	35	--	300	mg/kg	ND	ND	42	27	ND	ND	0.019 J	0.004 J	5.1	1.6	ND	ND	3.8	ND	ND	3.7			
bis(2-Ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	ND	ND	5.4	2.8 J	ND	ND	0.92	ND	0.59 J	ND	ND	ND	ND	0.13 J	0.14 J	0.2 J			
Di-n-butylphthalate	84-74-2	--	--	--	--	66,000	mg/kg	ND	ND	ND	ND	0.14 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
Di-n-octylphthalate	117-84-0	--	--	--	--	820	mg/kg	ND	ND	ND	ND	ND	0.043 J	ND												
Fluoranthrene	206-44-0	2,500	2,500	440	--	3,000	mg/kg	ND	ND	ND	ND	ND	0.017 J	ND												
Fluorene	86-73-7	2,500	2,500	180	--	3,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	0.039 J	0.058 J	ND	ND	0.06 J	ND	ND	0.063 J				
Naphthalene	91-20-3	9.5	140	62	--	8.6	mg/kg	ND	ND	22	13	ND	ND	0.016 J	0.007 J	3.3	0.95 J	ND	ND	1.8	ND	ND	2.3			
Pyrene	129-00-0	1,900	1,900	430	--	2,300	mg/kg	ND	ND	ND	ND	ND	0.018 J	0.005 J	ND											
<b>Metals</b>																										
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	2.7	4.5	4.6	5.8	6.2	ND	ND	11.1	1.9	3.1	ND	ND	ND	9.9	ND	ND			
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	250	178	257	253	11	239	229	158	132	390	181	167	165	292	122	729			
Beryllium	7440-41-7	--	--	--	--	230	mg/kg	--	--	--	--	--	ND	ND	0.78	0.33 J	0.55 J	ND	ND	ND	ND	ND	ND			
Cadmium	7440-43-9	--	--	--	3.8	10	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	9.7	16.5	15.7	12.3	7.9	19.3	13.1	14.2	7.2	11.3	10.7	6.5	10.4	17.5	6.3	10.9			
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	19	15.3	17	17	17.1	18.9	15.1	32.1	16	24.3	19.7	13.1	17	13.9	10.5	13.3			
Lead	7439-92-1	--	--	--	140	800	mg/kg	8	10.7	443	167	9.9	8.5	9.4	13.5	17.5	7.7	7.5	4.5	11.7	9.3	5.8	9.2			
Mercury	7439-97-6	--	--	--	1	4.6	mg/kg	--	--	--	--	--	ND	0.11	ND	ND	0.09	ND	ND	ND	ND	ND	ND			
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	ND	10.1	10.5	7.8	ND	16.2	13.5	13.6	7.2	9.5	10.9	7.6 J	9.3 J	16.1	9.3	12.1			
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	ND	ND	0.6	0.42	0.37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
Thallium	7440-28-0	--	--	--	--	1.2	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	30.4	43.2	158	116	39.6	45.7	50.8	86.8	55.3	65.3	45.8	36.6	48.2	43.5	41.5	37			
<b>Petroleum Hydrocarbons</b>																										
TPH	--	--	--	--	--	--	mg/kg	34	17	19,000	14,000	44	--	--	--	--	--	--	--	--	--	--	--			
DRO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	ND	13	ND	790	510	ND	ND	900	ND	60	800			
GRO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	ND	ND	ND	1,200 J	760 J	ND	ND	960 J	ND	8.1 J	1,700 J			
JP-4	--	--	--	--	--	--	mg/kg	--	--	--	--	--	ND	ND	ND	760	530	ND	ND	470	ND	ND	950			
ORO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	ND	140	ND	7.8	3.8	ND	ND	8,900	ND	460	8,400			
<b>EPH/VPH Fractions (Converted)</b>																										
C9-C10 Aromatics	--	1,000	1,000	720	--	--	mg/kg	--	--	--	--	--	ND	ND	ND	1,200 J	760 J	ND	ND	960	ND	8.1	1,700			
C9-C18 Aliphatics	--	540	900	270,000	--	--	mg/kg	23.8	11.9	13,300	9,800	30.8	ND	5.2	ND	848	575	ND	ND	689	ND	24	985			
C11-C22 Aromatics	--	3,900	3,900	2,000	--	--	mg/kg	10.2	5.1	5,700	4,200	13.2	ND	148	ND	710	469	ND	ND	9,581	ND	496	9,165			

Notes:  
**Bolded** value indicates the analyte was detected above the limit of detection (LOD).  
Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.  
 Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.  
 Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.  
<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).  
<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).  
<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).  
 CASRN = Chemical Abstracts Service Registration Number  
 -- = Not available/not analyzed.  
 ft bgs = Feet below ground surface.  
 J = Indicates the result is an estimated value.  
 mg/kg = Milligrams per kilogram.  
 ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%
Diesel-Range Organics (DRO)	--	40.00%	60.00%
Gasoline-Range Organics (GRO)	100.00%	--	--
Oil-Range Organics (ORO)	--	--	100.00%
Jet Propellant 4 (JP-4)	--	70.00%	30.00%

Table 3-19: ERP Site 7 Detected Soil Analytical Results Summary  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	CASRN	Boring ID					Units	PUMP #1	PUMP #2	PUMP #3	PUMP #4	PUMP #5	PUMP #6	FSA-SB-1	FSA-SB-2	FSA-SB-3	FSA-SB-4	FSA-SB-5	FSA-SB-6
		Sample Depth (ft bgs)						2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	4.0 - 5.0	4.0 - 5.0	3.0 - 4.0	2.0 - 3.0	3.0 - 4.0	3.0 - 4.0
		Sample Date						Feb-05	Feb-05	Feb-05	Feb-05	Feb-05	Feb-05	Jun-06	Jun-06	Jun-06	Jun-06	Jun-06	Jun-06
		Screening Level																	
MDEQ Tier-1 RBSL <sup>A</sup>					EPA RSL <sup>B</sup>														
DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	Industrial Soil															
<b>VOCs</b>																			
1,1,2-Trichloroethane	79-00-5	--	--	--	--	1	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
2-Butanone	78-93-3	--	--	--	--	19,000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
2-Hexanone	591-78-6	--	--	--	--	130	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
4-Methyl-2-Pentanone	108-10-1	--	--	--	--	14,000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	71-43-2	230	8,900	0.25	--	5.1	mg/kg	ND	ND	ND [ND]	ND	ND							
Carbon Disulfide	75-15-0	--	--	--	--	350	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	108-90-7	--	--	--	--	130	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	67-66-3	--	--	--	--	1.4	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	100-41-4	28	1,300	130	--	25	mg/kg	ND	ND	ND [ND]	ND	<b>0.0018 J</b>	ND						
Methylene Chloride	75-09-2	--	--	--	--	320	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	ND	ND	ND [ND]	ND	ND							
trans-1,2-Dichloroethene	156-60-5	--	--	--	--	30	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethylene	79-01-6	--	--	--	--	1.9	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Xylenes (Total)	1330-20-7	310	610	1,600	--	250	mg/kg	ND	<b>0.0027</b>	<b>1.08 [3.88]</b>	ND	<b>0.0018</b>	ND						
<b>SVOCs</b>																			
2-Methylnaphthalene	91-57-6	250	250	35	--	300	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butylphthalate	84-74-2	--	--	--	--	66,000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-octylphthalate	117-84-0	--	--	--	--	820	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthrene	206-44-0	2,500	2,500	440	--	3,000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	86-73-7	2,500	2,500	180	--	3,000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	91-20-3	9.5	140	62	--	8.6	mg/kg	ND	ND	<b>3 [13]</b>	ND	ND							
Pyrene	129-00-0	1,900	1,900	430	--	2,300	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
<b>Metals</b>																			
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	7440-41-7	--	--	--	--	230	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	7440-43-9	--	--	--	3.8	10	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Lead	7439-92-1	--	--	--	140	800	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	7439-97-6	--	--	--	1	4.6	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	7440-28-0	--	--	--	--	1.2	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
<b>Petroleum Hydrocarbons</b>																			
TPH	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
DRO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
GRO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
JP-4	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
ORO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--
<b>EPH/VPF Fractions (Converted)</b>																			
C9-C10 Aromatics	--	1,000	1,000	720	--	--	mg/kg	ND	ND	<b>38</b>	ND	<b>23</b>	ND	ND	ND	ND	ND	ND	ND
C9-C18 Aliphatics	--	540	900	270,000	--	--	mg/kg	--	--	--	--	--	ND	ND	ND	ND	ND	ND	ND
C11-C22 Aromatics	--	3,900	3,900	2,000	--	--	mg/kg	--	--	--	--	--	ND	ND	ND	<b>45</b>	ND	ND	ND

Notes:  
**Bolded** value indicates the analyte was detected above the limit of detection (LOD).  
Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.  
 Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.  
 Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.  
<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).  
<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).  
<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).  
 CASRN = Chemical Abstracts Service Registration Number  
 -- = Not available/not analyzed.  
 ft bgs = Feet below ground surface.  
 J = Indicates the result is an estimated value.  
 mg/kg = Milligrams per kilogram.  
 ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%
Diesel-Range Organics (DRO)	--	40.00%	60.00%
Gasoline-Range Organics (GRO)	100.00%	--	--
Oil-Range Organics (ORO)	--	--	100.00%
Jet Propellant 4 (JP-4)	--	70.00%	30.00%

Table 3-20: ERP Site 7 Detected Groundwater Analytical Results - October 2020  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	Well ID			7-MW1	7-MW2	7-MW5	7-MW6	7-MW7	7-MW11	7-MW12	7-MW13	7-MW17	7-MW18	7-MW19
	Screen Depth (ft bgs)			53 - 73	42 - 62	43 - 63	43 - 63	44 - 64	39.5 - 59.5	40 - 60	39.6 - 59.6	35 - 55	38 - 58	37.5 - 57.5
	Sample Date			Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20
	CASRN	Screening Level	Units											
<b>VOCs</b>														
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	--	--	--	--	--	--	< 0.80 [ $< 0.80$ ]	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	--	--	--	--	--	--	<b>43 [48]</b>	--	--	--	--
1,3,5-Trimethylbenzene	108-67-8	60 <sup>B</sup>	µg/L	--	--	--	--	--	--	<b>9.9 [12]</b>	--	--	--	--
2-Butanone	78-93-3	560 <sup>B</sup>	µg/L	--	--	--	--	--	--	<b>5.4 J [4.7 J]</b>	--	--	--	--
Benzene	71-43-2	5 <sup>A</sup>	µg/L	--	--	--	--	--	--	<b>2 [1.7]</b>	--	--	--	--
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	--	--	--	--	--	--	<b>1.5 J [0.95 J]</b>	--	--	--	--
Carbon Tetrachloride	56-23-5	3.0 <sup>A</sup>	µg/L	--	--	--	--	--	--	< 0.40 [ $< 0.40$ ]	--	--	--	--
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	--	--	--	--	--	--	< 0.40 [ $< 0.40$ ]	--	--	--	--
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	--	--	--	--	--	--	< 0.40 [ $< 0.40$ ]	--	--	--	--
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	--	--	--	--	--	--	<b>27 [27]</b>	--	--	--	--
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	--	--	--	--	--	--	<b>7.6 [8.2]</b>	--	--	--	--
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	--	--	--	--	--	--	<b>6 [5.8]</b>	--	--	--	--
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	--	--	--	--	--	--	<b>2.8 [2.8]</b>	--	--	--	--
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	--	--	--	--	--	--	<b>4.4 [4.7]</b>	--	--	--	--
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	--	--	--	--	--	--	<b>10 [11]</b>	--	--	--	--
o-Xylene	95-47-6	10,000 <sup>A</sup>	µg/L	--	--	--	--	--	--	<b>0.48 J [0.40 J]</b>	--	--	--	--
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	--	--	--	--	--	--	<b>10 [10]</b>	--	--	--	--
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	--	--	--	--	--	--	<b>0.72 J [0.77 J]</b>	--	--	--	--
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	--	--	--	--	--	--	<b>0.37 J [0.31 J]</b>	--	--	--	--
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	--	--	--	--	--	--	< 1.0 U [ $< 0.40$ ]	--	--	--	--
<b>EPH</b>														
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	--	--	--	<b>450</b>	--	<b>66 J</b>	<b>2,900 [2,500]</b>	--	--	<b>910 J</b>	<b>13,000 J</b>
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	--	--	--	<b>270 J</b>	--	<b>94 J</b>	<b>1,000 [1,000]</b>	--	--	<b>260 J</b>	<b>1,500</b>
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	--	--	--	< 280	--	< 240	< 240 [ $< 240$ ]	--	--	< 290	< 250
Total EPH	--	1,000 <sup>C</sup>	µg/L	--	--	--	<b>730</b>	--	<b>170 J</b>	<b>3,900 [3,600]</b>	--	--	<b>1,300</b>	<b>15,000</b>
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	--	<b>660</b>	<b>440</b>	<b>4,400</b>	<b>340</b>	<b>1,600</b>	<b>8,000 [8,000]</b>	980	< 300	<b>1,800</b>	<b>16,000</b>
<b>VPH</b>														
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>640 J+</b>	< 20 UJ	< 20 UJ	<b>780 J-</b>	< 20 R	<b>28 J-</b>	<b>260 J- [260 J-]</b>	<b>28 J-</b>	< 20 UJ	<b>120 J</b>	<b>760 J</b>
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>400 J+</b>	< 20	< 20 UJ	<b>540 J</b>	< 20 R	<b>120 J</b>	<b>350 J- [360 J-]</b>	<b>82 J</b>	< 20 UJ	<b>140</b>	<b>1,300 J</b>
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>450 J+</b>	< 20 UJ	< 20 UJ	<b>560 J-</b>	< 20 R	<b>27 J</b>	<b>280 J- [290 J-]</b>	<b>26 J</b>	< 20 UJ	<b>95 J+</b>	<b>730 J</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>2.4</b>	< 0.50	< 0.50 UJ	<b>43 J</b>	< 0.50 R	<b>0.49 J</b>	<b>2.3 J [2.0 J]</b>	<b>0.37 J</b>	< 0.50 UJ	<b>1.2</b>	< 0.50 UJ
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>75 J+</b>	< 0.50 UJ	< 0.50 UJ	<b>56 J-</b>	< 0.50 R	<b>0.90 J-</b>	<b>26 J- [27 J-]</b>	<b>0.47 J-</b>	< 0.50 UJ	<b>10</b>	<b>51 J</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	<b>3.5 J+</b>	< 2.0	< 2.0 UJ	<b>22 J</b>	< 2.0 R	< 2.0 UJ	< 2.0 UJ [ $< 2.0 UJ$ ]	< 2.0 UJ	< 2.0 UJ	< 2.0	< 2.0 UJ
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.50	< 0.50	< 0.50 UJ	< 0.50 J	<b>0.55 J</b>	<b>0.42 J</b>	< 0.50 UJ [ $< 0.50 UJ$ ]	< 0.50 UJ	< 0.50 UJ	< 0.50	< 0.50 UJ
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	< 1.0 U	< 1.0	< 1.0 UJ	<b>5.4 J+</b>	< 1.0 R	< 1.0 UJ	<b>7.6 J- [8.1 J-]</b>	< 1.0 UJ	< 1.0 UJ	<b>1.5 J+</b>	< 1.0 UJ

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+/J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

Table 3-20: ERP Site 7 Detected Groundwater Analytical Results - October 2020  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	Well ID			7-MW20	7-MW26	7-MW27	7-MW28	7-MW29	7-MW32	7-MW34	7-MW35
	Screen Depth (ft bgs)			37 - 57	40 - 60	40 - 60	40 - 60	40 - 60	40 - 60	40 - 60	40 - 60
	Sample Date			Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20
	CASRN	Screening Level	Units								
<b>VOCs</b>											
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	--	<b>2.6</b>	--	<b>0.32 J</b>	--	< 0.80	--	--
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	--	<b>3.6</b>	--	<b>0.33 J</b>	--	<b>0.19 J</b>	--	--
1,3,5-Trimethylbenzene	108-67-8	60 <sup>B</sup>	µg/L	--	< 0.40	--	< 0.40	--	< 0.40	--	--
2-Butanone	78-93-3	560 <sup>B</sup>	µg/L	--	< 4.0	--	< 4.0	--	< 4.0	--	--
Benzene	71-43-2	5 <sup>A</sup>	µg/L	--	<b>0.30 J</b>	--	< 0.40	--	< 0.40	--	--
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	--	< 0.80	--	< 0.80	--	<b>0.25 J</b>	--	--
Carbon Tetrachloride	56-23-5	3.0 <sup>A</sup>	µg/L	--	< 0.40	--	<b>7.0</b>	--	<b>2.9</b>	--	--
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	--	< 0.40	--	<b>2.5 J+</b>	--	<b>1.8 J+</b>	--	--
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	--	<b>60</b>	--	<b>0.84 J</b>	--	< 0.40	--	--
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	--	<b>19</b>	--	< 0.40	--	< 0.40	--	--
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	--	<b>18</b>	--	< 0.40	--	< 0.40	--	--
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	--	< 0.80	--	<b>0.30 J</b>	--	<b>0.21 J</b>	--	--
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	--	< 0.80	--	<b>0.30 J</b>	--	< 0.80	--	--
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	--	<b>5.3</b>	--	< 0.80	--	< 0.80	--	--
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	--	<b>9.8</b>	--	< 0.40	--	< 0.40	--	--
o-Xylene	95-47-6	10,000 <sup>A</sup>	µg/L	--	< 0.40	--	< 0.40	--	< 0.40	--	--
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	--	<b>19</b>	--	< 0.40	--	< 0.40	--	--
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	--	<b>0.83 J</b>	--	< 0.40	--	< 0.40	--	--
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	--	<b>0.22 J</b>	--	< 0.40	--	<b>0.24 J</b>	--	--
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	--	<b>4.2</b>	--	<b>15</b>	--	<b>4.2</b>	--	--
<b>EPH</b>											
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	--	--	<b>220 J</b>	--	<b>990 J</b>	--	--	--
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	--	--	<b>210 J</b>	--	<b>340</b>	--	--	--
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	--	--	< 260	--	< 240	--	--	--
Total EPH	--	1,000 <sup>C</sup>	µg/L	--	--	<b>440</b>	--	<b>1,300</b>	--	--	--
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	< 360	<b>920</b>	<b>2,700</b>	< 310	<b>2,700</b>	< 290	<b>290</b>	--
<b>VPH</b>											
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>30</b>	<b>150 J+</b>	<b>420 J</b>	< 20 UJ	<b>340 J</b>	< 20 UJ	<b>41 J-</b>	<b>370 J-</b>
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>47 J+</b>	<b>200 J+</b>	<b>480 J+</b>	< 20 UJ	<b>1,400 J</b>	< 20 UJ	<b>56 J+</b>	<b>810 J</b>
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>23 J+</b>	<b>190 J+</b>	<b>490 J</b>	< 42.2 UJ	<b>430 J</b>	< 20 UJ	< 20 UJ	<b>200 J-</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.50	<b>1.8 J+</b>	<b>24 J+</b>	< 0.50 UJ	<b>18 J+</b>	< 0.50 UJ	< 0.50	<b>3.2 J</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>1.0 J+</b>	<b>20 J+</b>	<b>38 J</b>	< 0.50 UJ	<b>120 J</b>	< 0.50 UJ	<b>0.40 J-</b>	<b>140 J-</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 2.0	< 3.4 U	<b>13 J+</b>	< 2.0 UJ	<b>11 J+</b>	< 2.0 UJ	< 2.0	<b>4.0 J</b>
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.50	< 0.50 U	< 0.50	< 0.50 UJ	< 0.50	< 0.50 UJ	< 0.50	<b>0.73 J</b>
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	< 1.0	< 1.0 U	<b>3.1 J+</b>	< 1.0 UJ	<b>1.3 J+</b>	< 1.0 UJ	< 1.0	< 1.0 R

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+/J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

Table 3-21: ERP Site 7 Detected Groundwater Analytical Results - April 2021  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	Well ID			7-MW1	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	7-MW12	7-MW13	7-MW17	7-MW18	7-MW19	7-MW20	
	Screen Depth (ft bgs)			53 - 73	43 - 63	43 - 63	44 - 64	40 - 60	43 - 63	40 - 60	39.6 - 59.6	35 - 55	38 - 58	37.5 - 57.5	37 - 57	
	Sample Date			Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21
	CASRN	Screening Level	Units													
<b>VOCs</b>																
1,1,2-Trichloroethane	79-00-5	3 <sup>A</sup>	µg/L	--	--	--	< 0.80	--	< 0.80	< 0.80	--	< 0.80	--	--	--	
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	--	--	--	< 0.80	--	< 0.80	< 0.80	--	< 0.80	--	--	--	
1,2,3-Trichlorobenzene	87-61-6	NE	µg/L	--	--	--	< 0.80	--	< 0.80	< 0.80	--	< 0.80	--	--	--	
1,2,4-Trichlorobenzene	120-82-1	70 <sup>A</sup>	µg/L	--	--	--	< 0.80	--	< 0.80	< 0.80	--	< 0.80	--	--	--	
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	<b>57</b>	--	< 1.0 U	--	--	--	
1,3,5-Trimethylbenzene	108-67-8	60 <sup>B</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	<b>8.5</b>	--	< 0.40	--	--	--	
Acetone	67-64-1	1,400 <sup>B</sup>	µg/L	--	--	--	< 6.4	--	< 6.4	< 6.4	--	< 6.4	--	--	--	
Benzene	71-43-2	5 <sup>A</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	<b>0.28 J</b>	--	< 0.40	--	--	--	
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	--	--	--	< 0.80	--	< 0.80	< 2.0 U	--	< 0.80	--	--	--	
Carbon Tetrachloride	56-23-5	3.0 <sup>A</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	< 0.40	--	<b>2.6</b>	--	--	--	
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	< 0.40	--	<b>2.3 J+</b>	--	--	--	
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	< 0.40	--	<b>0.41 J</b>	--	--	--	
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	<b>8.1</b>	--	< 0.40	--	--	--	
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	<b>7.7</b>	--	< 0.40	--	--	--	
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	--	--	--	< 0.80	--	< 0.80	<b>2.4</b>	--	< 2.0 U	--	--	--	
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	--	--	--	< 0.80	--	< 0.80	<b>1.1</b>	--	< 0.80	--	--	--	
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	--	--	--	< 0.80	--	< 0.80	<b>6.1</b>	--	< 0.80	--	--	--	
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	<b>12</b>	--	< 0.40	--	--	--	
o-Xylene	95-47-6	10,000 <sup>A</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	< 0.40	--	< 0.40	--	--	--	
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	<b>14</b>	--	< 0.40	--	--	--	
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	< 0.40	--	< 0.40	--	--	--	
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	--	--	--	< 0.40	--	< 0.40	< 0.40	--	<b>7.0</b>	--	--	--	
<b>EPH</b>																
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>2800 J</b>	--	<b>310</b>	--	--	--	<b>2,600 J</b>	--	--	<b>1,700 J</b>	<b>4,700 J</b>	<b>1,400</b>	
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>440 J</b>	--	<b>350</b>	--	--	--	<b>1,800 J</b>	--	--	<b>340 J</b>	<b>720 J</b>	<b>260</b>	
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	<b>520 J</b>	--	< 240	--	--	--	< 250	--	--	<b>140 J</b>	<b>67 J</b>	<b>130 J</b>	
Total EPH	--	1,000 <sup>C</sup>	µg/L	<b>3700 J</b>	--	<b>700</b>	--	--	--	<b>4,500 J</b>	--	--	<b>2,200 J</b>	<b>5,500 J</b>	<b>1,800</b>	
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	<b>3700 J</b>	<b>600</b>	<b>5400</b>	--	<b>950 J</b>	< 310	<b>7,100 J</b>	<b>660 J</b>	< 310	<b>2,600 J</b>	<b>6,100 J</b>	<b>3,700</b>	
<b>VPH</b>																
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>420 J+</b>	<b>45 J+</b>	<b>680 J+</b>	--	<b>54 J</b>	--	<b>430</b>	--	< 20 UJ	<b>290 J</b>	<b>620 J+</b>	<b>110 J-</b>	
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>340 J</b>	<b>40</b>	<b>590 J+</b>	--	<b>51</b>	--	<b>430</b>	--	<b>1.4 J-</b>	<b>210 J-</b>	<b>820</b>	<b>75</b>	
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>170 J+</b>	<b>22 J+</b>	<b>210 J+</b>	--	<b>32</b>	--	<b>180</b>	--	< 20 UJ	<b>160 J+</b>	<b>220 J+</b>	<b>65</b>	
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>1.6 J+</b>	<b>0.95</b>	<b>31</b>	--	<b>0.21 J</b>	--	<b>1.2</b>	--	< 0.50 UJ	<b>2.8 J+</b>	<b>1.9</b>	<b>0.43 J</b>	
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>43 J+</b>	< 0.50	<b>42</b>	--	<b>4.0</b>	--	<b>8.6</b>	--	< 0.50 UJ	<b>25 J+</b>	<b>31</b>	<b>1.1</b>	
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 2.0 U	< 2.0 U	<b>29 J+</b>	--	< 2.0	--	<b>24</b>	--	< 2.0 UJ	<b>4.4 J</b>	<b>17 J+</b>	<b>2.3 J-</b>	
Methyl tert-Butyl Ether	1634-04-4	14.0 <sup>B</sup>	µg/L	<b>4.8 J+</b>	< 2.0	<b>3.9 J-</b>	--	< 2.0	--	<b>1.0 J-</b>	--	< 2.0 UJ	< 2.0 UJ	<b>4.1 J-</b>	< 2.0 UJ	
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.50	< 0.50	< 0.50	--	< 0.50	--	< 0.50	--	< 0.50 UJ	< 0.50	<b>2.1</b>	< 0.50	
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	< 1.0	< 1.0	<b>1.9</b>	--	< 1.0	--	<b>4.5</b>	--	< 1.0 UJ	< 1.0	<b>0.68 J</b>	< 1.0	

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded and shaded** values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVP, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+/J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

Table 3-21: ERP Site 7 Detected Groundwater Analytical Results - April 2021  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	Well ID			7-MW22	7-MW26	7-MW27	7-MW28	7-MW29	7-MW34	7-MW35
	Screen Depth (ft bgs)			39 - 64	40 - 60	40 - 60	40 - 60	40 - 60	40 - 60	40 - 60
	Sample Date			Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21
	CASRN	Screening Level	Units							
<b>VOCs</b>										
1,1,2-Trichloroethane	79-00-5	3 <sup>A</sup>	µg/L	--	< 0.80	--	< 0.80 [ $< 0.80$ ]	<b>3.8</b>	< 0.80	< 4.0
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	--	<b>2.1</b>	--	< 0.80 [ $< 0.80$ ]	<b>1.7</b>	< 0.80	< 4.0
1,2,3-Trichlorobenzene	87-61-6	NE	µg/L	--	< 0.80	--	<b>0.64 J</b> [ $< 0.80$ ]	< 0.80	< 0.80	< 4.0
1,2,4-Trichlorobenzene	120-82-1	70 <sup>A</sup>	µg/L	--	< 0.80	--	<b>0.56 J</b> [ $< 0.80$ ]	< 0.80	< 0.80	< 4.0
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	--	<b>2.7</b>	--	<b>1.0 U</b> [ $< 0.40$ ]	<b>100</b>	<b>1.0 U</b>	<b>660</b>
1,3,5-Trimethylbenzene	108-67-8	60 <sup>B</sup>	µg/L	--	< 0.40	--	< 0.40 [ $< 0.40$ ]	<b>15 [15]</b>	< 0.40	<b>41</b>
Acetone	67-64-1	1,400 <sup>B</sup>	µg/L	--	< 6.4	--	< 6.4 [ $< 6.4$ ]	10 U [ $< 10$ U]	< 6.4	< 32
Benzene	71-43-2	5 <sup>A</sup>	µg/L	--	<b>1.4</b>	--	< 0.40 [ $< 0.40$ ]	< 0.40 [ <b>0.21 J</b> ]	< 0.40	< 2.0
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	--	< 0.80	--	< 0.80 [ $< 0.80$ ]	< 0.80 [ $< 0.80$ ]	<b>2.0 U</b>	<b>10 U</b>
Carbon Tetrachloride	56-23-5	3.0 <sup>A</sup>	µg/L	--	< 0.40	--	<b>8 [8.6]</b>	< 0.40 [ $< 0.40$ ]	< 0.40	< 2.0
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	--	< 0.40	--	<b>2.5 J+</b> [ <b>2.6 J+</b> ]	1.0 U [ $< 1.0$ U]	< 0.40	< 2.0
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	--	<b>26</b>	--	<b>0.54 J</b> [ <b>0.57 J</b> ]	<b>11 [11]</b>	<b>1.3</b>	<b>13</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	--	<b>9.7</b>	--	< 0.40 [ $< 0.40$ ]	<b>12 [12]</b>	< 0.40	<b>70</b>
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	--	<b>18</b>	--	< 0.40 [ $< 0.40$ ]	<b>12 [12]</b>	< 0.40	<b>99</b>
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	--	< 0.80	--	2.0 U [ $< 2.0$ U]	2.0 U [ $< 2.0$ U]	< 0.80	< 4.0
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	--	< 0.80	--	<b>0.75 J</b> [ $< 0.80$ ]	<b>3.4 [3.6]</b>	< 0.80	<b>7.1</b>
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	--	<b>4.8</b>	--	<b>0.28 J</b> [ $< 0.80$ ]	<b>4.6 [4.8]</b>	< 0.80	<b>68</b>
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	--	<b>4.7</b>	--	< 0.40 [ $< 0.40$ ]	<b>17 [17]</b>	< 0.40	<b>150</b>
o-Xylene	95-47-6	10,000 <sup>A</sup>	µg/L	--	< 0.40	--	< 0.40 [ $< 0.40$ ]	<b>0.20 J</b> [ $< 0.40$ ]	< 0.40	< 2.0
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	--	<b>21</b>	--	< 0.40 [ $< 0.40$ ]	<b>7.4 [7.6]</b>	< 0.40	<b>75</b>
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	--	<b>1.2</b>	--	< 0.40 [ $< 0.40$ ]	<b>0.36 J</b> [ <b>0.36 J</b> ]	< 0.40	< 2.0
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	--	<b>0.95 J</b>	--	<b>15 [16]</b>	< 0.40 [ $< 0.40$ ]	< 0.40	< 2.0
<b>EPH</b>										
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>4,500</b>	--	<b>450 J</b>	--	<b>870 [700]</b>	--	<b>520,000</b>
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>690</b>	--	<b>180 J</b>	--	<b>380 [420]</b>	--	<b>46,000</b>
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	<b>100 J</b>	--	<b>55 J</b>	--	< 260 [ $< 250$ ]	--	< 13000
Total EPH	--	1,000 <sup>C</sup>	µg/L	<b>5,300</b>	--	<b>690 J</b>	--	<b>1,300 [1,200]</b>	--	<b>570,000</b>
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	<b>5,800</b>	<b>940</b>	<b>2,800 J</b>	< 290 [ $< 290$ ]	<b>2,500 [2,500]</b>	< 300	<b>650,000 J+</b>
<b>VPH</b>										
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>720</b>	<b>200 J+</b>	<b>140 J+</b>	< 20 U [ $< 20$ U]	<b>1,100 J</b> [ <b>1,100 J</b> ]	< 20	<b>2,000 J+</b>
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>370</b>	<b>160</b>	<b>650 J+</b>	<b>0.48 J</b> [ $< 20$ ]	<b>1,100 J</b> [ <b>1,200 J</b> ]	<b>8.7 J</b>	<b>2,500 J+</b>
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>220</b>	<b>100 J+</b>	<b>190 J+</b>	< 20 U [ $< 20$ ]	<b>670 J+</b> [ <b>650 J+</b> ]	< 20	<b>700 J+</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>2.1</b>	<b>1.9</b>	<b>4.0 J+</b>	< 0.50 [ $< 0.50$ ]	<b>18 J+</b> [ <b>19 J+</b> ]	<b>0.22 J</b>	<b>1.6 J+</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>3.0</b>	<b>9.9</b>	<b>25 J+</b>	< 0.50 [ $< 0.50$ ]	<b>44 J+</b> [ <b>45 J+</b> ]	< 0.50	<b>51 J+</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	<b>14</b>	<b>2.5 J+</b>	<b>15 J+</b>	< 2.0 U [ $< 2.0$ U]	<b>12 J</b> [ <b>13 J</b> ]	< 2.0 U	<b>20 J+</b>
Methyl tert-Butyl Ether	1634-04-4	14.0 <sup>B</sup>	µg/L	<b>4.9 J-</b>	< 2.0	<b>0.50 J</b>	< 2.0 UJ [ $< 2.0$ UJ]	<b>3.8 J</b> [ <b>3.9 J</b> ]	< 2.0 UJ	<b>3.6 J</b>
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.50	< 0.50	< 0.50	< 0.50 [ $< 0.50$ ]	<b>1.9 J+</b> [ <b>1.6 J+</b> ]	< 0.50	<b>0.95 J+</b>
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	< 1.0	< 1.0	<b>2.5 J+</b>	< 1.0 [ $< 1.0$ ]	<b>2.7 J+</b> [ <b>2.6 J+</b> ]	< 1.0	<b>0.67 J+</b>

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded and shaded** values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTPVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+/J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

Table 3-22: ERP Site 6 Detected Groundwater Analytical Results - October 2021  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	Well ID		7-MW1	7-MW2	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	7-MW11	7-MW12
	Screen Depth (ft bgs)		53 - 73	42 - 62	43 - 63	43 - 63	44 - 64	40 - 60	43 - 63	39.5 - 59.5	40 - 60
	Sample Date		Oct-21	Oct-21	Oct-21	Oct-21	Oct-21	Oct-21	Oct-21	Oct-21	Oct-21
	CASRN	Screening Level	Units								
<b>VOCs</b>											
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	--
Benzene	71-43-2	5 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	--
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	--
Carbon Tetrachloride	56-23-5	3.0 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	--
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	--
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	--
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	--
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	--
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	--
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	--
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	--
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	--
<b>EPH</b>											
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>2,700 J</b>	--	<b>120 J</b>	<b>330</b>	--	--	--	<b>1,700</b>
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>480 J</b>	--	< 250 UJ	<b>300</b>	--	--	--	<b>1,500</b>
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	<b>620 J</b>	--	< 250 UJ	< 250 U	--	--	--	< 290 U
Total EPH	--	1,000 <sup>C</sup>	µg/L	<b>3,800 J</b>	--	<b>460 J</b>	<b>750</b>	--	--	--	<b>3,300</b>
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	<b>4,700</b>	<b>970 J+</b>	<b>860 J+</b>	<b>3,100</b>	< 340	< 330	< 320	<b>730 J</b> <b>5,500</b>
<b>VPH</b>											
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>610 J+</b>	<b>55</b>	<b>46</b>	<b>670 J+</b>	< 20 U	<b>61</b>	< 20 U	<b>130 J+</b> <b>310 J+</b>
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>510 J+</b>	<b>54</b>	<b>91</b>	<b>580 J+</b>	<b>4.2 J</b>	<b>26</b>	<b>9.4 J</b>	<b>140 J+</b> <b>370 J+</b>
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>320 J+</b>	<b>29 J+</b>	<b>43 J+</b>	<b>360 J+</b>	< 20 U	< 20 U	< 20 U	<b>77 J+</b> <b>220 J+</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>2.3 J+</b>	<b>0.34 J</b>	<b>0.83</b>	<b>6.7 J+</b>	<b>0.17 J</b>	<b>0.32 J</b>	<b>0.46 J</b>	<b>1.1 J+</b> <b>2.4 J+</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>71 J+</b>	<b>0.40 J</b>	<b>1.1</b>	<b>30 J+</b>	< 0.50	<b>1.2</b>	< 0.50	<b>1.0 J+</b> <b>26 J+</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	<b>3.9 J+</b>	< 2.0	< 2.0	<b>18 J+</b>	< 2.0	< 2.0	< 2.0	< 2.0 <b>7.9 J+</b>
Methyl tert-Butyl Ether	1634-04-4	14.0 <sup>B</sup>	µg/L	<b>1.8 J+</b>	< 2.0	< 2.0	<b>0.43 J+</b>	< 2.0	< 2.0	< 2.0	< 2.0 UJ
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	<b>1.5 J+</b>	< 1.0	< 1.0	<b>2.8 J+</b>	< 1.0	< 1.0	< 1.0	<b>0.49 J+</b> <b>8.5 J+</b>

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

**Table 3-22: ERP Site 6 Detected Groundwater Analytical Results - October 2021**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			7-MW15	7-MW16	7-MW17	7-MW18	7-MW19	7-MW20	7-MW22	7-MW26	7-MW28
	Screen Depth (ft bgs)			40 - 60	28 - 53	35 - 55	38 - 58	37.5 - 57.5	37 - 57	39 - 64	40 - 60	40 - 60
	Sample Date			Oct-21	Oct-21	Oct-21	Oct-21	Oct-21	Oct-21	Oct-21	Oct-21	Oct-21
	CASRN	Screening Level	Units									
<b>VOCs</b>												
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	2.2	< 0.80
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	0.71 J	< 0.40
Benzene	71-43-2	5 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	0.34 J	< 0.40
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	0.32 J	< 0.80
Carbon Tetrachloride	56-23-5	3.0 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	< 0.40	5.6
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	< 0.40	2.1 J+
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	48	0.74 J
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	12	< 0.40
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	18	< 0.40
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	7.6	< 0.80
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	6.4	< 0.40
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	34	< 0.40
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	--	--	--	--	--	--	--	1.4	< 0.40
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	--	--	--	--	--	--	--	2.3	16
<b>EPH</b>												
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	150 J	--	--	1,300 [1,200]	1,200 J- [ 930 J]	--	400 J	1,200	--
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	360	--	--	290 J [900 J]	< 280 U [ 310 J]	--	< 290 UJ	220 J	--
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	890 J+	--	--	< 270 UJ [ 1,700 J+]	< 280 U [ 260 J]	--	< 290 UJ	< 270 U	--
Total EPH	--	1,000 <sup>C</sup>	µg/L	1,400	--	--	1,700 J [3,800 J]	1,700 J- [ 1,500 J]	--	860 J+	1,500	--
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	1,000 J+	< 330	< 320	2,200 J [3,100 J]	1,600 J [ 1,700 J]	510 J+	820 J	1,500 J+	380 J+
<b>VPH</b>												
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	4.7 J	< 20 UJ	< 20 U	930 J+ [ 630 J+]	710 J+ [ 680 J+]	75 J-	270	240 J+	< 20 U
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	9.6 J	2.7 J	1.1 J	310 J+ [ 320 J+]	750 J+ [ 750 J+]	64	200	220 J+	3.7 J
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	< 20 U	< 20 U	< 20 U	210 J+ [ 210 J+]	420 J+ [ 420 J+]	37	140	170 J+	< 20 U
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.50	< 0.50	< 0.50	2.7 J+ [ 2.6 J+]	1.1 J+ [ 1.1 J+]	0.32 J	0.77	0.59 J+	< 0.50
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	< 0.50	< 0.50	< 0.50	22 J+ [ 20 J+]	25 J+ [ 24 J+]	1.2	0.51	11 J+	< 0.50
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 2.0	< 2.0	< 2.0	4.0 J+ [ 10 J+]	4.0 J+ [ 14 J+]	1.1 J+	1.6 J	< 2.0	1.1 J
Methyl tert-Butyl Ether	1634-04-4	14.0 <sup>B</sup>	µg/L	< 2.0 UJ	< 2.0	< 2.0	< 2.0 [ < 2.0 ]	1.3 J+ [ < 2.0 ]	< 2.0	< 2.0	< 2.0	< 2.0
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.50	< 0.50	< 0.50	0.92 J+ [ 0.59 J+]	0.26 J+ [ 0.18 J+]	< 0.50	< 0.50	< 0.50	< 0.50
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	< 1.0	< 1.0	< 1.0	< 1.0 [ < 1.0 ]	1.6 J+ [ 1.3 J+]	< 1.0	< 1.0	< 1.0	< 1.0

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

**Table 3-22: ERP Site 6 Detected Groundwater Analytical Results - October 2021  
Montana Air National Guard Base - Great Falls International Airport  
Great Falls, Montana**

Analyte	Well ID			7-MW29	7-MW34	7-MW35
	Screen Depth (ft bgs)			40 - 60	40 - 60	40 - 60
	Sample Date			Oct-21	Oct-21	Oct-21
	CASRN	Screening Level	Units			
<b>VOCs</b>						
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	--	--	--
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	--	--	--
Benzene	71-43-2	5 <sup>A</sup>	µg/L	--	--	--
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	--	--	--
Carbon Tetrachloride	56-23-5	3.0 <sup>A</sup>	µg/L	--	--	--
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	--	--	--
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	--	--	--
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	--	--	--
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	--	--	--
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	--	--	--
n-Propylbenzene	103-65-1	660 <sup>B</sup>	µg/L	--	--	--
sec-Butylbenzene	135-98-8	2,000 <sup>B</sup>	µg/L	--	--	--
t-Butylbenzene	98-06-6	690 <sup>B</sup>	µg/L	--	--	--
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	--	--	--
<b>EPH</b>						
C9-C18 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>2,700</b>	--	<b>2,300</b>
C11-C22 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>490</b>	--	<b>330</b>
C19-C36 Aliphatics	--	1,000 <sup>C</sup>	µg/L	<b>600 J+</b>	--	< 270 U
Total EPH	--	1,000 <sup>C</sup>	µg/L	<b>3,800</b>	--	<b>2,800</b>
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	<b>3,700</b>	<b>370 J+</b>	<b>3,200</b>
<b>VPH</b>						
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>1,200 J+</b>	<b>62 J+</b>	<b>750 J+</b>
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>1,300 J+</b>	<b>60 J+</b>	<b>1,000 J+</b>
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>680 J+</b>	<b>43 J+</b>	<b>530 J+</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>1.5 J+</b>	<b>0.82 J+</b>	<b>1.3 J+</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>28 J+</b>	<b>0.28 J+</b>	<b>41 J+</b>
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	<b>14 J+</b>	<b>4.3 J+</b>	<b>6.0 J+</b>
Methyl tert-Butyl Ether	1634-04-4	14.0 <sup>B</sup>	µg/L	< 2.0	< 2.0	<b>1.4 J+</b>
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	<b>1.5 J+</b>	< 0.50	< 0.50
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	<b>1.0 J+</b>	< 1.0	<b>1.4 J+</b>

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

An exceedance of the 1,000 µg/L EPH screen value indicates only that fractionation is required. If none of the fractions exceed, then the EPH value does not need to be identified as exceeding RBSLs.

Table 3-23: ERP Site 7 Detected Groundwater Analytical Results - April 2022  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	Well ID			7-MW1	7-MW2	7-MW5	7-MW6	7-MW7	7-MW9	7-MW11	7-MW12	7-MW16	7-MW17
	Screen Depth (ft bgs)			53 - 73	42 - 62	43 - 63	43 - 63	44 - 64	43 - 63	39.5 - 59.5	40 - 60	28 - 53	35 - 55
	Sample Date			Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22
	CASRN	Screening Level	Units										
<b>VOCs</b>													
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	<b>2.7</b>	--	--	--	--	--	--	--	--	< 0.80
1,1-Dichloroethylene	75-35-4	7.0 <sup>A</sup>	µg/L	< 0.80	--	--	--	--	--	--	--	--	< 0.80
1,2-Dichloroethane	107-06-2	5 <sup>A</sup>	µg/L	< 0.40	--	--	--	--	--	--	--	--	<b>0.17 J</b>
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	<b>0.29 J</b>	--	--	--	--	--	--	--	--	< 0.40
1,3,5-Trimethylbenzene	108-67-8	60 <sup>B</sup>	µg/L	< 0.40	--	--	--	--	--	--	--	--	< 0.40
Acetone	67-64-1	1400 <sup>B</sup>	µg/L	<b>17</b>	--	--	--	--	--	--	--	--	< 6.4
Benzene	71-43-2	5 <sup>A</sup>	µg/L	<b>0.41 J</b>	--	--	--	--	--	--	--	--	< 0.40
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	< 0.80	--	--	--	--	--	--	--	--	< 0.80
Carbon Tetrachloride	56-23-5	3.0 <sup>A</sup>	µg/L	< 0.40	--	--	--	--	--	--	--	--	<b>2.6</b>
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	< 0.40	--	--	--	--	--	--	--	--	<b>2.4 J+</b>
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	<b>55</b>	--	--	--	--	--	--	--	--	< 0.40
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>64</b>	--	--	--	--	--	--	--	--	< 0.40
m/p-Xylene	--	10000 <sup>A</sup>	µg/L	< 0.80	--	--	--	--	--	--	--	--	< 0.80
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	<b>0.24 J</b>	--	--	--	--	--	--	--	--	< 0.80
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	<b>20</b>	--	--	--	--	--	--	--	--	< 0.80
n-Propylbenzene	103-65-1	NE	µg/L	<b>64 J-</b>	--	--	--	--	--	--	--	--	< 0.40
o-Xylene	95-47-6	10000 <sup>A</sup>	µg/L	< 0.40	--	--	--	--	--	--	--	--	< 0.40
sec-Butylbenzene	135-98-8	200 <sup>B</sup>	µg/L	<b>41 J-</b>	--	--	--	--	--	--	--	--	< 0.40
t-Butylbenzene	98-06-6	69 <sup>B</sup>	µg/L	<b>1.3</b>	--	--	--	--	--	--	--	--	< 0.40
Tetrachloroethylene	127-18-4	5 <sup>A</sup>	µg/L	< 0.40	--	--	--	--	--	--	--	--	< 0.40
Toluene	108-88-3	1000 <sup>A</sup>	µg/L	< 0.40	--	--	--	--	--	--	--	--	< 0.40
trans-1,2-Dichloroethylene	156-60-5	100 <sup>A</sup>	µg/L	< 0.40	--	--	--	--	--	--	--	--	< 0.40
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	<b>0.66 J</b>	--	--	--	--	--	--	--	--	<b>6.7</b>
Vinyl Chloride	75-01-4	0.2 <sup>A</sup>	µg/L	< 0.20	--	--	--	--	--	--	--	--	< 0.20
<b>EPH</b>													
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	--	< 300	<b>590</b>	<b>6,500</b>	< 290	< 290	<b>840</b>	<b>6,300</b>	< 300	--
<b>VPH</b>													
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>540</b>	< 20 U	<b>48</b>	<b>550 J+</b>	< 20 U	< 20 U	<b>31</b>	<b>290</b>	<b>29</b>	--
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>380</b>	< 20 U	<b>26</b>	<b>510</b>	< 20 U	< 20 U	<b>33</b>	<b>260</b>	< 20 U	--
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	<b>170</b>	< 20 U	< 20 U	<b>130 J+</b>	<b>2.3 J</b>	< 20 U	<b>5.2 J</b>	<b>170</b>	< 20 U	--
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 2.5	< 0.50	<b>0.20 J</b>	<b>19</b>	< 0.50	< 0.50	< 0.50	<b>3.6</b>	< 0.50	--
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	<b>56</b>	< 0.50	<b>0.43 J</b>	<b>26</b>	< 0.50	< 0.50	< 0.50	<b>13</b>	<b>1.0</b>	--
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	<b>14 J+</b>	< 2.0	<b>6.3 J+</b>	<b>15 J+</b>	< 2.0	<b>7.2 J+</b>	< 2.0	<b>12 J+</b>	< 2.0	--
Methyl tert-Butyl Ether	1634-04-4	14.0 <sup>B</sup>	µg/L	< 10	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	--
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 2.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>0.15 J</b>	<b>3.4</b>	--
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	< 5.0	< 1.0	< 1.0	<b>2.9</b>	< 1.0	< 1.0 U	< 1.0	<b>7.1</b>	<b>3.8</b>	--

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+/J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

EPH fractionation was not performed during the April 2022 sampling event.

Table 3-23: ERP Site 7 Detected Groundwater Analytical Results - April 2022  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	Well ID			7-MW18	7-MW19	7-MW20	7-MW22	7-MW26	7-MW28	7-MW29	7-MW34	7-MW35	7-MW36
	Screen Depth (ft bgs)			38 - 58	37.5 - 57.5	37 - 57	39 - 64	40 - 60	40 - 60	40 - 60	40 - 60	40 - 60	40 - 60
	Sample Date			Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22	Apr-22
	CASRN	Screening Level	Units										
<b>VOCs</b>													
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	--	--	--	--	2.1 [1.9]	< 0.80 [0.29 J]	--	--	--	0.48 J
1,1-Dichloroethylene	75-35-4	7.0 <sup>A</sup>	µg/L	--	--	--	--	< 0.80 [< 0.80]	< 0.80 [< 0.80]	--	--	--	< 0.80
1,2-Dichloroethane	107-06-2	5 <sup>A</sup>	µg/L	--	--	--	--	0.47 J [< 0.40]	0.20 J [< 0.40]	--	--	--	< 0.40
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	--	--	--	--	< 0.40 [< 0.40]	< 0.40 [< 0.40]	--	--	--	1.7
1,3,5-Trimethylbenzene	108-67-8	60 <sup>B</sup>	µg/L	--	--	--	--	< 0.40 [< 0.40]	< 0.40 [< 0.40]	--	--	--	< 0.40
Acetone	67-64-1	1400 <sup>B</sup>	µg/L	--	--	--	--	< 10 U [< 10 U]	< 6.4 [< 6.4]	--	--	--	< 6.4
Benzene	71-43-2	5 <sup>A</sup>	µg/L	--	--	--	--	0.32 J [0.48 J]	< 0.40 [< 0.40]	--	--	--	< 0.40
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	--	--	--	--	< 0.80 [< 0.80]	< 0.80 [< 0.80]	--	--	--	< 0.80
Carbon Tetrachloride	56-23-5	3.0 <sup>A</sup>	µg/L	--	--	--	--	< 0.40 [< 0.40]	6.7 [5.2]	--	--	--	< 0.40
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	--	--	--	--	< 0.40 [< 0.40]	2.2 J+ [2.2 J+]	--	--	--	< 0.40
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	--	--	--	--	38 [35]	0.34 J [0.63 J]	--	--	--	3.4
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	--	--	--	--	8 J [5.5 J]	< 0.40 [< 0.40]	--	--	--	0.22 J
m/p-Xylene	--	10000 <sup>A</sup>	µg/L	--	--	--	--	< 0.80 [< 0.80]	< 0.80 [< 0.80]	--	--	--	< 2.0 U
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	--	--	--	--	< 0.80 [< 0.80]	< 0.80 [< 0.80]	--	--	--	< 0.80
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	--	--	--	--	3.9 J [2.7 J]	< 0.80 [< 0.80]	--	--	--	< 0.80
n-Propylbenzene	103-65-1	NE	µg/L	--	--	--	--	4.5 J [2.4 J]	< 0.40 [< 0.40]	--	--	--	0.35 J
o-Xylene	95-47-6	10000 <sup>A</sup>	µg/L	--	--	--	--	< 0.40 [< 0.40]	< 0.40 [< 0.40]	--	--	--	< 0.40
sec-Butylbenzene	135-98-8	200 <sup>B</sup>	µg/L	--	--	--	--	25 [25]	< 0.40 [< 0.40]	--	--	--	0.59 J
t-Butylbenzene	98-06-6	69 <sup>B</sup>	µg/L	--	--	--	--	1 [1]	< 0.40 [< 0.40]	--	--	--	< 0.40
Tetrachloroethylene	127-18-4	5 <sup>A</sup>	µg/L	--	--	--	--	< 0.40 [< 0.40]	< 0.40 [< 0.40]	--	--	--	< 0.40
Toluene	108-88-3	1000 <sup>A</sup>	µg/L	--	--	--	--	< 0.40 [< 0.40]	< 0.40 [< 0.40]	--	--	--	< 0.40
trans-1,2-Dichloroethylene	156-60-5	100 <sup>A</sup>	µg/L	--	--	--	--	< 0.40 [< 0.40]	< 0.40 [< 0.40]	--	--	--	< 0.40
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	--	--	--	--	0.69 J [0.62 J]	14 J [11 J]	--	--	--	< 0.40
Vinyl Chloride	75-01-4	0.2 <sup>A</sup>	µg/L	--	--	--	--	< 0.20 [< 0.20]	< 0.20 [< 0.20]	--	--	--	0.15 J
<b>EPH</b>													
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	6,000	14,000	2,600	6,100	620 [770]	< 290 [< 300]	4,300	< 290	5,500	1,800
<b>VPH</b>													
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	370	1,000 J	170	510 J	190 J+ [200 J+]	110 J [88 J]	890	59	2,600 J	25
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	400	390	91	170	140 [120]	< 20 U [< 20 U]	1600	< 20 U	> 1,100 J+	59
C9-C12 Aliphatics	--	1,400 <sup>C</sup>	µg/L	360	540 J	99	190 J	96 J+ [82 J+]	< 20 [< 20]	370	< 20	270 J	< 20 U
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 2.5	2.2	0.50	0.70	3.0 J [0.94 J]	< 0.50 [< 0.50]	5.7	< 0.50	5.1 J+	< 0.50
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	23	33	2.1	2.2	8 J [5.9 J]	< 0.50 [< 0.50]	42	< 0.50	36 J+	0.42 J
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 10 U	< 3.0 U	< 2.0	< 2.0	< 2.0 [2.0 J+]	< 2.0 [< 2.0]	26 J+	< 2.0	4.8 J+	< 2.0
Methyl tert-Butyl Ether	1634-04-4	14.0 <sup>B</sup>	µg/L	< 10	< 2.0	< 2.0	< 2.0	< 2.0 [< 2.0]	< 2.0 [< 2.0]	< 20	< 2.0	< 2.0	< 2.0
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 2.5	6.5	0.17 J	< 0.50	< 0.50 [< 0.50]	< 0.50 [< 0.50]	< 5.0	< 0.50	140 J+	< 0.50
Xylenes, Total	1330-20-7	10,000 <sup>A</sup>	µg/L	< 5.0	1.7	2.0 J+	0.72 J	< 1.0 [< 1.0]	< 1.0 [< 1.0]	< 10	< 1.0	2.1 J+	< 1.0

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

Results in brackets represent blind duplicate results.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+/J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

EPH fractionation was not performed during the April 2022 sampling event.

Table 3-24: ERP Site 8 Detected Soil Analytical Results Summary  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	CASRN	Boring ID		8-SB1	8-SB2	8-SB3	8-SB4		8-SB5		8-SB6	8-SB6			8-SB7						
		Sample Depth (ft bgs)		1.5	3.0	3.0	1.5	5.5	1.0	5.5	1.5	0.5-2.4	4.5-5.7	9.5-10.3	0.5-2.4	4.5-5.8	8.9-10.3				
		Sample Date		Sep-90	Sep-90	Sep-90	Sep-90		Sep-90		Sep-90	Apr-96			Apr-96						
		Screening Level					Units														
MDEQ Tier-1 RBSL <sup>A</sup>					EPA RSL <sup>B</sup>																
DC Comm.		DC Const.	Leaching >20 ft	RCRA Metals	Industrial Soil																
<b>VOCs</b>																					
1,1,2-Trichloroethane	79-00-5	--	--	--	--	1	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001 J	ND	ND	ND	
2-Butanone	78-93-3	--	--	--	--	19,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	0.033	0.002 J	0.006 J	0.093	ND	
2-Hexanone	591-78-6	--	--	--	--	130	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	0.002 J	ND	0.004 J	0.018 J	ND	
4-Methyl-2-Pentanone	108-10-1	--	--	--	--	14,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025	ND	
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	0.095 J	0.14	ND	ND	0.12	ND	0.024 J	0.056 J	0.61 J	ND	0.13 J	0.95 J	0.2 J	
Carbon Disulfide	75-15-0	--	--	--	--	350	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001 J	ND	0.001 J	0.001 J	
Chlorobenzene	108-90-7	--	--	--	--	130	mg/kg	ND	ND	ND	0.035	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Ethylbenzene	100-41-4	28	1,300	130	--	25	mg/kg	ND	ND	ND	ND	ND	ND	0.008	ND	ND	ND	ND	0.001 J	ND	
Methylene Chloride	75-09-2	--	--	--	--	320	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.002 J	ND	ND	ND	
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	0.029	ND	ND	0.006	ND	ND	ND	0.046	ND	ND	ND	ND	0.001 J	
trans-1,2-Dichloroethene	156-60-5	--	--	--	--	30	mg/kg	ND	ND	ND	ND	ND	ND	ND	0.008	ND	ND	ND	ND	ND	
Trichloroethene	79-01-6	--	--	--	--	1.9	mg/kg	ND	ND	0.004 J	0.26	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Xylenes (Total)	1330-20-7	310	610	1,600	--	250	mg/kg	--	--	--	--	--	--	--	--	0.002 J	ND	0.001 J	0.004 J	0.004 J	
<b>SVOCs</b>																					
1,2-Dichlorobenzene	95-50-1	--	--	--	--	930	mg/kg	ND	ND	ND	ND	0.24 J	ND	ND	ND	ND	ND	ND	ND	ND	
2-Methylnaphthalene	91-57-6	250	250	35	--	300	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
bis(2-Ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	55 J	ND	0.14 J	0.096 J	ND	
Di-n-butylphthalate	84-74-2	--	--	--	--	66,000	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Di-n-octylphthalate	117-84-0	--	--	--	--	820	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012 J	ND	ND	
Naphthalene	91-20-3	9.5	140	62	--	8.6	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
<b>Metals</b>																					
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	6.3	7.1	22.2	7.4	3.2	3.2	3.5	7.3	8.6	2.5	3.3	7.6	2.5	
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	182	302	119	223	151	73.4	88.5	187	358	78.3	128	436	96.1	
Beryllium	7440-41-7	--	--	--	--	230	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	0.52 J	0.26 J	0.3 J	0.45 J	0.29 J	
Cadmium	7440-43-9	--	--	--	3.8	10	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	9.4	12.5	10.5	14	15.6	8.9	12.6	14.6	15.3	7.8	12.7	12.1	8.3	
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	12.6	17.2	6	19.8	7.4	5.2	6.3	14.2	37.4	11	11.1	26.7	10	
Lead	7439-92-1	--	--	--	140	800	mg/kg	11.4	13.7	12.3	14.9	7.5	7.4	8.9	12.9	8.1	5.9	7.9	16.6	6.2	
Mercury	7439-97-6	--	--	--	1	4.6	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	7.5	8.5	ND	ND	7.8	ND	ND	7.6	11.9	8.6	11	10.6	8.8	
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	ND	ND	0.32	ND	0.35	ND	ND	ND	ND	ND	0.28 J	ND	ND	
Thallium	7440-28-0	--	--	--	--	1.2	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	39.2	46.3	20.2	48.3	37.7	26	42.9	45.4	52.7	47.5	44.8	137	41.7	
<b>Petroleum Hydrocarbons</b>																					
TPH	--	--	--	--	--	--	mg/kg	140	25	ND	ND	ND	ND	ND	22	--	--	--	--	--	
DRO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	ND	ND	ND	55 J	ND	
GRO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	180	ND	ND	ND	ND	
JP-4	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	
ORO	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	15	ND	ND	1,700	ND	
<b>EPH/VPH Fractions (Converted)</b>																					
C9-C10 Aromatics	--	1,000	1,000	720	--	--	mg/kg	--	--	--	--	--	--	--	--	180	ND	ND	ND	ND	
C9-C18 Aliphatics	--	540	900	270,000	--	--	mg/kg	98	17.5	ND	ND	ND	ND	ND	15.4	ND	ND	ND	22	ND	
C11-C22 Aromatics	--	3,900	3,900	2,000	--	--	mg/kg	42	7.5	ND	ND	ND	ND	ND	6.6	15	ND	ND	1,733	ND	

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.

Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.

Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.

<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).

<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).

<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

mg/kg = Milligrams per kilogram.

ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%
Diesel-Range Organics (DRO)	--	40.00%	60.00%
Gasoline-Range Organics (GRO)	100.00%	--	--
Oil-Range Organics (ORO)	--	--	100.00%
Jet Propellant 4 (JP-4)	--	70.00%	30.00%

Table 3-24: ERP Site 8 Detected Soil Analytical Results Summary  
 Montana Air National Guard Base - Great Falls International Airport  
 Great Falls, Montana

Analyte	CASRN	Boring ID						8-SB8			8-SB9			8-SB10		
		Sample Depth (ft bgs)						0.5-2.4	4.5-5.5	9.5-10.5	1.0-3.0	4.5-5.5	8.5-9.4	1.0-3.0	4.5-6.5	9.0-9.9
		Sample Date						Apr-96			Apr-96			Apr-96		
		Screening Level						Units								
DC Comm.	DC Const.	Leaching >20 ft	RCRA Metals	EPA RSL <sup>B</sup> Industrial Soil												
<b>VOCs</b>																
1,1,2-Trichloroethane	79-00-5	--	--	--	--	1	mg/kg	ND	ND	ND						
2-Butanone	78-93-3	--	--	--	--	19,000	mg/kg	<b>0.023</b>	<b>0.01 J</b>	ND	<b>0.004 J</b>	ND	<b>0.008 J</b>	<b>0.002 J</b>	ND	<b>0.01 J</b>
2-Hexanone	591-78-6	--	--	--	--	130	mg/kg	<b>0.011 J</b>	<b>0.011</b>	ND	<b>0.004 J</b>	ND	<b>0.002 J</b>	ND	ND	ND
4-Methyl-2-Pentanone	108-10-1	--	--	--	--	14,000	mg/kg	<b>0.022</b>	ND	ND	<b>0.006 J</b>	ND	ND	ND	ND	ND
Acetone	67-64-1	--	--	--	--	110,000	mg/kg	<b>0.14 J</b>	<b>0.91 J</b>	<b>0.82 J</b>	<b>0.028</b>	<b>0.082</b>	<b>0.093</b>	<b>0.21</b>	<b>0.9 J</b>	<b>0.16</b>
Carbon Disulfide	75-15-0	--	--	--	--	350	mg/kg	<b>0.001 J</b>	<b>0.001 J</b>	ND	ND	ND	<b>0.001 J</b>	<b>0.001 J</b>	ND	ND
Chlorobenzene	108-90-7	--	--	--	--	130	mg/kg	ND	ND	ND						
Ethylbenzene	100-41-4	28	1,300	130	--	25	mg/kg	ND	<b>ND</b>	<b>0.25 J</b>	ND	ND	ND	ND	ND	ND
Methylene Chloride	75-09-2	--	--	--	--	320	mg/kg	ND	<b>0.09 J</b>	<b>0.077 J</b>	ND	ND	ND	ND	ND	ND
Toluene	108-88-3	5,500	5,500	100	--	4,700	mg/kg	<b>0.001 J</b>	<b>0.001 J</b>	<b>0.42 J</b>	ND	<b>0.001 J</b>	<b>0.001 J</b>	<b>0.001 J</b>	ND	<b>0.001 J</b>
trans-1,2-Dichloroethene	156-60-5	--	--	--	--	30	mg/kg	ND	ND	ND						
Trichloroethene	79-01-6	--	--	--	--	1.9	mg/kg	ND	ND	ND						
Xylenes (Total)	1330-20-7	310	610	1,600	--	250	mg/kg	<b>0.001 J</b>	<b>0.001 J</b>	<b>1.9</b>	ND	<b>0.001 J</b>	ND	ND	ND	<b>0.001 J</b>
<b>SVOCs</b>																
1,2-Dichlorobenzene	95-50-1	--	--	--	--	930	mg/kg	ND	ND	ND						
2-Methylnaphthalene	91-57-6	250	250	35	--	300	mg/kg	ND	ND	<b>0.22 J</b>	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	117-81-7	--	--	--	--	160	mg/kg	<b>0.98</b>	ND	<b>0.1 J</b>	<b>0.2 J</b>	<b>0.19 J</b>	ND	ND	ND	ND
Di-n-butylphthalate	84-74-2	--	--	--	--	66,000	mg/kg	<b>0.017 J</b>	ND	<b>0.026 J</b>	ND	ND	ND	ND	ND	ND
Di-n-octylphthalate	117-84-0	--	--	--	--	820	mg/kg	ND	ND	ND	<b>0.006 J</b>	<b>0.014 J</b>	ND	ND	ND	ND
Naphthalene	91-20-3	9.5	140	62	--	8.6	mg/kg	ND	ND	<b>0.38 J</b>	ND	ND	ND	ND	ND	ND
<b>Metals</b>																
Arsenic	7440-38-2	--	--	--	22.5 <sup>C</sup>	3	mg/kg	<b>10.5</b>	<b>4</b>	<b>3.5</b>	<b>22.4</b>	<b>3.1</b>	<b>5</b>	<b>3.8</b>	<b>2.3</b>	<b>6.7</b>
Barium	7440-39-3	--	--	--	421	22,000	mg/kg	<b>186</b>	<b>89.5</b>	<b>160</b>	<b>168</b>	<b>130</b>	<b>209</b>	<b>229</b>	<b>100</b>	<b>93.9</b>
Beryllium	7440-41-7	--	--	--	--	230	mg/kg	<b>0.62 J</b>	<b>0.29 J</b>	<b>0.45 J</b>	<b>0.53 J</b>	<b>0.3 J</b>	<b>0.42 J</b>	<b>0.36 J</b>	<b>0.37 J</b>	<b>0.34 J</b>
Cadmium	7440-43-9	--	--	--	3.8	10	mg/kg	<b>0.48 J</b>	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	7440-47-3	--	--	--	12,000	--	mg/kg	<b>13.2</b>	<b>7.4</b>	<b>10.7</b>	<b>11.1</b>	<b>7.3</b>	<b>14.5</b>	<b>9.1</b>	<b>9</b>	<b>6.1</b>
Copper	7440-50-8	--	--	--	--	4,700	mg/kg	<b>34</b>	<b>11.4</b>	<b>12.7</b>	<b>36.6</b>	<b>24.9</b>	<b>10.9</b>	<b>15.9</b>	<b>11.5</b>	<b>22.1</b>
Lead	7439-92-1	--	--	--	140	800	mg/kg	<b>15</b>	<b>6.5</b>	<b>7.4</b>	<b>17.2</b>	<b>6.1</b>	<b>6.5</b>	<b>6.7</b>	<b>5.1</b>	<b>8</b>
Mercury	7439-97-6	--	--	--	1	4.6	mg/kg	ND	ND	<b>0.14</b>						
Nickel	7440-02-0	--	--	--	--	2,200	mg/kg	<b>12.5</b>	<b>9</b>	<b>8.5</b>	<b>9.2</b>	<b>7.9</b>	<b>10.9</b>	<b>9.1</b>	<b>8.8</b>	<b>11.2</b>
Selenium	7782-49-2	--	--	--	2.6	580	mg/kg	ND	ND	ND						
Thallium	7440-28-0	--	--	--	--	1.2	mg/kg	ND	ND	<b>0.42</b>	ND	ND	ND	ND	ND	ND
Zinc	7440-66-6	--	--	--	1,233	35,000	mg/kg	<b>68.3</b>	<b>42.3</b>	<b>53.9</b>	<b>57.8</b>	<b>56.4</b>	<b>56</b>	<b>43.8</b>	<b>38</b>	<b>54.4</b>
<b>Petroleum Hydrocarbons</b>																
TPH	--	--	--	--	--	--	mg/kg	--	--	--	--	--	--	--	--	--
DRO	--	--	--	--	--	--	mg/kg	ND	ND	<b>340</b>	ND	ND	ND	ND	ND	ND
GRO	--	--	--	--	--	--	mg/kg	ND	ND	<b>1,200</b>	ND	ND	ND	ND	ND	ND
JP-4	--	--	--	--	--	--	mg/kg	ND	ND	<b>240</b>	ND	ND	ND	ND	ND	ND
ORO	--	--	--	--	--	--	mg/kg	ND	ND	<b>260 J</b>	ND	ND	ND	ND	ND	ND
<b>EPH/VPH Fractions (Converted)</b>																
C9-C10 Aromatics	--	1,000	1,000	720	--	--	mg/kg	ND	ND	<b>1,200</b>	ND	ND	ND	ND	ND	ND
C9-C18 Aliphatics	--	540	900	270,000	--	--	mg/kg	ND	ND	<b>304</b>	ND	ND	ND	ND	ND	ND
C11-C22 Aromatics	--	3,900	3,900	2,000	--	--	mg/kg	ND	ND	<b>536</b>	ND	ND	ND	ND	ND	ND

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.

Shaded values indicate concentration is greater than the DC Commercial RBSL, DC Construction RBSL, or EPA RSL.

Data first compared to MDEQ Tier-1 RBSL. If a value does not exist, then EPA RSLs were used.

<sup>A</sup> = Montana Department of Environmental Quality Tier-1 Risk-Based Screening Levels (MDEQ, 2020).

<sup>B</sup> = EPA Regional Screening Levels (EPA, 2023).

<sup>C</sup> = RCRA Metals screening level for arsenic is based off of Montana Background Threshold Value (MDEQ, 2020).

CASRN = Chemical Abstracts Service Registration Number

-- = Not available/not analyzed.

ft bgs = Feet below ground surface.

J = Indicates the result is an estimated value.

mg/kg = Milligrams per kilogram.

ND = Not detected.

Petroleum Hydrocarbons Conversion Table			
Historical Analyte	C9-C10 Aromatics	C9-C18 Aliphatics	C11-C22 Aromatics
Total Petroleum Hydrocarbons (TPH)	--	70.00%	30.00%
Diesel-Range Organics (DRO)	--	40.00%	60.00%
Gasoline-Range Organics (GRO)	100.00%	--	--
Oil-Range Organics (ORO)	--	--	100.00%
Jet Propellant 4 (JP-4)	--	70.00%	30.00%

**Table 3-25: ERP Site 8 Detected Groundwater Analytical Results - October 2020**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			8-DMW1	8-DMW2	8-MW1	8-MW2	8-MW4	8-MW7	8-MW8	8-MW13
	Screen Depth (ft bgs)			83.5 - 93.5	70 - 80	38 - 58	44 - 64	40 - 60	40 - 60	44 - 64	40 - 60
	Sample Date			Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20	Oct-20
	CASRN	Screening Level	Units								
<b>VOCs</b>											
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	< 0.80 UJ	< 0.80 UJ	< 0.80	< 0.80	< 0.80	<b>0.94 J-</b>	< 0.80 UJ	<b>0.47 J [0.48 J]</b>
1,2,3-Trichlorobenzene	87-61-6	NE	µg/L	<b>0.21 J-</b>	< 0.80 UJ	< 0.80	< 0.80	< 0.80	< 0.80 UJ	< 0.80 UJ	< 0.80 [ <lt; 0.80]<="" td=""> </lt;>
1,2,4-Trichlorobenzene	120-82-1	70 <sup>A</sup>	µg/L	< 0.40 UJ	< 0.40 UJ	< 0.40	< 0.40	<b>0.34 J</b>	< 0.40 UJ	<b>0.31 J-</b>	<b>0.96 J [0.96 J]</b>
Acetone	67-64-1	1400 <sup>B</sup>	µg/L	< 6.4 UJ	< 6.4 UJ	< 6.4	< 6.4	<b>3 0 J</b>	< 6.4 UJ	< 6.4 UJ	< 6.4 [ <lt; 6.4]<="" td=""> </lt;>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.40 UJ	<b>0.31 J-</b>	< 0.40	< 0.40	< 0.40	< 0.40 UJ	< 0.40 UJ	< 0.40 [ <lt; 0.40]<="" td=""> </lt;>
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	< 0.40 UJ	< 0.40 UJ	<b>2.8 J+</b>	< 0.40	< 0.40	< 0.40 UJ	< 0.40 UJ	< 1.0 U [ <lt; 1.0="" td="" u]<=""> </lt;>
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	< 0.40 UJ	<b>1.4 J-</b>	<b>87</b>	<b>0.36 J</b>	<b>50</b>	<b>33 J-</b>	<b>0.90 J-</b>	<b>99 [100]</b>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	< 0.40 UJ	< 0.40 UJ	< 0.40	< 0.40	< 0.40	< 0.40 UJ	< 0.40 UJ	<b>0.27 J [0.31 J]</b>
Isopropylbenzene	98-82-8	450 <sup>B</sup>	µg/L	< 0.40 UJ	< 0.40 UJ	< 0.40	< 0.40	< 0.40	< 0.40 UJ	< 0.40 UJ	<b>0.20 J [0.20 J]</b>
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	<b>0.27 J-</b>	< 0.80 UJ	< 0.80	<b>0.32 J</b>	<b>0.22 J</b>	<b>0.31 J-</b>	<b>0.21 J-</b>	<b>0.40 J [0.39 J]</b>
Methyl tert-Butyl Ether	1634-04-4	14.0 <sup>B</sup>	µg/L	< 0.80 UJ	< 0.80 UJ	< 0.80	< 0.80	< 0.80	< 0.80 UJ	<b>0.35 J-</b>	< 0.80 [ <lt; 0.80]<="" td=""> </lt;>
o-Xylene	95-47-6	10,000 <sup>A</sup>	µg/L	< 0.40 UJ	< 0.40 UJ	< 0.40	< 0.40	< 0.40	< 0.40 UJ	< 0.40 UJ	<b>0.26 J [0.27 J]</b>
Tetrachloroethylene	127-18-4	5 <sup>A</sup>	µg/L	< 0.40 UJ	< 0.40 UJ	< 0.40	< 0.40	< 0.40	< 0.40 UJ	< 0.40 UJ	<b>0.30 J [0.28 J]</b>
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	<b>0.40 J-</b>	< 0.40 UJ	< 0.40	<b>0.36 J</b>	<b>0.29 J</b>	<b>0.31 J-</b>	< 0.40 UJ	<b>0.21 J [0.18 J]</b>
trans-1,2-Dichloroethylene	156-60-5	100 <sup>A</sup>	µg/L	< 0.40 UJ	< 0.40 UJ	<b>0.23 J</b>	< 0.40	< 0.40	<b>0.78 J-</b>	<b>0.37 J-</b>	< 0.40 [ <lt; 0.40]<="" td=""> </lt;>
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	< 0.40 UJ	< 1.0 U	<b>3.2</b>	< 0.40	<b>1.2</b>	<b>3.5 J-</b>	< 1.0 U	<b>2.7 [2.6]</b>
Vinyl Chloride	75-01-4	0.2 <sup>A</sup>	µg/L	< 0.20 UJ	< 0.20 UJ	< 0.20	<b>0.63 J</b>	<b>12</b>	<b>4.4 J-</b>	<b>1.6 J-</b>	<b>0.85 J [0.84 J]</b>
<b>EPH</b>											
Total EPH, Screen	--	1000 <sup>C</sup>	µg/L	NA	NA	< 300	< 320	NA	< 300	< 290	< 290 [ <lt; 290]<="" td=""> </lt;>
<b>VPH</b>											
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	< 20 R	< 20 UJ	<b>41</b>	< 20 U	<b>23 J-</b>	<b>27 J+</b>	< 20 UJ	<b>44 [49]</b>
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	< 20	< 20	< 20	< 20	< 20 UJ	< 20	<b>19 J</b>	< 20 U [ <lt; 20="" td="" u]<=""> </lt;>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.50	<b>0.30 J</b>	< 0.50	< 0.50	< 0.50 UJ	< 0.50	< 0.50 UJ	< 0.50 [ <lt; 0.50]<="" td=""> </lt;>
Ethylbenzene	100-41-4	700 <sup>A</sup>	µg/L	< 0.50 R	< 0.50 UJ	< 0.50 U	< 0.50	< 0.50 UJ	< 0.50	<b>0.73 J</b>	< 0.50 U [ <lt; 0.50="" td="" u]<=""> </lt;>

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+/J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

R = Rejected result.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

**Table 3-26: ERP Site 8 Detected Groundwater Analytical Results - April 2021**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID		8-DMW1	8-MW1	8-MW2	8-MW4	8-MW7	8-MW8	8-MW10	8-MW13	8-MW14	
	Screen Depth (ft bgs)		83.5 - 93.5	38 - 58	44 - 64	40 - 60	40 - 60	44 - 64	39 - 59	40 - 60	45 - 65	
	Sample Date		Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	Apr-21	
	CASRN	Screening Level	Units									
<b>VOCs</b>												
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	< 0.80 UJ	<b>0.67 J</b>	< 0.80	<b>0.76 J</b>	<b>1.5</b>	< 0.80	< 0.80	< 3.2	< 0.80
1,2,4-Trimethylbenzene	95-63-6	56 <sup>B</sup>	µg/L	1.0 UJ	1.0 U	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 1.6	<b>0.40 J</b>
Benzene	71-43-2	5 <sup>A</sup>	µg/L	< 0.40 UJ	<b>0.24 J</b>	< 0.40	< 0.40	<b>0.34 J</b>	<b>0.39 J</b>	< 0.40	< 1.6	< 0.40
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	< 0.40 UJ	<b>2.4 J+</b>	<b>1.8 J+</b>	1.0 U	< 0.40	<b>1.6 J+</b>	1.0 U	4.0 U	< 0.40
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	< 0.40 UJ	<b>86</b>	<b>8.4</b>	<b>59</b>	<b>69</b>	<b>2.6</b>	<b>0.83 J</b>	<b>370</b>	<b>0.78 J</b>
m/p-Xylene	--	10,000 <sup>A</sup>	µg/L	2.0 UJ	2.0 U	< 0.80	2.0 U	2.0 U	2.0 U	< 0.80	< 3.2	< 0.80
n-Butylbenzene	104-51-8	100 <sup>B</sup>	µg/L	< 0.80 UJ	<b>0.22 J</b>	< 0.80	< 0.80	< 0.80	< 0.80	< 0.80	< 3.2	< 0.80
Tetrachloroethylene	127-18-4	5 <sup>A</sup>	µg/L	< 0.40 UJ	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	<b>1.5</b>	< 1.6	< 0.40
Toluene	108-88-3	1,000 <sup>A</sup>	µg/L	< 0.40 UJ	< 0.40	< 0.40	1.0 U	< 0.40	< 0.40	< 0.40	< 1.6	< 0.40
trans-1,2-Dichloroethylene	156-60-5	100 <sup>A</sup>	µg/L	< 0.40 UJ	< 0.40	< 0.40	<b>0.38 J</b>	<b>0.88 J</b>	< 0.40	< 0.40	< 1.6	< 0.40
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	< 0.40 UJ	<b>2.4</b>	<b>0.59 J</b>	<b>1.1</b>	<b>7.4</b>	<b>0.87 J</b>	< 0.40	<b>6.8</b>	< 0.40
Vinyl Chloride	75-01-4	0.2 <sup>A</sup>	µg/L	< 0.20 UJ	< 0.20	< 0.20	<b>17</b>	<b>2.7</b>	< 0.20	< 0.20	< 0.80	<b>1.6</b>
<b>EPH</b>												
Total EPH, Screen	--	1,000 <sup>C</sup>	µg/L	<b>460 J</b>	--	--	--	--	--	--	--	--

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+ noted if high bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

**Table 3-27: ERP Site 8 Detected Groundwater Analytical Results - October 2021**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID			8-MW1	8-MW2	8-MW4	8-MW7	8-MW8	8-MW13	8-MW14
	Screen Depth (ft bgs)			38 - 58	44 - 64	40 - 60	40 - 60	44 - 64	40 - 60	45 - 65
	Sample Date			Oct-21						
	CASRN	Screening Level	Units							
<b>VOCs</b>										
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	<b>0.80 J</b>	< 0.80	<b>0.50 J</b>	<b>1.2</b>	< 0.80	<b>0.73 J</b>	< 0.80
1,1-Dichloroethylene	75-35-4	7.0 <sup>A</sup>	µg/L	< 0.80	< 0.80	< 0.80	<b>0.26 J</b>	< 0.80	< 0.80	< 0.80
Acetone	67-64-1	1400 <sup>B</sup>	µg/L	< 6.4	<b>7.9 J</b>	< 6.4	< 6.4	< 6.4	< 6.4	<b>84</b>
Carbon Disulfide	75-15-0	81 <sup>B</sup>	µg/L	< 0.80	< 0.80	<b>0.22 J</b>	< 0.80	< 0.80	< 0.80	<b>0.44 J</b>
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	< 1.0 U	< 0.40	< 0.40	<b>1.0 J+</b>	< 1.0 U	< 1.0 U	< 0.40
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	<b>130</b>	<b>0.50 J</b>	<b>90</b>	<b>77</b>	<b>3.9</b>	<b>180</b>	<b>1.3</b>
Tetrachloroethylene	127-18-4	5 <sup>A</sup>	µg/L	<b>0.23 J</b>	< 0.40	< 0.40	< 0.40	< 0.40	<b>0.26 J</b>	< 0.40
trans-1,2-Dichloroethylene	156-60-5	100 <sup>A</sup>	µg/L	<b>1.1</b>	< 0.40	<b>0.22 J</b>	<b>0.42 J</b>	< 0.40	<b>0.51 J</b>	< 0.40
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	<b>2.5</b>	< 0.40	<b>1.1</b>	<b>7.3</b>	<b>0.89 J</b>	<b>4.2</b>	< 0.40
Vinyl Chloride	75-01-4	0.2 <sup>A</sup>	µg/L	< 0.20	<b>0.68 J</b>	<b>7.1</b>	<b>1.6</b>	< 0.20	<b>0.86 J</b>	<b>1.2 J</b>
<b>EPH</b>										
Total EPH, Screen	--	1000 <sup>C</sup>	µg/L	< 300	< 310	<b>470 J+</b>	< 330	< 300	< 350	< 320
<b>VPH</b>										
C5-C8 Aliphatics	--	650 <sup>C</sup>	µg/L	<b>63</b>	< 20 U	<b>38 J+</b>	<b>34 J-</b>	< 20	<b>83</b>	< 20 U
C9-C10 Aromatics	--	1,100 <sup>C</sup>	µg/L	<b>10 J</b>	<b>13 J</b>	< 20	<b>0.99 J</b>	< 20	<b>0.88 J</b>	< 20
Naphthalene	91-20-3	100 <sup>A</sup>	µg/L	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	<b>4.8</b>
Methyl tert-Butyl Ether	1634-04-4	14 <sup>B</sup>	µg/L	< 2.0	< 2.0	< 2.0	<b>0.73 J</b>	< 2.0	< 2.0	< 2.0 UJ

Notes:

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

< = Indicates the result is less than the LOD for VOCs and MTEPH. For MTVPH, indicates the results are less than the reporting limit.

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+J- noted if high/low bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

UJ = Estimated reporting limit.

**Table 3-28: ERP Site 8 Detected Groundwater Analytical Results - April 2022**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Analyte	Well ID		8-MW1	8-MW2	8-MW3	8-MW4	8-MW7	8-MW8	8-MW13	8-MW14	
	Screen Depth (ft bgs)		38 - 58	44 - 64	37 - 57	40 - 60	40 - 60	44 - 64	40 - 60	45 - 65	
	Sample Date		Apr-22								
	CASRN	Screening Level	Units								
<b>VOCs</b>											
1,1-Dichloroethane	75-34-3	2.8 <sup>B</sup>	µg/L	1.3 J	< 0.80	1.6 J	0.41 J	0.83 J	< 0.80	< 3.2	< 0.80
1,2-Dichloroethane	107-06-2	5 <sup>A</sup>	µg/L	0.53 J	< 0.40	< 1.6	0.23 J	0.21 J	< 0.40	< 1.6	< 0.40
Chloroform	67-66-3	70 <sup>A</sup>	µg/L	< 4.0 U	1.0 J+	< 4.0 U	< 1.0 U	< 0.40	3.8 J+	< 4.0 U	< 0.40
cis-1,2-Dichloroethylene	156-59-2	70 <sup>A</sup>	µg/L	280	19	280	91	40	6.1	350	0.35 J
trans-1,2-Dichloroethylene	156-60-5	100 <sup>A</sup>	µg/L	< 1.6	< 0.40	< 1.6	< 0.40	0.40 J	< 0.40	< 1.6	< 0.40
Trichloroethylene	79-01-6	5 <sup>A</sup>	µg/L	2.9 J	1.3	5.8	0.89 J	4.1	1.3	4.9	< 0.40
Vinyl Chloride	75-01-4	0.2 <sup>A</sup>	µg/L	< 0.80	0.50 J	1.3 J	28	5.5	< 0.20	< 0.80	< 0.20

**Notes:**

**Bolded** value indicates the analyte was detected above the limit of detection (LOD).

**Bolded** and shaded values indicate concentration is greater than the screening criteria.

<sup>A</sup> = MDEQ Circular DEQ-7 Numeric Water Quality Standards (MDEQ, 2019).

<sup>B</sup> = EPA RSLs for Tap Water (EPA, 2023).

<sup>C</sup> = Montana Tier-1 RBSLs (MDEQ, 2020).

-- = Not available/not analyzed.

J = Indicates the result is an estimated value. J+ noted if high bias is suspected.

µg/L = Micrograms per liter.

U = Qualified as not detected due to associated blank contamination, VOCs reported as less than the limit of quantitation (LOQ).

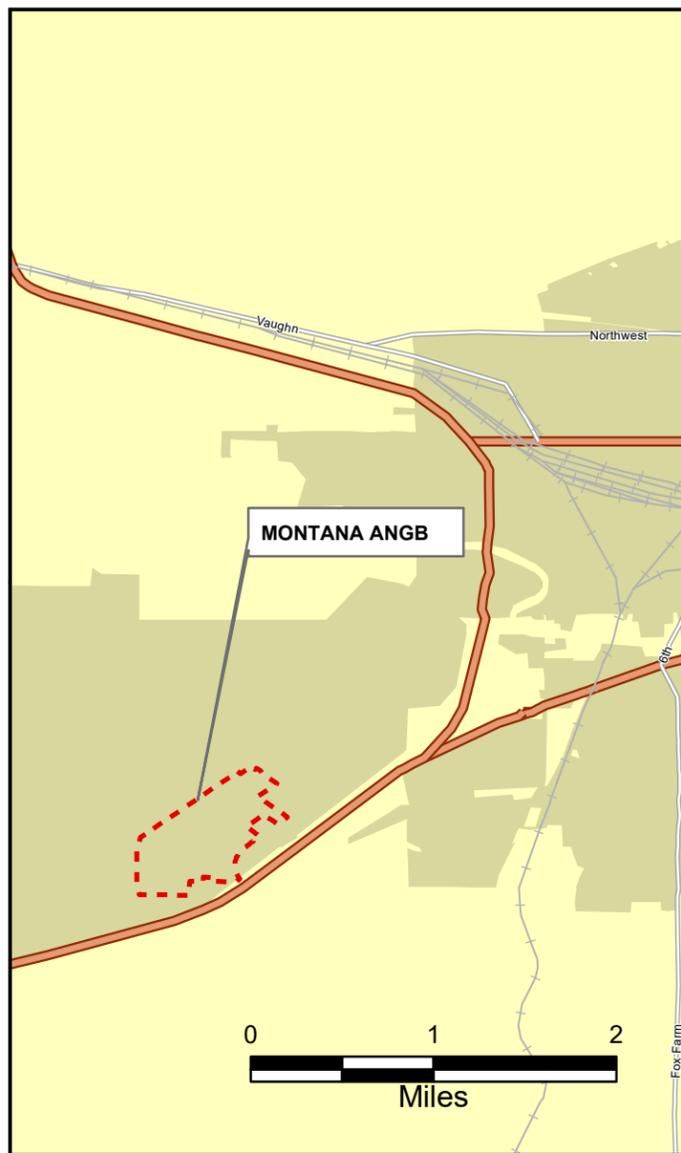
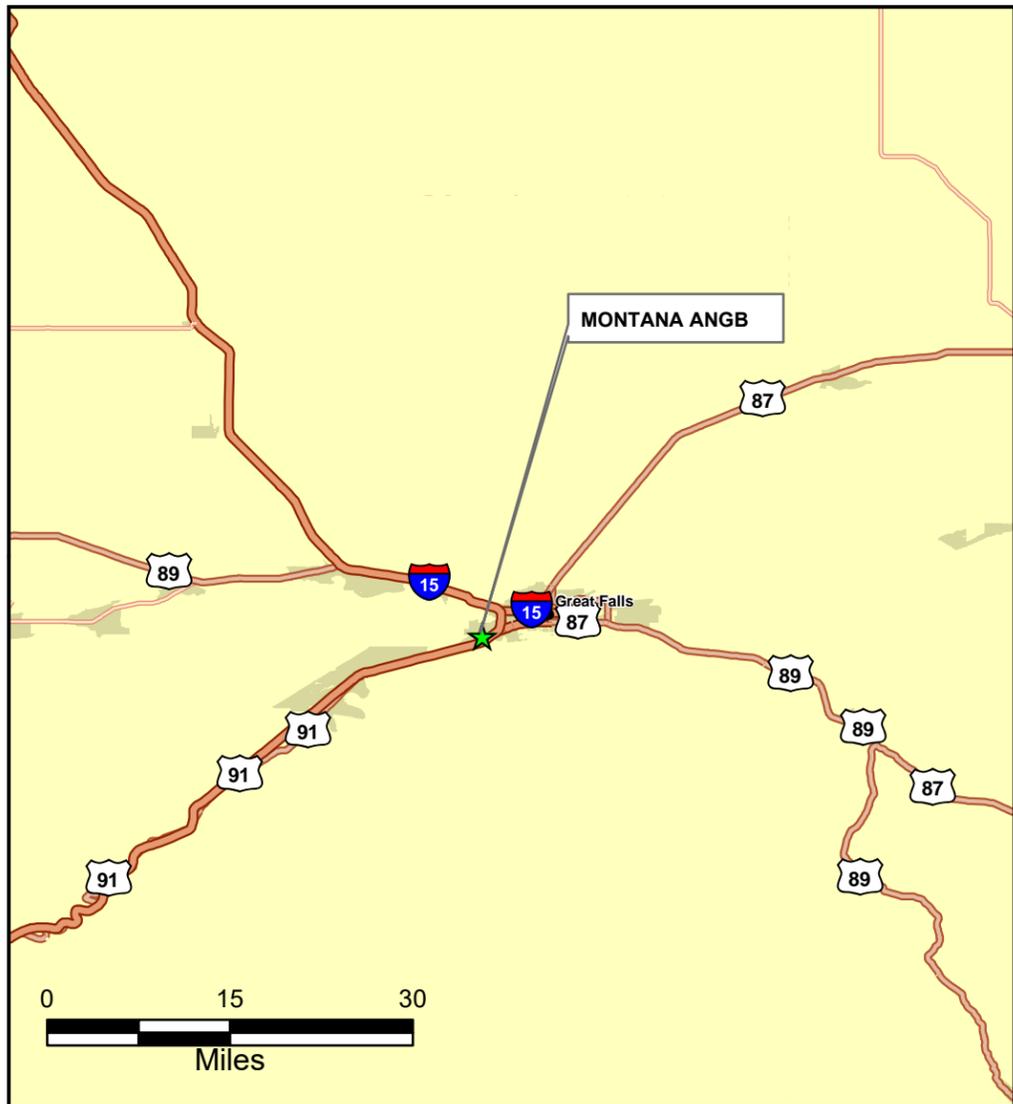
**Table 5-1: Remedial Alternative Screening**  
**Montana Air National Guard Base - Great Falls International Airport**  
**Great Falls, Montana**

Technology/Process Options	Screening Criteria			Screening Rationale	Screening Result
	Effectiveness	Implementability	Cost-Effectiveness		
No Action	Low This remedy would not be protective to human health and the environment.	Low It is unlikely that this alternative would be accepted by regulators.	High Only costs associated with this alternative are infrastructure abandonment.	Regulatory Requirement	RETAINED
Land Use Controls	High This remedy prevents any potential exposure to impacted soil and groundwater.	Medium Implementation of LUCs is relatively simple although regulators would likely want to see additional groundwater monitoring and LNAPL skimming.	Medium to High Low costs to maintain the LUCs as only annual inspections and reporting would be required.	Prevents exposure to residual soil contamination and groundwater contamination. Groundwater can be removed from LUC once it has attenuated to below standards.	RETAINED
Long Term Groundwater Monitoring/MNA	Medium Monitors contaminant degradation over time and ensure contaminant plumes are stable or shrinking.	Medium Currently implemented and will most likely be required by regulators going forward	Medium Costs include mobilization sampling and reporting. Costs can be reduced by optimizing sample program, decreasing sample frequency and going to an annual report.	Ongoing LTM will likely be required by regulators going forward.	RETAINED
Passive LNAPL Skimming	Low Has a minimal effect on the overall LNAPL plumes	High LNAPL Removal is required by MDEQ where LNAPL thicknesses exceed 0.01 feet	High Product skimming done with sorbent socks changed out quarterly. LNAPL is only present in 3 to 5 monitoring wells.	Regulatory Requirement	RETAINED
Enhanced Bioremediation / Biostimulation	Medium It is effective but would be difficult to implement on a scale that would significantly decrease the overall cleanup time.	Medium Some infrastructure is already in place but additional infrastructure would need to be added in mission critical portions of the base.	Low Costs of additional infrastructure and the ongoing O&M drives costs. In addition, increased sampling would be required to monitor remedies.	Remedies have previously been implemented onsite to varying degrees of effectiveness.	RETAINED
Surfactant Flushing of LNAPL	Low LNAPL at Site has low transmissivity and minimal thicknesses. Was not previously successful	Medium Could be implemented using existing infrastructure	Low Costs per pound of LNAPL removed would be very high.	Previously used at the Site.	ELIMINATED
Bioventing / Vapor Extraction	Medium Previously used at Sites 6 and 8 with moderate amounts of mass removed. Does not address groundwater contamination.	Low The areas that would need to be accessed to fully implement this alternative are in mission critical areas.	Low A significant amount of new infrastructure would be required to implement the remedy successfully.	Previously used at the Site.	RETAINED
Soil Excavation	Medium Would remove source contamination and prevent continued leaching to groundwater.	Medium Excavations could be implemented to top-of-bedrock. Excavations at Site 7 could not occur until USTs are removed.	Low to Medium Costs vary based on method of treatment / disposition of excavated materials.	Removal of source contamination prevents continued leaching of contaminants into groundwater and prevents exposure to residual soil contamination.	RETAINED

# FIGURES

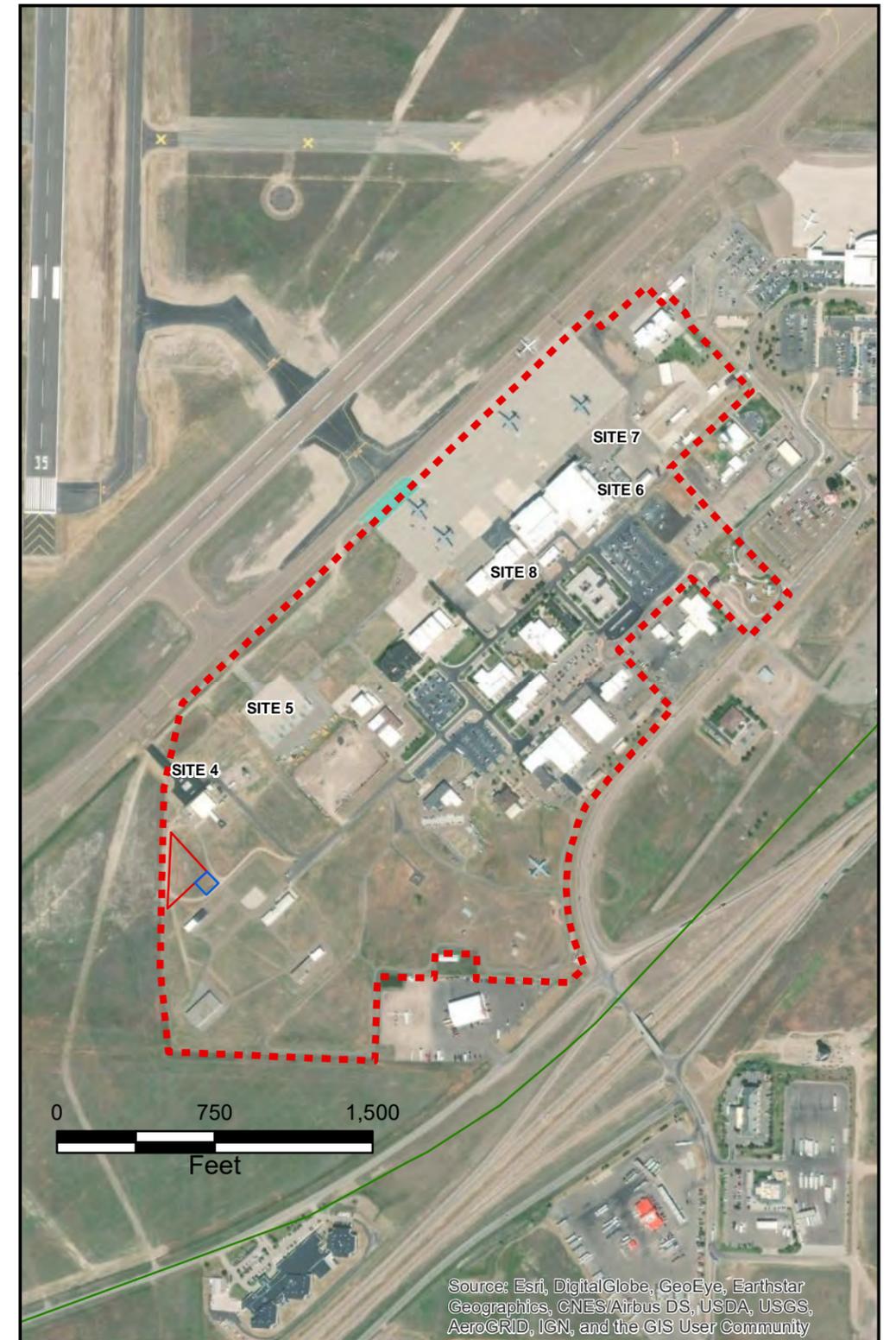
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Figure 1-1	Facility Location Map
Figure 1-2	Site Location Map
Figure 2-1	Monitoring Well Location Map
Figure 2-2	October 2020 Potentiometric Surface Map
Figure 2-3	April 2021 Potentiometric Surface Map
Figure 2-4	October 2021 Potentiometric Surface Map
Figure 2-5	April 2022 Potentiometric Surface Map
Figure 3-1	Site 4 Soil Concentration Map
Figure 3-2	Site 6 Soil Concentration Map
Figure 3-3	Site 7 Soil Concentration Map
Figure 3-4	Site 8 Soil Concentration Map



**LEGEND**

 MONTANA ANGB BOUNDARY



**AECOM**

**FIGURE 1-1**  
**FACILITY LOCATION MAP**  
**MONTANA AIR NATIONAL GUARD BASE**  
**GREAT FALLS INTERNATIONAL AIRPORT**  
**GREAT FALLS, MONTANA**

L:\DCS\Projects\60615401\900 CAD GIS\figures\GREAT FALLS Nov 2019\IGFANG Figure 1-2 Site Location Map.mxd Oct 08 2021 - 4:03:17 PM kyle.priest

**LEGEND**

- + SITE LOCATION
- MONTANA ANGB BOUNDARY
- ROADS



**FIGURE 1-2**  
**SITE LOCATION MAP**  
 MONTANA AIR NATIONAL GUARD BASE  
 GREAT FALLS INTERNATIONAL AIRPORT  
 GREAT FALLS, MONTANA

IMAGE SOURCE ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS/USDA, USGS, AERO GRID, IGN, GIS COMMUNITY, 2018

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**LEGEND**

- + MONITORING WELL
- BIO-VENTING WELL
- ▲ EXTRACTION/INJECTION WELL
- VAPOR EXTRACTION WELL
- ROADS



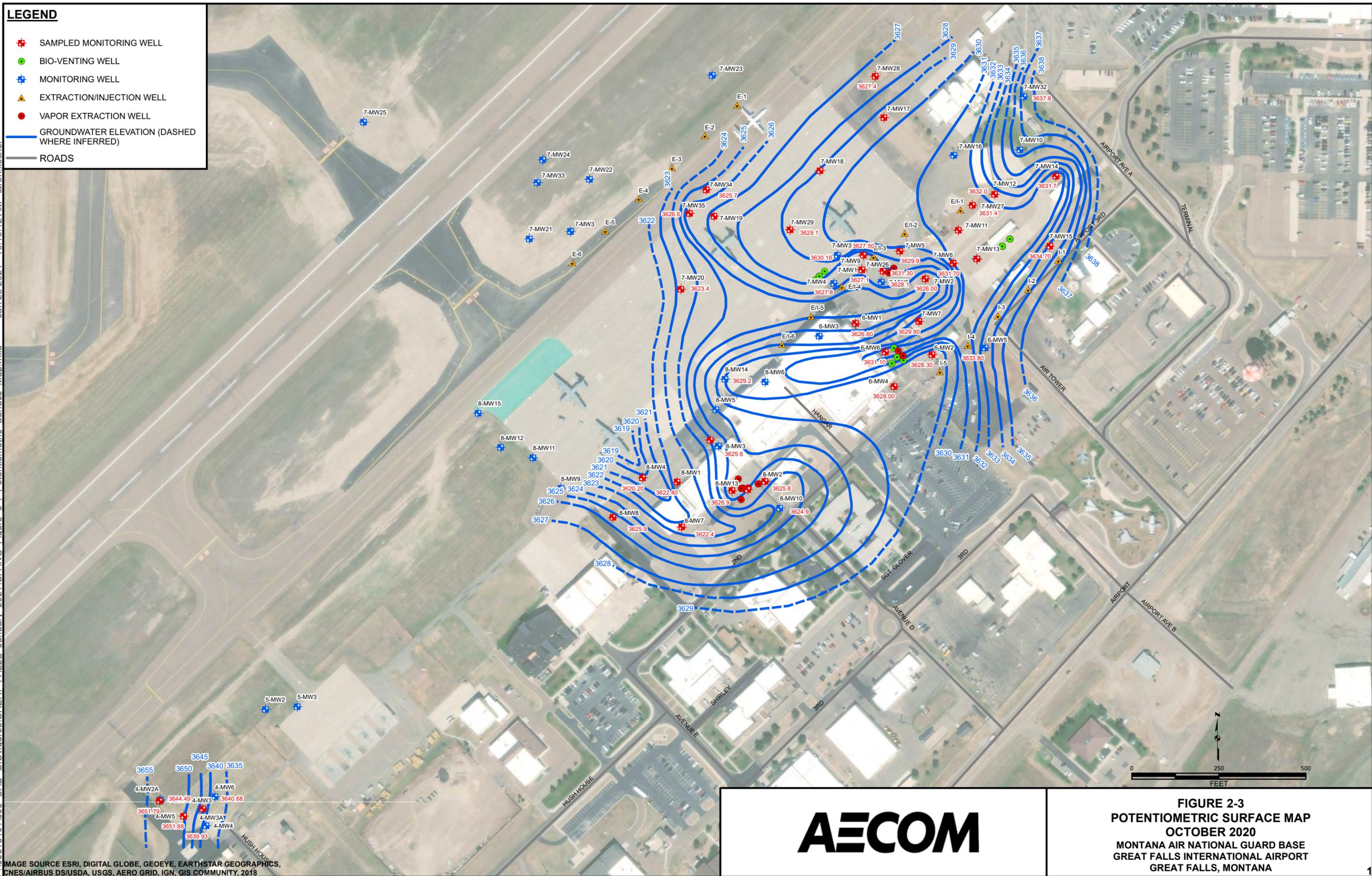
**FIGURE 2-2**  
**MONITORING WELL LOCATION MAP**  
 MONTANA AIR NATIONAL GUARD BASE  
 GREAT FALLS INTERNATIONAL AIRPORT  
 GREAT FALLS, MONTANA

IMAGE SOURCE ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS/USDA, USGS, AERO GRID, IGN, GIS COMMUNITY, 2018

P:\160615401900\_CAD\_GIS\figures\GREAT FALLS January 2021\GFANG Figure 3-1 Potentiometric Surface Map.mxd Jan 25 2021 - 10:10:12 AM iaren.fischer

**LEGEND**

- + SAMPLED MONITORING WELL
- BIO-VENTING WELL
- + MONITORING WELL
- ▲ EXTRACTION/INJECTION WELL
- VAPOR EXTRACTION WELL
- GROUNDWATER ELEVATION (DASHED WHERE INFERRED)
- ROADS



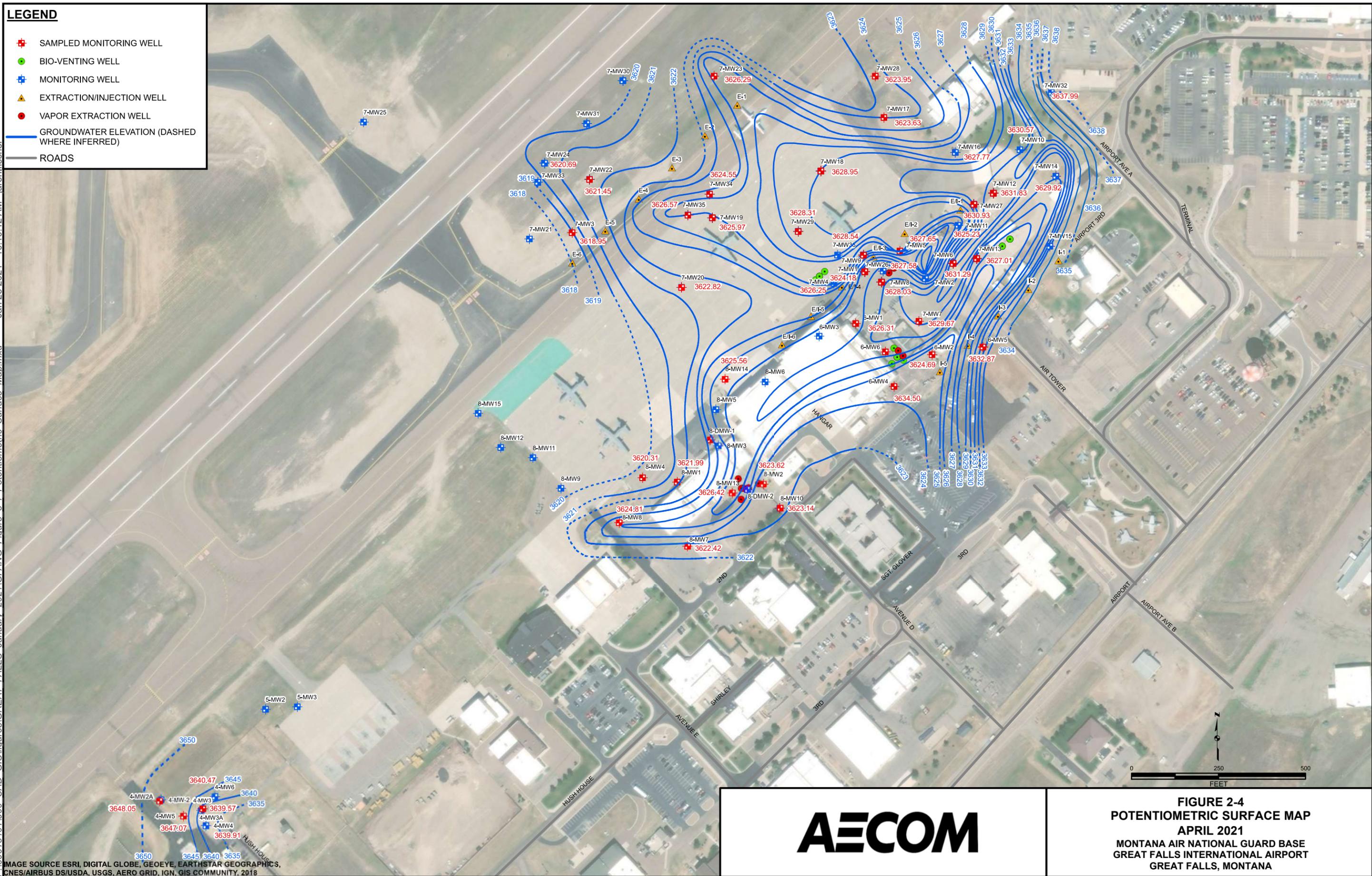
**FIGURE 2-3**  
**POTENTIOMETRIC SURFACE MAP**  
**OCTOBER 2020**  
 MONTANA AIR NATIONAL GUARD BASE  
 GREAT FALLS INTERNATIONAL AIRPORT  
 GREAT FALLS, MONTANA

IMAGE SOURCE ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS/USDA, USGS, AERO GRID, IGN, GIS COMMUNITY, 2018

P:\160615401\1900 CAD GIS\figures\GREAT FALLS January 2021\GFANG Figure 3-1 Potentiometric Surface Map.mxd Jan 25 2021 - 10:10:12 AM iaren.fischer

**LEGEND**

- + SAMPLED MONITORING WELL
- BIO-VENTING WELL
- + MONITORING WELL
- ▲ EXTRACTION/INJECTION WELL
- VAPOR EXTRACTION WELL
- GROUNDWATER ELEVATION (DASHED WHERE INFERRED)
- ROADS



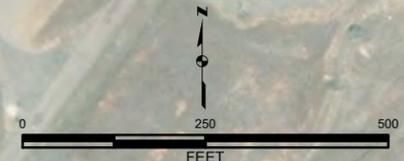
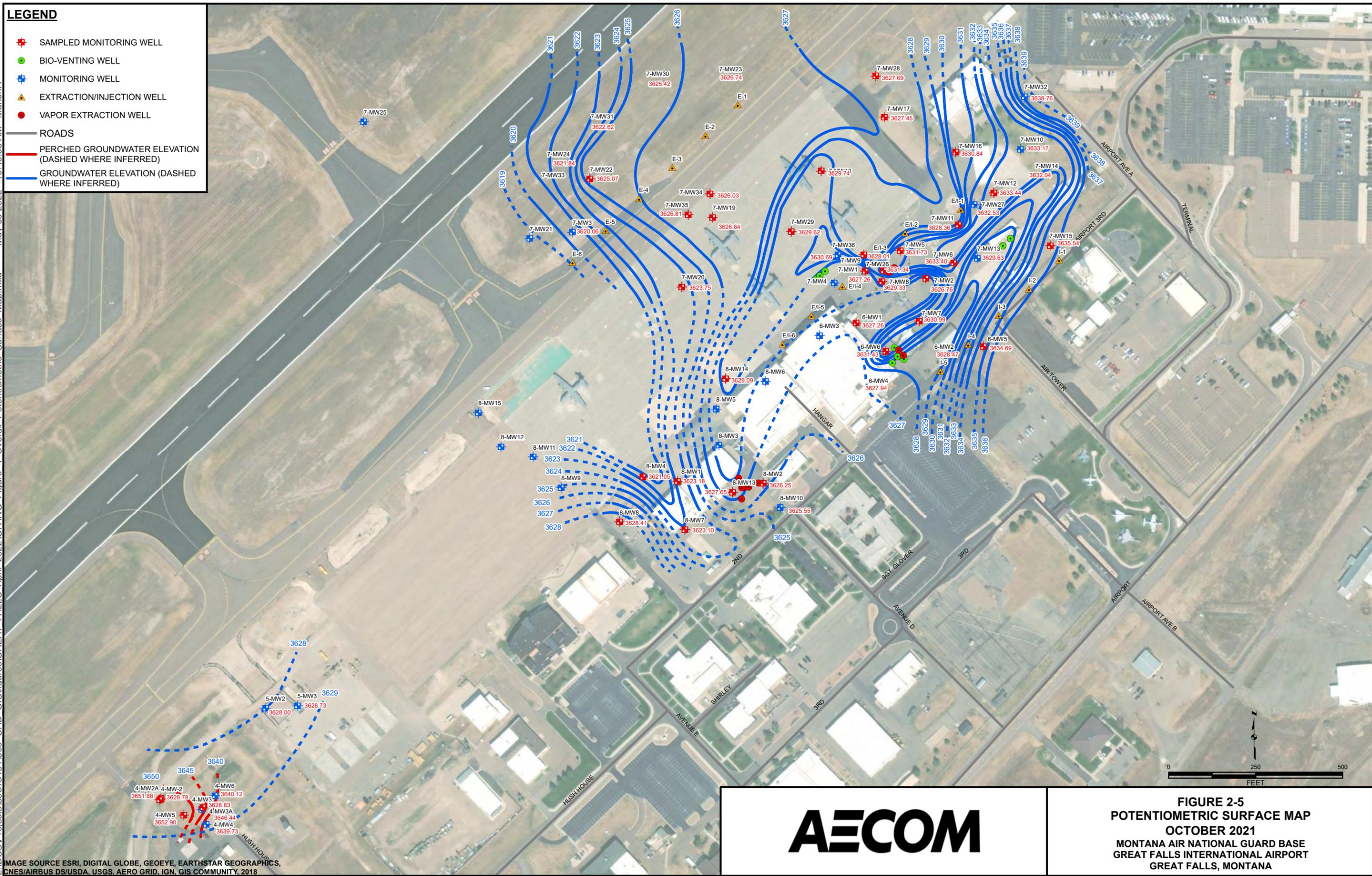
**FIGURE 2-4**  
**POTENTIOMETRIC SURFACE MAP**  
**APRIL 2021**  
**MONTANA AIR NATIONAL GUARD BASE**  
**GREAT FALLS INTERNATIONAL AIRPORT**  
**GREAT FALLS, MONTANA**

IMAGE SOURCE ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS/USDA, USGS, AERO GRID, IGN, GIS COMMUNITY, 2018

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**LEGEND**

- + SAMPLED MONITORING WELL
- BIO-VENTING WELL
- + MONITORING WELL
- ▲ EXTRACTION/INJECTION WELL
- VAPOR EXTRACTION WELL
- ROADS
- PERCHED GROUNDWATER ELEVATION (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (DASHED WHERE INFERRED)



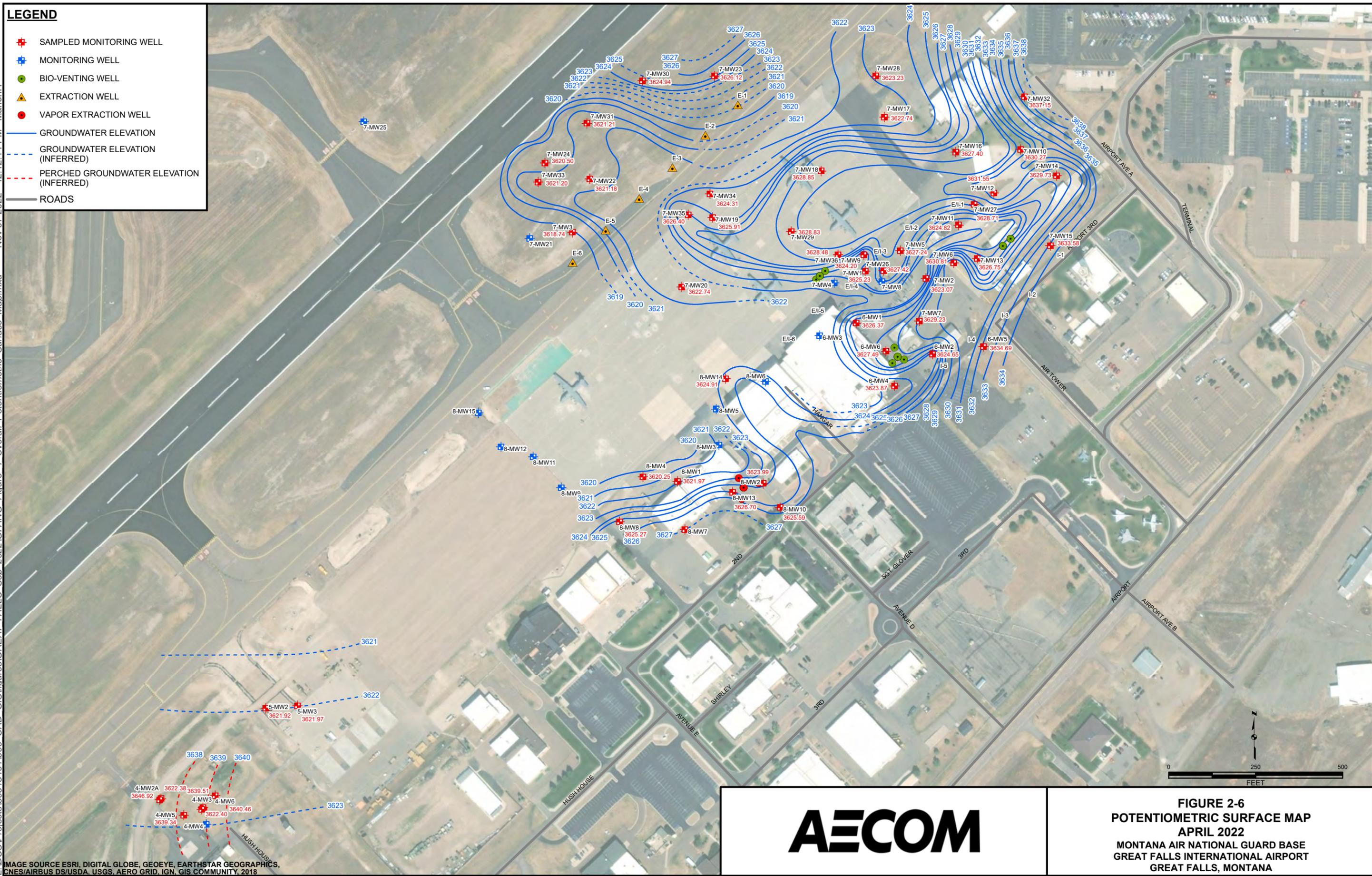
**FIGURE 2-5**  
**POTENTIOMETRIC SURFACE MAP**  
**OCTOBER 2021**  
**MONTANA AIR NATIONAL GUARD BASE**  
**GREAT FALLS INTERNATIONAL AIRPORT**  
**GREAT FALLS, MONTANA**

IMAGE SOURCE ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS/USDA, USGS, AERO GRID, IGN, GIS COMMUNITY, 2018

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**LEGEND**

- + SAMPLED MONITORING WELL
- + MONITORING WELL
- BIO-VENTING WELL
- ▲ EXTRACTION WELL
- VAPOR EXTRACTION WELL
- GROUNDWATER ELEVATION
- - - GROUNDWATER ELEVATION (INFERRED)
- - - PERCHED GROUNDWATER ELEVATION (INFERRED)
- ROADS



**FIGURE 2-6**  
**POTENTIOMETRIC SURFACE MAP**  
**APRIL 2022**  
 MONTANA AIR NATIONAL GUARD BASE  
 GREAT FALLS INTERNATIONAL AIRPORT  
 GREAT FALLS, MONTANA

IMAGE SOURCE ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS/USDA, USGS, AERO GRID, IGN, GIS COMMUNITY, 2018

**LEGEND**

- Soil Boring Location
- Former Site 4 Burn Area

4-SB10		
Date	Oct-2010	
Depth (ft bgs)	1.0	6.0
<b>EPH / VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	147	ND
C11-C22 Aromatics	63	ND
<b>Metals</b>		
Barium	205	309

4-SB12		
Date	Oct-2010	
Depth (ft bgs)	1.0	3.5
<b>EPH / VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	ND	ND
C11-C22 Aromatics	ND	ND
<b>Metals</b>		
Barium	238	128

4-SB6		
Date	Oct-2010	
Depth (ft bgs)	1.0	6.0
<b>EPH / VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	ND	ND
C11-C22 Aromatics	ND	ND
<b>Metals</b>		
Barium	137	175

4-SB9		
Date	Oct-2010	
Depth (ft bgs)	1.0	6.0
<b>EPH / VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	ND	ND
C11-C22 Aromatics	ND	ND
<b>Metals</b>		
Barium	220	172

4-SB3		
Date	Sep-1990	
Depth (ft bgs)	3.0	7.0
<b>EPH / VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	ND	ND
C11-C22 Aromatics	ND	ND
<b>Metals</b>		
Barium	290	138

4-SB13		
Date	Oct-2010	
Depth (ft bgs)	1.0	5.5
<b>EPH / VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	ND	ND
C11-C22 Aromatics	ND	ND
<b>Metals</b>		
Barium	208	184

4-SB11			
Date	Oct-2010		
Depth (ft bgs)	0.5	2.0	6.0
<b>EPH / VPH Fractions (Converted)</b>			
C9-C18 Aliphatics	ND	165	ND
C11-C22 Aromatics	ND	70	ND
<b>Metals</b>			
Barium	201 [176]	275	147

4-SB7		
Date	Oct-2010	
Depth (ft bgs)	1.0	6.25
<b>EPH / VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	ND	ND
C11-C22 Aromatics	ND	ND
<b>Metals</b>		
Barium	173	177

4-SB2		
Date	Sep-1990	
Depth (ft bgs)	1.0	3.5
<b>EPH / VPH Fractions (Converted)</b>		
C9 C18 Aliphatics	60 [1,050]	420 [161]
C11 C22 Aromatics	26 [450]	180 [69]
<b>Metals</b>		
Barium	219 [170]	165 [214]

4-SB8		
Date	Oct-2010	
Depth (ft bgs)	1.25	6.5
<b>EPH / VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	ND	ND
C11-C22 Aromatics	ND	ND
<b>Metals</b>		
Barium	133	859

4-SB1		
Date	Sep-1990	
Depth (ft bgs)	1.1	5.5
<b>EPH / VPH Fractions (Converted)</b>		
C9 C18 Aliphatics	58	ND
C11 C22 Aromatics	25	ND
<b>Metals</b>		
Barium	214	219

4-SB5		
Date	Sep-1990	
Depth (ft bgs)	1.5	3.5
<b>EPH / VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	98	ND
C11-C22 Aromatics	42	ND
<b>Metals</b>		
Barium	260	205

4-SB4		
Date	Sep-1990	
Depth (ft bgs)	1.5	7.0
<b>EPH/VPH Fractions (Converted)</b>		
C9-C18 Aliphatics	62	ND
C11-C22 Aromatics	26	ND
<b>Metals</b>		
Barium	238	1,190

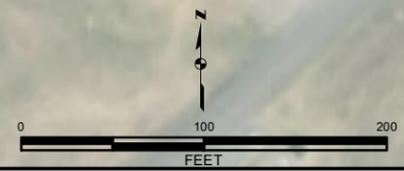
Analyte	Screening Criteria (mg/kg)				
	MDEQ Tier-1 RBSL <sup>A</sup>				EPA RSL <sup>B</sup>
	DC Comm.	DC Const.	Leaching >20 feet	RCRA Metals	Industrial Soil
<b>EPH / VPH Fractions (Converted)</b>					
C9-C18 Aliphatics	540	900	270,000	--	--
C11-C22 Aromatics	3,900	3,900	2,000	--	--
<b>Metals</b>					
Barium	--	--	--	421	22,000

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**Notes:**

1. **Bolded** value indicates the analyte was detected above the limit of detection (LOD).
2. Shaded values indicate concentration is greater than the MDEQ DC Commercial RBSL (DC comm.), MDEQ DC Construction RBSL (DC const.), MDEQ Resource Conservation and Recovery Act (RCRA) metals screening level, and/or EPA RSL.
3. Results are presented in units of milligram per kilogram (mg/kg).
4. Results in brackets represent blind duplicate results.
5. <sup>A</sup> = Montana Department of Environmental Quality (MDEQ) Tier-1 Risk-Based Screening Levels (RBSLs) (MDEQ, 2020).
6. <sup>B</sup> = United States Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) (EPA, 2022).
7. -- = Not available/not analyzed.
8. EPH = Extracable petroleum hydrocarbon.
9. VPH = Volatile petroleum hydrocarbon.
10. ft bgs = Feet below ground surface.
11. J = Indicates the result is an estimated value.
12. ND = Not detected.

IMAGE SOURCE ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS/USDA, USGS, AERO GRID, IGN, GIS COMMUNITY, 2018

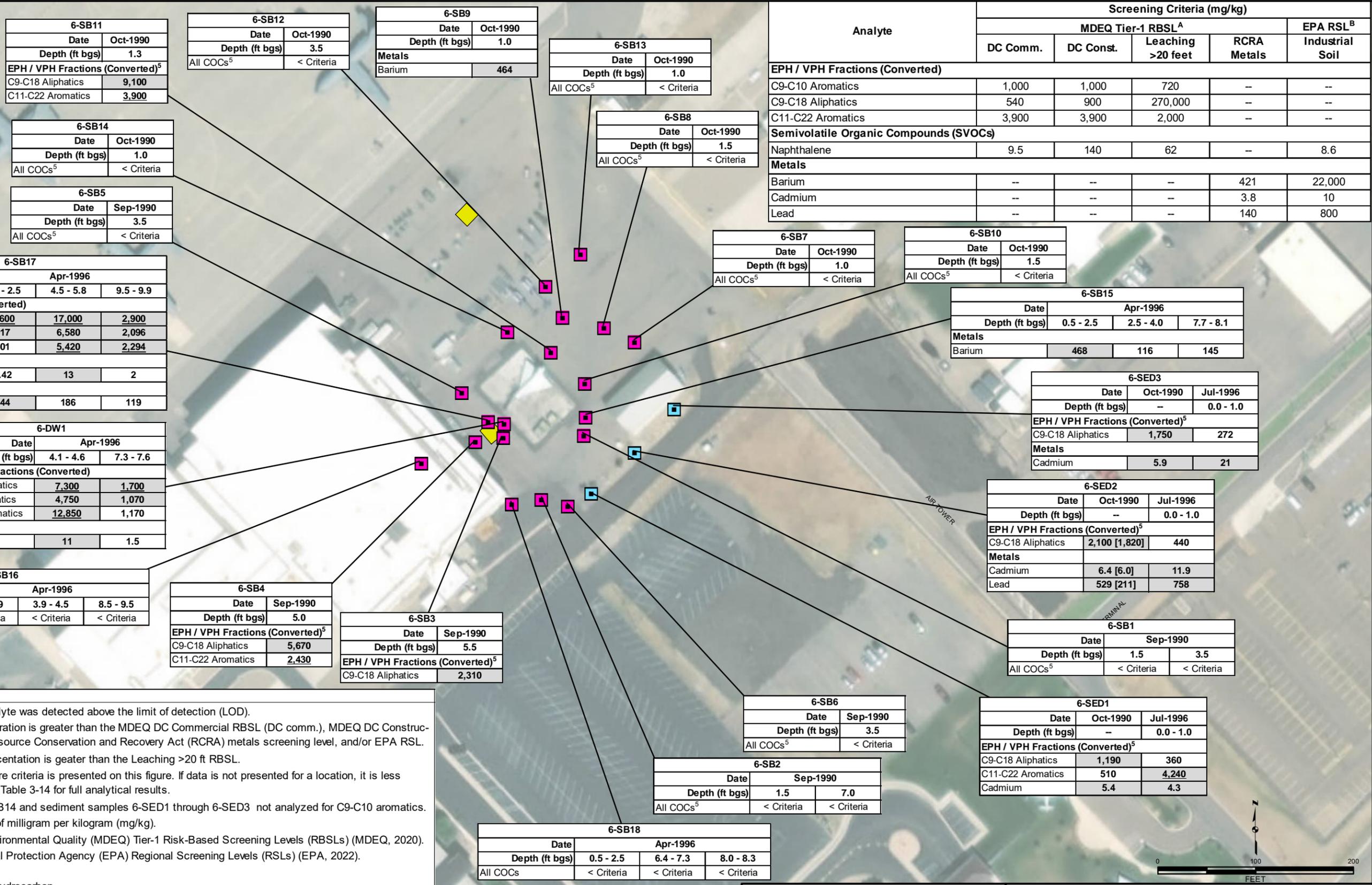


**FIGURE 3-1**  
**SITE 4 SOIL CONCENTRATION MAP**  
 MONTANA AIR NATIONAL GUARD BASE  
 GREAT FALLS INTERNATIONAL AIRPORT  
 GREAT FALLS, MONTANA

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**LEGEND**

- Sediment Sample Location
- Soil Boring Location
- Former Dry Well Location



- Notes:**
- Bolded** value indicates the analyte was detected above the limit of detection (LOD).
  - Shaded values indicate concentration is greater than the MDEQ DC Commercial RBSL (DC comm.), MDEQ DC Construction RBSL (DC const.), MDEQ Resource Conservation and Recovery Act (RCRA) metals screening level, and/or EPA RSL.
  - Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.
  - Only data exceeding one or more criteria is presented on this figure. If data is not presented for a location, it is less than all applicable criteria. See Table 3-14 for full analytical results.
  - Soil borings 6-SB1 through 6-SB14 and sediment samples 6-SED1 through 6-SED3 not analyzed for C9-C10 aromatics.
  - Results are presented in units of milligram per kilogram (mg/kg).
  - <sup>A</sup> = Montana Department of Environmental Quality (MDEQ) Tier-1 Risk-Based Screening Levels (RBSLs) (MDEQ, 2020).
  - <sup>B</sup> = United States Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) (EPA, 2022).
  - = Not available/not analyzed.
  - EPH = Extracable petroleum hydrocarbon.
  - VPH = Volatile petroleum hydrocarbon.
  - ft bgs = Feet below ground surface.
  - ND = Not detected.
  - COCs = Contaminants of concern.

MAGE SOURCE ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS/USDA, USGS, AERO GRID, IGN, GIS COMMUNITY, 2018

**FIGURE 3-2**  
**SITE 6 SOIL CONCENTRATION MAP**  
 MONTANA AIR NATIONAL GUARD BASE  
 GREAT FALLS INTERNATIONAL AIRPORT  
 GREAT FALLS, MONTANA

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**LEGEND**

- Soil Boring Location
- Former Dry Well Location

7-SB5			
Date	Apr-1996		
Depth (ft bgs)	1.0 - 3.0	4.5 - 5.4	8.0 - 8.6
<b>EPH / VPH Fractions (Converted)</b>			
C9-C10 Aromatics	ND	<b>1,200 J</b>	<b>760 J</b>
C9-C18 Aliphatics	ND	<b>848</b>	<b>575</b>
C11-C22 Aromatics	ND	<b>710</b>	<b>469</b>
<b>VOCs</b>			
Benzene	<b>0.005 J</b>	ND	<b>0.83 J</b>
Toluene	<b>0.006 J</b>	ND	<b>5.7</b>
<b>SVOCs</b>			
2-Methylnaphthalene	<b>0.004 J</b>	<b>5.1</b>	<b>1.6</b>
Naphthalene	<b>0.007 J</b>	<b>3.3</b>	<b>0.95 J</b>
<b>Metals</b>			
Barium	<b>158</b>	<b>132</b>	<b>390</b>
Lead	<b>13.5</b>	<b>17.5</b>	<b>7.7</b>

7-SB3		
Date	Sep-1990	
Depth (ft bgs)	3.5	5.5
<b>EPH / VPH Fractions (Converted)</b>		
C9-C10 Aromatics	--	--
C9-C18 Aliphatics	<b>13,300</b>	<b>9,800</b>
C11-C22 Aromatics	<b>5,700</b>	<b>4,200</b>
<b>VOCs</b>		
Benzene	<b>2.6 J</b>	ND
Toluene	<b>76</b>	<b>140</b>
<b>SVOCs</b>		
2-Methylnaphthalene	<b>42</b>	<b>27</b>
Naphthalene	<b>22</b>	<b>13</b>
<b>Metals</b>		
Barium	<b>257</b>	<b>253</b>
Lead	<b>443</b>	<b>167</b>

Analyte	Screening Criteria (mg/kg)				
	MDEQ Tier-1 RBSL <sup>A</sup>				EPA RSL <sup>B</sup>
	DC Comm.	DC Const.	Leaching >20 feet	RCRA Metals	Industrial Soil
<b>EPH / VPH Fractions (Converted)</b>					
C9-C10 Aromatics	1,000	1,000	720	--	--
C9-C18 Aliphatics	540	900	270,000	--	--
C11-C22 Aromatics	3,900	3,900	2,000	--	--
<b>Volatile Organic Compounds (VOCs)</b>					
Benzene	230	8,900	0.25	--	5.1
Toluene	5,500	5,500	100	--	4700
<b>Semivolatile Organic Compounds (SVOCs)</b>					
2-Methylnaphthalene	250	250	35	--	300
Naphthalene	9.5	140	62	--	8.6
<b>Metals</b>					
Barium	--	--	--	421	22,000
Lead	--	--	--	140	800

7-SB1	
Date	Sep-1990
Depth (ft bgs)	1.5
<b>EPH / VPH Fractions (Converted)</b>	
C9-C10 Aromatics	--
C9-C18 Aliphatics	<b>23.8</b>
C11-C22 Aromatics	<b>10.2</b>
<b>VOCs</b>	
Benzene	ND
Toluene	ND
<b>SVOCs</b>	
2-Methylnaphthalene	ND
Naphthalene	ND
<b>Metals</b>	
Barium	<b>250</b>
Lead	<b>8</b>

7-SB4	
Date	Sep-1990
Depth (ft bgs)	5.0
<b>EPH / VPH Fractions (Converted)</b>	
C9-C10 Aromatics	--
C9-C18 Aliphatics	<b>30.8</b>
C11-C22 Aromatics	<b>13.2</b>
<b>VOCs</b>	
Benzene	ND
Toluene	ND
<b>SVOCs</b>	
2-Methylnaphthalene	ND
Naphthalene	ND
<b>Metals</b>	
Barium	<b>11</b>
Lead	<b>9.9</b>

7-SB7			
Date	Apr-1996		
Depth (ft bgs)	1.0 - 3.0	3.4 - 5.2	8.0 - 8.3
<b>EPH / VPH Fractions (Converted)</b>			
C9-C10 Aromatics	ND	<b>8.1</b>	<b>1,700</b>
C9-C18 Aliphatics	ND	<b>24</b>	<b>985</b>
C11-C22 Aromatics	ND	<b>496</b>	<b>9,165</b>
<b>VOCs</b>			
Benzene	ND	ND	ND
Toluene	ND	ND	ND
<b>SVOCs</b>			
2-Methylnaphthalene	ND	ND	<b>3.7</b>
Naphthalene	ND	ND	<b>2.3</b>
<b>Metals</b>			
Barium	<b>292</b>	<b>122</b>	<b>729</b>
Lead	<b>9.3</b>	<b>5.8</b>	<b>9.2</b>

7-DW1		
Date	Sep-1990	
Depth (ft bgs)	1.2 - 3.2	3.2 - 4.3
<b>EPH / VPH Fractions (Converted)</b>		
C9-C10 Aromatics	ND	ND
C9-C18 Aliphatics	ND	<b>5.2</b>
C11-C22 Aromatics	ND	<b>148</b>
<b>VOCs</b>		
Benzene	ND	ND
Toluene	ND	ND
<b>SVOCs</b>		
2-Methylnaphthalene	ND	<b>0.019 J</b>
Naphthalene	ND	<b>0.016 J</b>
<b>Metals</b>		
Barium	<b>239</b>	<b>229</b>
Lead	<b>8.5</b>	<b>9.4</b>

7-SB2	
Date	Sep-1990
Depth (ft bgs)	1.0
<b>EPH / VPH Fractions (Converted)</b>	
C9-C10 Aromatics	--
C9-C18 Aliphatics	<b>11.9</b>
C11-C22 Aromatics	<b>5.1</b>
<b>VOCs</b>	
Benzene	ND
Toluene	ND
<b>SVOCs</b>	
2-Methylnaphthalene	ND
Naphthalene	ND
<b>Metals</b>	
Barium	<b>178</b>
Lead	<b>10.7</b>

7-SB6			
Date	Apr-1996		
Depth (ft bgs)	0.0 - 2.0	3.5 - 5.5	7.2 - 8.0
<b>EPH / VPH Fractions (Converted)</b>			
C9-C10 Aromatics	ND	ND	<b>960</b>
C9-C18 Aliphatics	ND	ND	<b>689</b>
C11-C22 Aromatics	ND	ND	<b>9,581</b>
<b>VOCs</b>			
Benzene	ND	ND	ND
Toluene	ND	ND	<b>1.1 J</b>
<b>SVOCs</b>			
2-Methylnaphthalene	ND	ND	<b>3.8</b>
Naphthalene	ND	ND	<b>1.8</b>
<b>Metals</b>			
Barium	<b>181</b>	<b>167</b>	<b>165</b>
Lead	<b>7.5</b>	<b>4.5</b>	<b>11.7</b>

- Notes:**
- Bolded** value indicates the analyte was detected above the limit of detection (LOD).
  - Shaded values indicate concentration is greater than the MDEQ DC Commercial RBSL (DC comm.), MDEQ DC Construction RBSL (DC const.), MDEQ Resource Conservation and Recovery Act (RCRA) metals screening level, and/or EPA RSL.
  - Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.
  - Results are presented in units of milligram per kilogram (mg/kg).
  - Results in brackets represent blind duplicate results.
  - <sup>A</sup> = Montana Department of Environmental Quality (MDEQ) Tier-1 Risk-Based Screening Levels (RBSLs) (MDEQ, 2020).
  - <sup>B</sup> = United States Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) (EPA, 2022).
  - = Not available/not analyzed.
  - EPH = Extracable petroleum hydrocarbon.
  - VPH = Volatile petroleum hydrocarbon.
  - ft bgs = Feet below ground surface.
  - J = Indicates the result is an estimated value.
  - ND = Not detected.

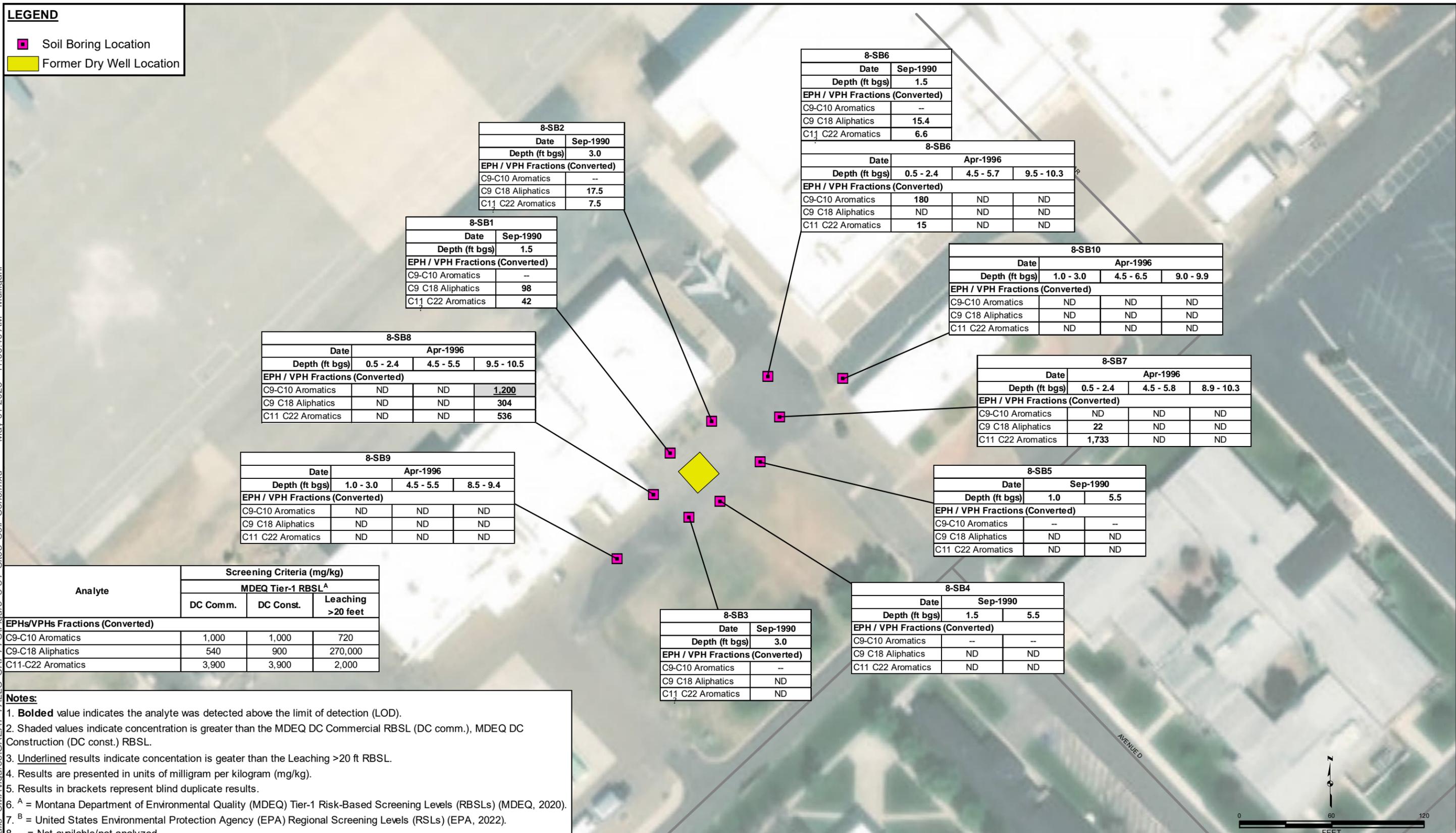


**FIGURE 3-3**  
**SITE 7 - DRY WELL AREA**  
**SOIL CONCENTRATION MAP**  
 MONTANA AIR NATIONAL GUARD BASE  
 GREAT FALLS INTERNATIONAL AIRPORT  
 GREAT FALLS, MONTANA

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**LEGEND**

- Soil Boring Location
- Former Dry Well Location



8-SB2	
Date	Sep-1990
Depth (ft bgs)	3.0
EPH / VPH Fractions (Converted)	
C9-C10 Aromatics	--
C9 C18 Aliphatics	17.5
C11 C22 Aromatics	7.5

8-SB1	
Date	Sep-1990
Depth (ft bgs)	1.5
EPH / VPH Fractions (Converted)	
C9-C10 Aromatics	--
C9 C18 Aliphatics	98
C11 C22 Aromatics	42

8-SB6	
Date	Sep-1990
Depth (ft bgs)	1.5
EPH / VPH Fractions (Converted)	
C9-C10 Aromatics	--
C9 C18 Aliphatics	15.4
C11 C22 Aromatics	6.6

8-SB6			
Date	Apr-1996		
Depth (ft bgs)	0.5 - 2.4	4.5 - 5.7	9.5 - 10.3
EPH / VPH Fractions (Converted)			
C9-C10 Aromatics	180	ND	ND
C9 C18 Aliphatics	ND	ND	ND
C11 C22 Aromatics	15	ND	ND

8-SB10			
Date	Apr-1996		
Depth (ft bgs)	1.0 - 3.0	4.5 - 6.5	9.0 - 9.9
EPH / VPH Fractions (Converted)			
C9-C10 Aromatics	ND	ND	ND
C9 C18 Aliphatics	ND	ND	ND
C11 C22 Aromatics	ND	ND	ND

8-SB8			
Date	Apr-1996		
Depth (ft bgs)	0.5 - 2.4	4.5 - 5.5	9.5 - 10.5
EPH / VPH Fractions (Converted)			
C9-C10 Aromatics	ND	ND	1,200
C9 C18 Aliphatics	ND	ND	304
C11 C22 Aromatics	ND	ND	536

8-SB7			
Date	Apr-1996		
Depth (ft bgs)	0.5 - 2.4	4.5 - 5.8	8.9 - 10.3
EPH / VPH Fractions (Converted)			
C9-C10 Aromatics	ND	ND	ND
C9 C18 Aliphatics	22	ND	ND
C11 C22 Aromatics	1,733	ND	ND

8-SB9			
Date	Apr-1996		
Depth (ft bgs)	1.0 - 3.0	4.5 - 5.5	8.5 - 9.4
EPH / VPH Fractions (Converted)			
C9-C10 Aromatics	ND	ND	ND
C9 C18 Aliphatics	ND	ND	ND
C11 C22 Aromatics	ND	ND	ND

8-SB5	
Date	Sep-1990
Depth (ft bgs)	1.0 5.5
EPH / VPH Fractions (Converted)	
C9-C10 Aromatics	--
C9 C18 Aliphatics	ND
C11 C22 Aromatics	ND

8-SB3	
Date	Sep-1990
Depth (ft bgs)	3.0
EPH / VPH Fractions (Converted)	
C9-C10 Aromatics	--
C9 C18 Aliphatics	ND
C11 C22 Aromatics	ND

8-SB4	
Date	Sep-1990
Depth (ft bgs)	1.5 5.5
EPH / VPH Fractions (Converted)	
C9-C10 Aromatics	--
C9 C18 Aliphatics	ND
C11 C22 Aromatics	ND

Analyte	Screening Criteria (mg/kg)		
	MDEQ Tier-1 RBSL <sup>A</sup>		
	DC Comm.	DC Const.	Leaching >20 feet
<b>EPHs/VPHs Fractions (Converted)</b>			
C9-C10 Aromatics	1,000	1,000	720
C9-C18 Aliphatics	540	900	270,000
C11-C22 Aromatics	3,900	3,900	2,000

- Notes:**
- Bolded** value indicates the analyte was detected above the limit of detection (LOD).
  - Shaded values indicate concentration is greater than the MDEQ DC Commercial RBSL (DC comm.), MDEQ DC Construction (DC const.) RBSL.
  - Underlined results indicate concentration is greater than the Leaching >20 ft RBSL.
  - Results are presented in units of milligram per kilogram (mg/kg).
  - Results in brackets represent blind duplicate results.
  - <sup>A</sup> = Montana Department of Environmental Quality (MDEQ) Tier-1 Risk-Based Screening Levels (RBSLs) (MDEQ, 2020).
  - <sup>B</sup> = United States Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) (EPA, 2022).
  - = Not available/not analyzed.
  - EPH = Extracable petroleum hydrocarbon.
  - VPH = Volatile petroleum hydrocarbon.
  - ft bgs = Feet below ground surface.
  - ND = Not detected.

IMAGE SOURCE ESRI, DIGITAL GLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS/USDA, USGS, AERO GRID, IGN, GIS COMMUNITY, 2018



**FIGURE 3-4**  
**SITE 8 SOIL CONCENTRATION MAP**  
 MONTANA AIR NATIONAL GUARD BASE  
 GREAT FALLS INTERNATIONAL AIRPORT  
 GREAT FALLS, MONTANA



**Figure B1-1**  
**Source: ES, 1992a**

ES ENGINEERING-SCIENCE

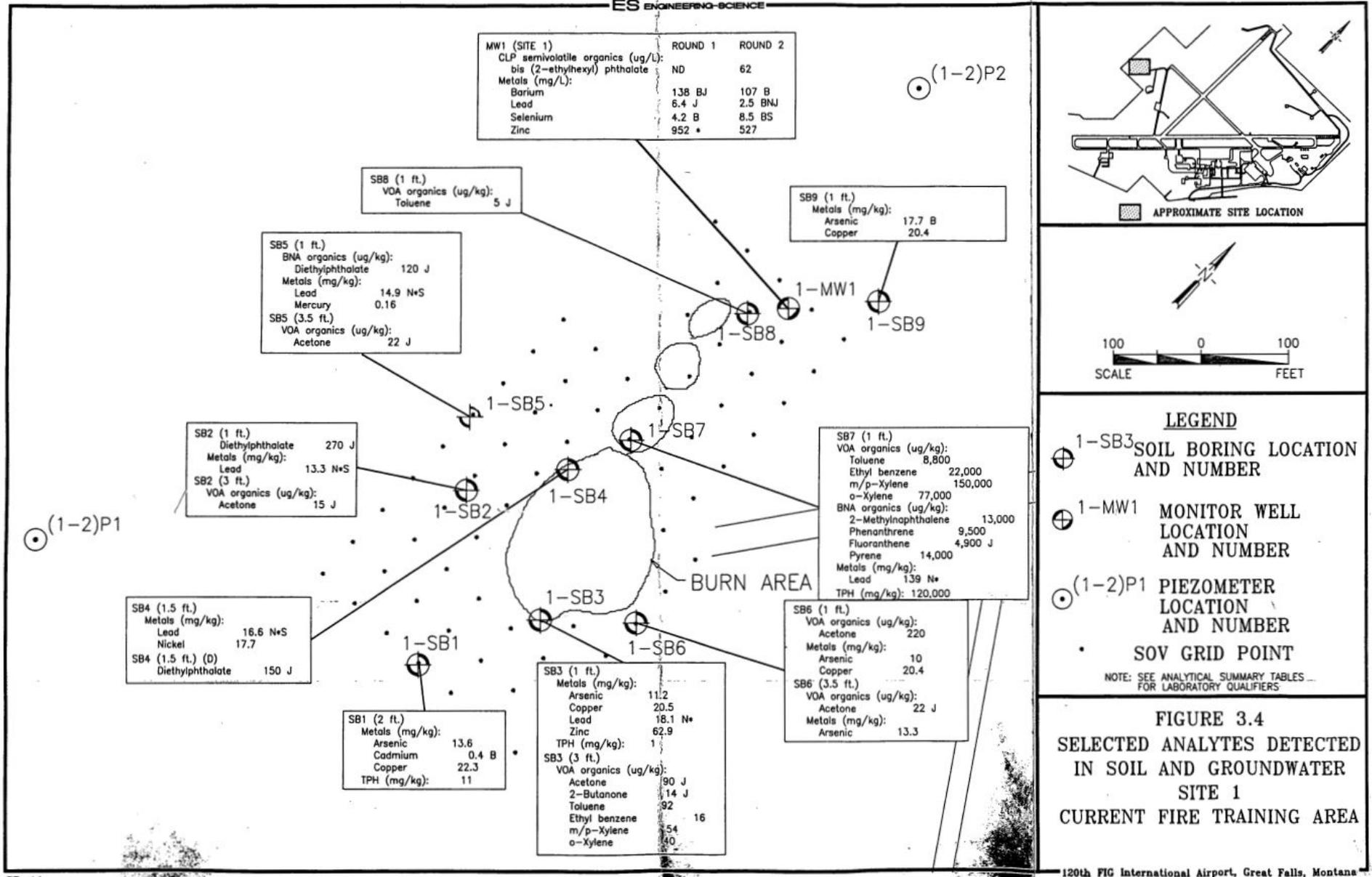


Figure B1-1  
Source: ES, 1992a

Table 3.8 Chemical Constituents Detected in Soil  
Site 1: Current Fire Training Area  
(CLP Laboratory Analysis)

Chemical	Background (1)	MANG-1 SB1-2	MANG-1 SB2-1	MANG-1 SB2-3	MANG-1 SB3-1	MANG-1 SB3-3	MANG-1 SB4-1.5	MANG-1 SB4-1.5(D)	MANG-1 SB5-1	MANG-1 SB5-3.5	MANG-1 SB6-1	MANG-1 SB6-3.5	MANG-1 SB7-1	MANG-1 SB8-1	MANG-1 SB9-1	Health (2) Criteria
<b>Volatile organics (µg/kg):</b>																
Acetone	ND-157	ND	ND	15 J	ND	90 J	ND	ND	ND	22 J	220	22 J	ND	ND	ND	8E06
2-Butanone	ND	ND	ND	ND	ND	14 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	4E06
Toluene	ND-9	ND	ND	ND	ND	92	ND	ND	ND	ND	ND	ND	8,800	5 J	ND	1.6E07
Ethyl benzene	ND	ND	ND	ND	ND	16	ND	ND	ND	ND	ND	ND	22,000	ND	ND	8E06
m/p-Xylene (3)	ND	ND	ND	ND	ND	54	ND	ND	ND	ND	ND	ND	150,000	ND	ND	1.6E08
o-Xylene	ND	ND	ND	ND	ND	40	ND	ND	ND	ND	ND	ND	77,000	ND	ND	1.6E08
<b>BNA organics (µg/kg):</b>																
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13,000	ND	ND	--
Diethylphthalate	ND	ND	270 J	ND	ND	ND	ND	150 J	120 J	ND	ND	ND	ND	ND	ND	6.4E07
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	9,900	ND	ND	--
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4,900	ND	ND	3.2E06
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14,000	ND	ND	2.4E06
<b>Metals (mg/kg):</b>																
Arsenic	1.9-9.9	13.6	3.8	9.5	11.2	8.6	8.4	8.4	6.2	6.2 S	10	15.3	6.3	8.7	17.7 B	80
Barium	ND-1,231	714 N	127 N	352 N	133 N	382 N	252 N	763 N	217 N	548 N	279 N	315 N	197 N	244 N	136 N	5,600
Cadmium	ND	0.4 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	40
Chromium	8.7-22.7	10.2 *	13.8 *	9.2 *	15.2 *	9.8 *	17.7 *	5.9 *	15.5 *	10.3 *	19.5 *	9.6 *	16.8 *	17.4 *	14.9 *	80,000
Copper	3.3-19.7	22.3	8.8	15.3	20.5	18.1	15.8	13.4	15.9	14	20.4	13.7	8.5	13.7	20.4	--
Lead	3.4-13.0	7 N*	13.3 N*	8 N*	18.1 N*	3.3 N*	16.6 N*	11.4 N*	14.9 N*	7.7 N*	11.7 N*	4 N*	139 N*	17 N*	11.2 N*	500
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	0.16	ND	ND	ND	ND	ND	ND	24
Nickel	3.6-17.6	ND	8.2	8.6	7.5 B	7.9	17.7	ND	10.7	7.1 B	15.5	ND	10.1	10.6	ND	1,600
Selenium	ND-0.66	0.45 B	ND	ND	ND	ND	ND	0.38 BW	ND	ND	ND	0.42 B	ND	0.36 BW	0.35 B	2,400
Zinc	21.6-61.3	41.4	39.5	31.8	62.9	21.9	51.9	23.5	43.4	26.1	46.5	23.5	54.7	43.5	42.7	16,000
Total petroleum hydrocarbons (mg/kg)	ND	11	ND	ND	25	ND	ND	ND	ND	ND	ND	ND	120,000	ND	ND	--

(1) Background is the average background concentration +/- two standard deviations.

(2) Based upon soil ingestion, see section 4.

(3) Meta- and para-xylene coelute and are not distinguishable by this method.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Organic:**

J The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

**Metals:**

B Reported value is less than reporting limit but greater than the instrument detection limit.

N Spiked sample recovery not within control limits set by lab QA/QC.

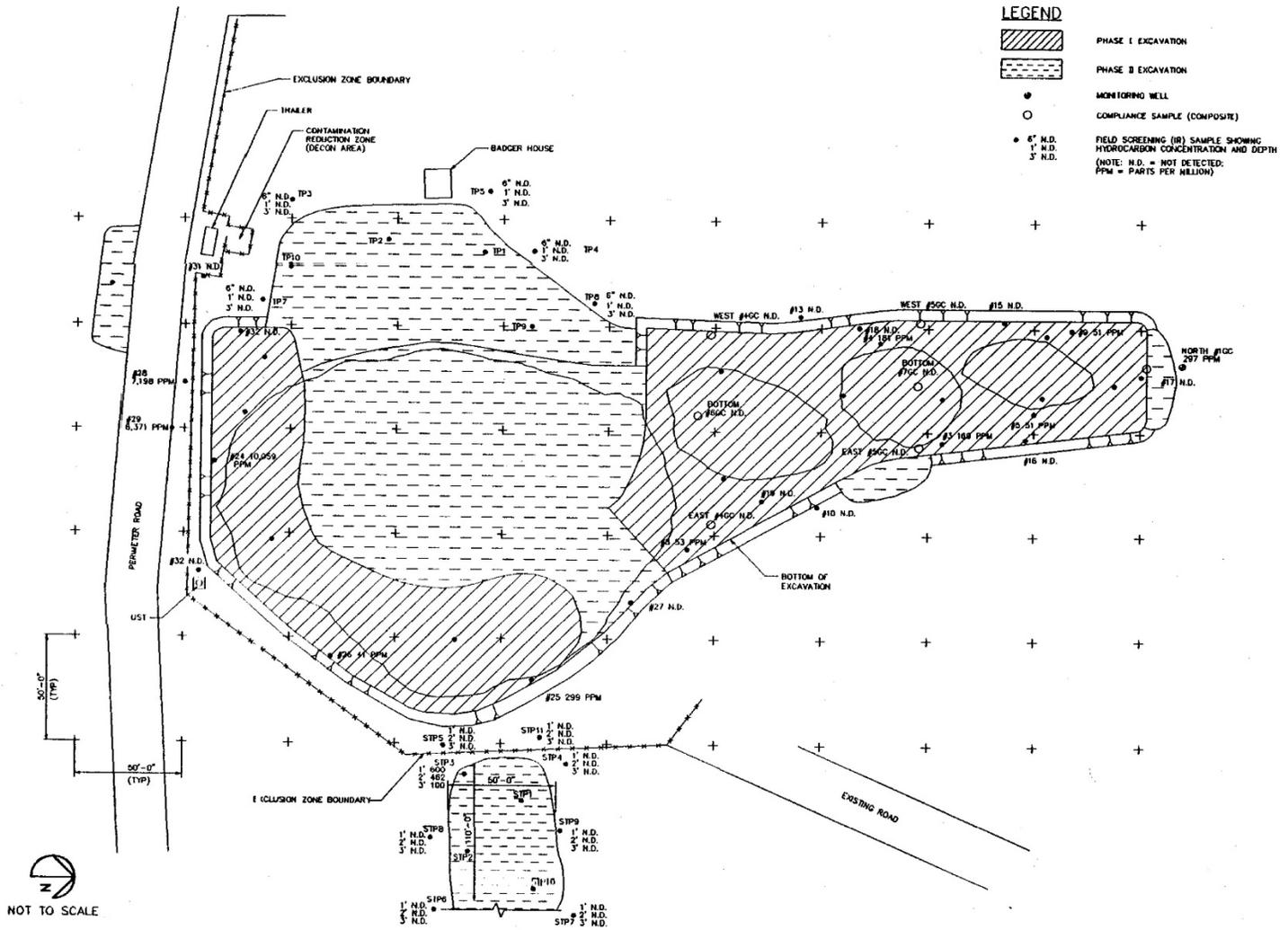
S Reported value was determined by the method of standard additions.

\* Duplicate analysis not within control limits set by lab QA/QC.

W Postdigestion spike for furnace AA analysis out of control limits (85 to 115%), while sample absorbance is less than 50% of spike absorbance.

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Figure B1-2  
Source: AGI, 1995



**AGI**  
TECHNOLOGIES

**TPH Concentrations at Excavation Limits**

MTANG/Solid Phase Bioremediation  
Great Falls, Montana

FIGURE

**4**

Figure4.dwg

PROJECT NO.  
15,543.002

DRAWN  
JSA

DATE  
4 Jan. 95

APPROVED

REVISED

DATE

**Table 1**  
**Field IR Screening Results – Determining Contamination Limits**  
TRC/Montana Air National Guard  
Great Falls, Montana

Sample I.D.	Date Collected	EPA 418.1 Modified
#1 Composite	04/30/94	120
#2 Grab	04/30/94	54
#3 Grab	04/30/94	169
#4 Grab	04/30/94	181
#5 Grab	04/30/94	51
#6 Grab	04/30/94	87
#7 Comp.	04/30/94	320
#8 Comp.	04/30/94	53
#9 Grab	04/30/94	51
#10 Comp.	05/02/94	ND
#11 Grab	05/02/94	26,456
#12 Grab	05/02/94	67
#13 Comp.	05/03/94	ND
#14 Comp.	05/03/94	14,765
#15 Comp.	05/03/94	ND
#16 Comp.	05/03/94	ND
#17	05/04/94	ND
#18	05/04/94	ND
#19	05/04/94	ND
#20	05/05/94	13,875
#21	05/05/94	200
#22	05/05/94	9,042
#23	05/05/94	188
#24	05/06/94	10,059
#25	05/06/94	299
TP1@3'	05/07/94	ND
TP1@1.5'	05/07/94	ND
TP1@6"	05/07/94	18,835
TP2@6"	05/07/94	7,500
TP2@1.0'	05/07/94	ND
TP2@3.0'	05/07/94	ND
TP3@6"	05/07/94	ND
TP3@1'	05/07/94	ND
TP3@3'	05/07/94	ND
TP4@6"	05/07/94	ND
TP4@1'	05/07/94	ND
TP4@3'	05/07/94	ND
TP5@6"	05/07/94	ND
TP5@1'	05/07/94	ND
TP5@3'	05/07/94	ND
TP6@6"	05/07/94	270
TP6@1'	05/07/94	ND
TP6@4'	05/07/94	ND
TP7@6"	05/07/94	ND
TP7@1'	05/07/94	ND
TP7@3'	05/07/94	ND
TP8@6"	05/07/94	ND
TP8@1'	05/07/94	ND

Sample I.D.	Date Collected	EPA 418.1 Modified
TP8@3'	05/07/94	ND
TP9@6"	05/07/94	907
TP9@1'	05/07/94	ND
TP9@3'	05/07/94	ND
TP10@6"	05/07/94	379
TP10@1'	05/07/94	ND
TP10@3'	05/07/94	ND
STP1/1'	05/07/94	25,060
STP1/2'	05/07/94	120
STP1/3'	05/07/94	87
STP2/1'	05/07/94	11,679
STP2/2'	05/07/94	120
STP2/3'	05/07/94	87
STP3/1'	05/07/94	600
STP3/2'	05/07/94	462
STP3/3'	05/07/94	100
STP4/1'	05/07/94	ND
STP4/2'	05/07/94	ND
STP4/3'	05/07/94	ND
STP5/1'	05/07/94	ND
STP5/2'	05/07/94	ND
STP5/3'	05/07/94	ND
STP6/1'	05/07/94	ND
STP6/2'	05/07/94	ND
STP6/3'	05/07/94	ND
STP7/1'	05/07/94	ND
STP7/2'	05/07/94	ND
STP7/3'	05/07/94	ND
STP8/1'	05/07/94	ND
STP8/2'	05/07/94	ND
STP8/3'	05/07/94	ND
STP9/1'	05/07/94	ND
STP9/2'	05/07/94	ND
STP9/3'	05/07/94	ND
STP10/1'	05/07/94	1,400
STP10/2'	05/07/94	472
STP10/3'	05/07/94	492
STP11/1'	05/07/94	ND
STP11/2'	05/07/94	ND
STP11/3'	05/07/94	ND
#26 Comp.	05/09/94	41
#27 Comp.	05/09/94	ND
#28/1'	05/10/94	7,198
#29/1.5'	05/10/94	6,371
#30/1.5	05/10/94	5,742
#31/1.5	05/10/94	ND
#32	05/10/94	ND

Notes:

All results in parts per million.  
ND – Not detected.

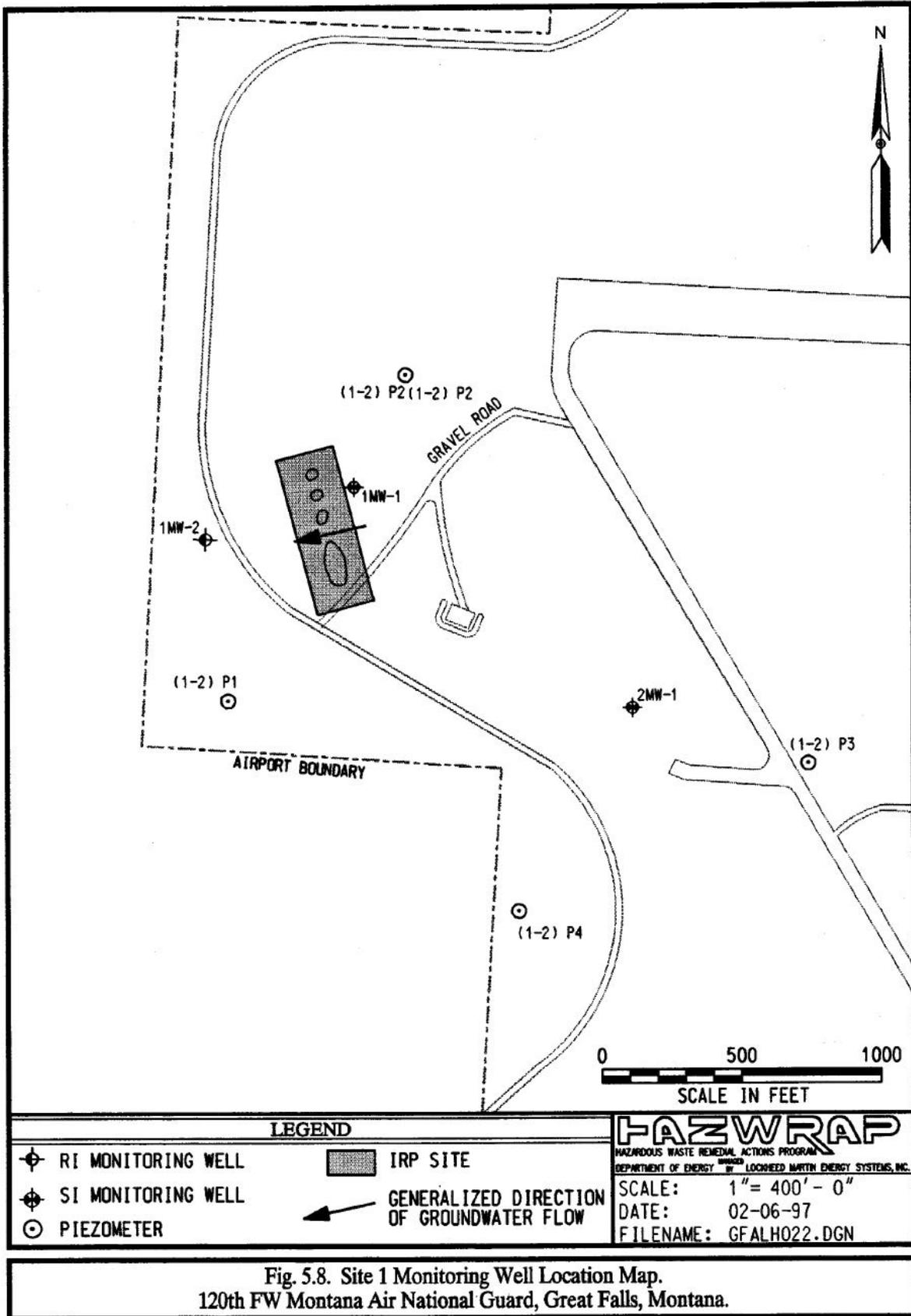


Fig. 5.8. Site 1 Monitoring Well Location Map.  
 120th FW Montana Air National Guard, Great Falls, Montana.

Table B1-3

Source: HAZWRAP, 1997

Table 5.6. Groundwater Organic Analyses -Site 1 - 120th FW MANG, Great Falls Montana

SAMPLE INFORMATION				Field Duplicate					
Site				1	1	1	1	1	1
Monitoring Well				MW1	MW1	MW2	MW2	MW2	MW2-GW3
Sample Number				1-MW1-GW1	1-MW1-GW2	1-MW2-GW1	1-MW2-GW2	1-MW2-GW2A	1-MW2-GW3
Matrix				Water	Water	Water	Water	Water	Water
Date Sample				5/16/96	7/11/96	5/2/96	5/16/96	5/16/96	7/19/96
Date Analyzed				5/28/96	7/23/96	5/6/96	5/17/96	5/17/96	7/17/96
ANALYTICAL INFORMATION									
VOCs									
Analyte	CRQL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result
Chloromethane	1	NE	NE	ND	R	ND	ND	ND	ND
Chloroethane	1	NE	NE	ND	R	ND	ND	ND	ND
Acetone	1	NE	NE	R	R	R	R	R	R
2-Butanone	5	NE	NE	R	R	R	R	R	R
Chloroform	1	100	57	ND	R	ND	ND	ND	ND
Benzene	1	5	5	ND	0.19J	ND	ND	ND	0.14J
Toluene	1	1000	1000	ND	R	ND	ND	ND	0.32J
2-Hexanone	1	NE	NE	ND	R	ND	ND	ND	R
1,4-Dichlorobenzene	1	75	75	ND	R	ND	ND	ND	0.18J
1,2-Dibromo-3-chloropropane	1	0.2	0.2	R	R	R	R	R	ND
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Sample Number				1-MW1-GW1	1-MW1-GW2		1-MW2-GW2	1-MW2-GW2A	1-MW2-GW3
Date Sampled				5/16/96	7/11/96		5/16/96	5/16/96	7/9/96
Date Analyzed				5/28/96	7/24/96		5/28/96	5/28/96	7/22/96
SVOCs									
Analyte	CRQL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result
Diethylphthalate	10	NE	23,000	1J	ND	ND	ND	ND	1J
Di-n-butylphthalate	10	NE	2700	1J	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	10	NE	6	1J	ND	1J	1J	1J	ND
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Date Sample				5/16/96	7/11/96		5/16/96	5/16/96	7/9/96
Date Analyzed				5/20/96	7/18-25/96		5/20/96	5/20/96	7/17-24/96
Petroleum Hydrocarbons				RL	MCLs	MDEQ	Result	Result	Result
Disel range, as diesel	0.25	NE	NE	0.35NJ			0.36NJ	ND	ND
Gasoline range	0.25	NE	NE	ND			R	ND	ND
Units	mg/l	mg/l	mg/l	mg/l			mg/l	mg/l	mg/l
<b>Legend</b>									
MCLs	Federal Drinking Water Standard Maximum Contaminant Level								
MDEQ	Montana Department of Environmental Quality Human Health Standards								
NE	ARAs Not Established								
DW	Dry Well								
SB	Soil Boring								
SS	Sediment/Surface Soil								
(DISS)	Dissolved Sample (total metals)								
	Concentration > or = MCLs OR MEDQ, ARARs, or Avge + 2 Standard Dev.								
CRQL	Contract Required Quantitation Limit								
RL	Reporting Limit								
ND	Compound Not Detected								
J	Concentration Estimated								
R	Results Rejected on Basis of Laboratory QA/QC								
N	Presumptive Evidence of Compound								



Figure B1-4  
 Source: HAZWRAP, 1997

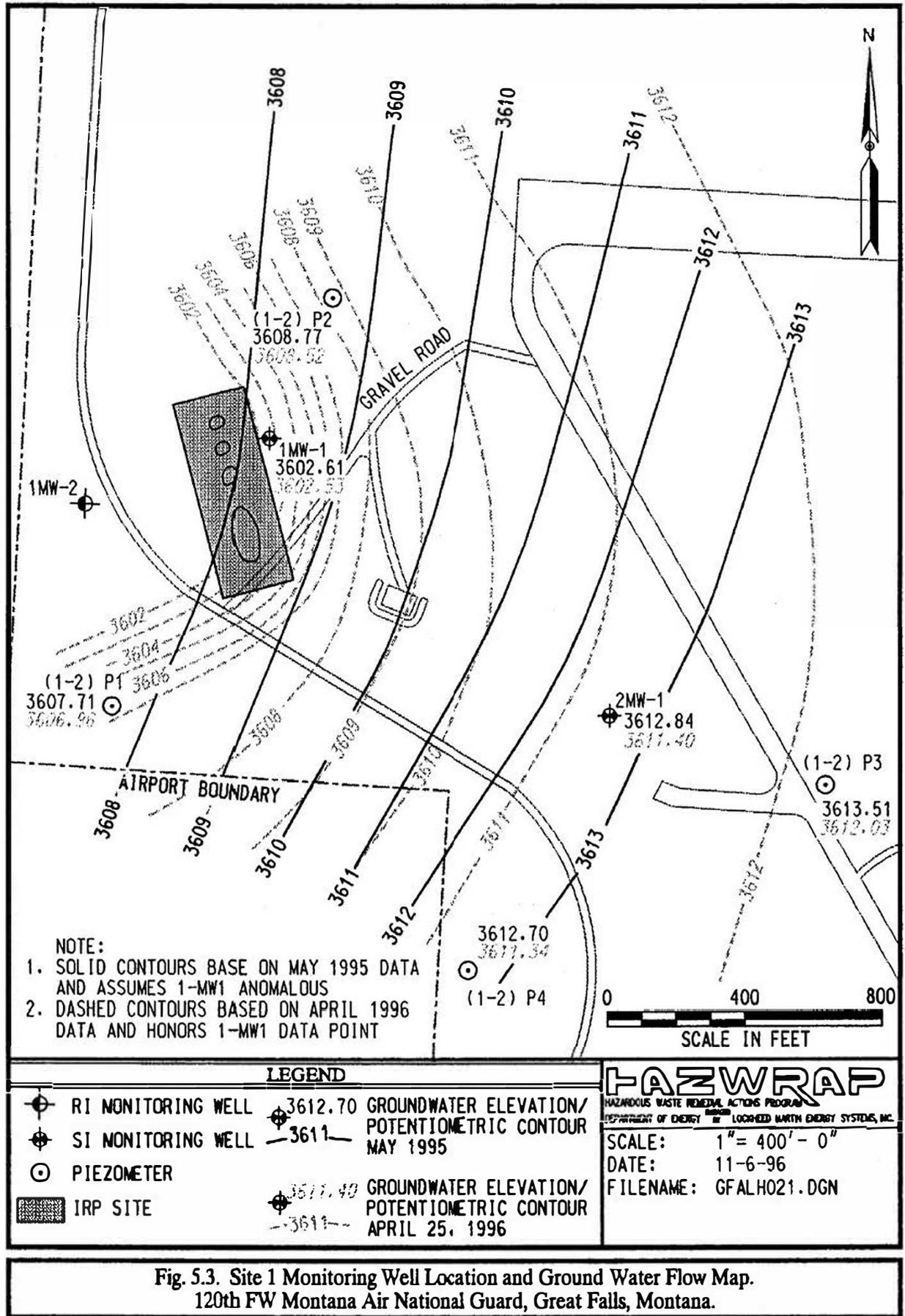


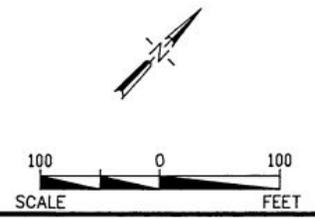
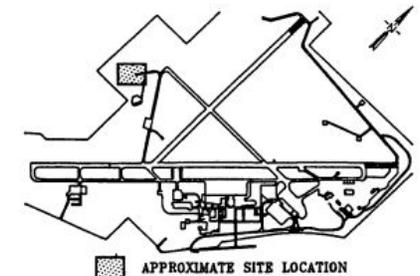
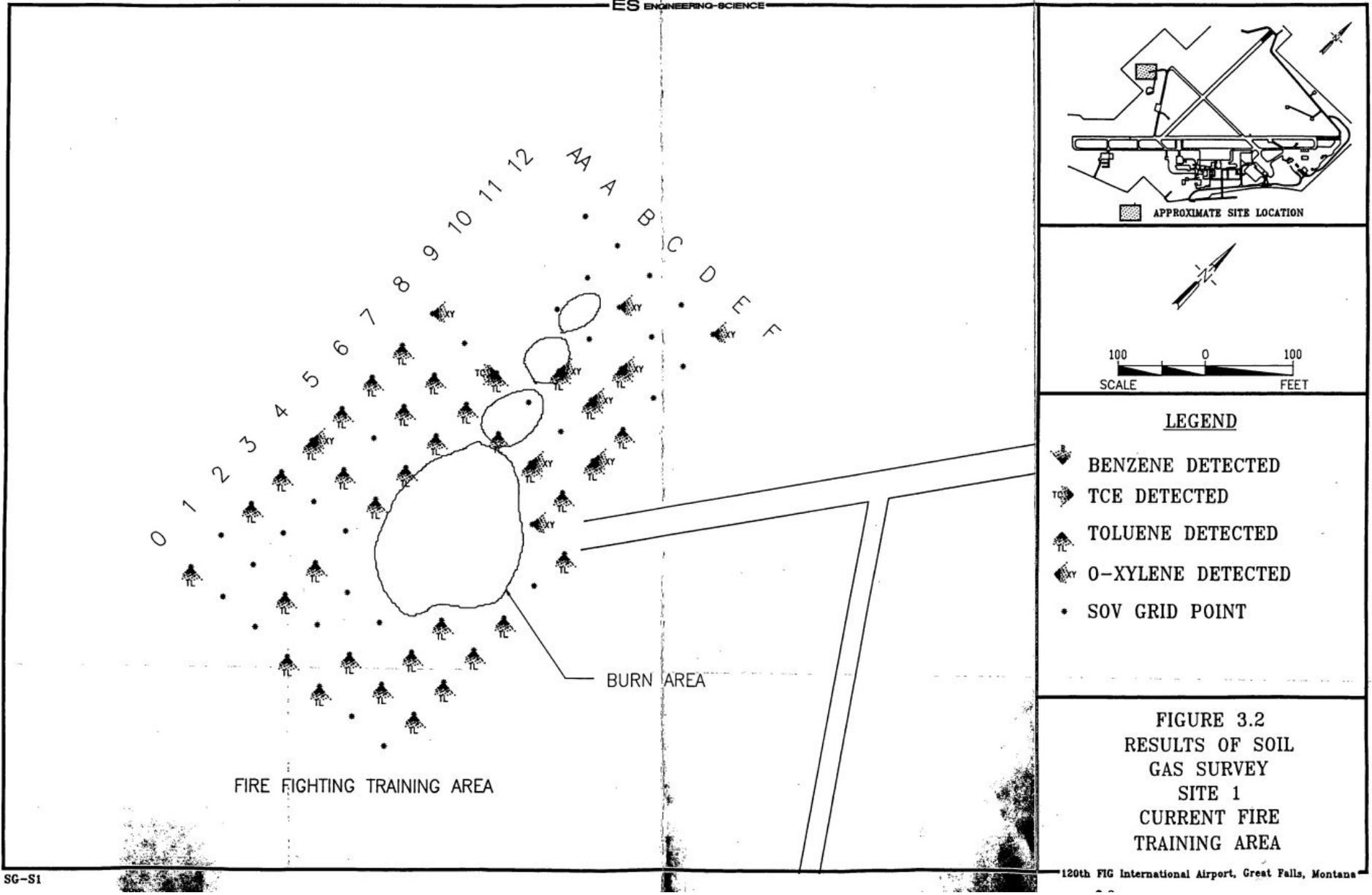
Table 3.4 Organic Constituents Detected in Soil Gas Survey  
Site 1: Current Fire Training Area  
(ppb by volume, GC)

Sample ID	Grid Coordinates		TCE	Toluene	o-Xylene
F0	0	0	ND	ND	ND
F1	0	-50	ND	18	ND
F2	0	-100	ND	19	ND
F3	0	-150	ND	8	ND
F4	0	-200	ND	21	ND
F5	0	-250	ND	0	ND
F6	0	-300	ND	14	ND
E0	50	0	ND	ND	ND
E1	50	-50	ND	***	ND
E2	50	-100	ND	8	ND
E3	50	-150	ND	***	ND
E6	50	-300	ND	ND	150
E7	50	-350	ND	8	ND
E8	50	-400	ND	10	28
E9	50	-450	ND	8	ND
E10	50	-500	ND	ND	ND
E11	50	-550	ND	ND	ND
E12	50	-600	ND	ND	290
D0	100	0	ND	19	ND
D1	100	-50	ND	22	ND
D2	100	-100	ND	ND	ND
D7	100	-350	ND	8	300
D8	100	-400	ND	ND	ND
D9	100	-450	ND	9	52
D10	100	-500	ND	33	97
D11	100	-550	ND	ND	ND
D12	100	-600	ND	ND	ND
C0	150	0	ND	8	ND
C1	150	-50	ND	ND	ND
C2	150	-100	ND	ND	ND
C7	150	-350	ND	***	ND
C8	150	-400	ND	ND	ND
C9	150	-450	ND	14	240
C10	150	-500	ND	ND	ND

Sample ID	Grid Coordinates		TCE	Toluene	o-Xylene
C11	150	-550	ND	ND	1,680
C12	150	-600	ND	ND	ND
B0	200	0	ND	ND	ND
B1	200	-50	ND	18	ND
B2	200	-100	ND	23	ND
B3	200	-150	ND	ND	ND
B4	200	-200	ND	8	ND
B5	200	-250	ND	8	ND
B6	200	-300	ND	12	ND
B7	200	-350	ND	8	ND
B8	200	-400	9	16	ND
B10	200	-500	ND	ND	ND
B11	200	-550	ND	ND	ND
B12	200	-600	ND	ND	ND
A0	250	0	ND	ND	ND
A1	250	-50	ND	ND	ND
A2	250	-100	ND	ND	ND
A3	250	-150	ND	ND	ND
A4	250	-200	ND	11	ND
A5	250	-250	ND	ND	ND
A6	250	-300	ND	12	ND
A7	250	-350	ND	12	ND
A8	250	-400	ND	ND	ND
A12	250	-600	ND	ND	ND
AA0	300	0	ND	8	ND
AA1	300	-50	ND	ND	ND
AA2	300	-100	ND	49	ND
AA3	300	-150	ND	12	ND
AA4	300	-200	ND	24	340
AA5	300	-250	ND	17	ND
AA6	300	-300	ND	19	ND
AA7	300	-350	ND	8	ND
AA8	300	-400	ND	ND	190

Figure B1-5  
Source: ES, 1992a

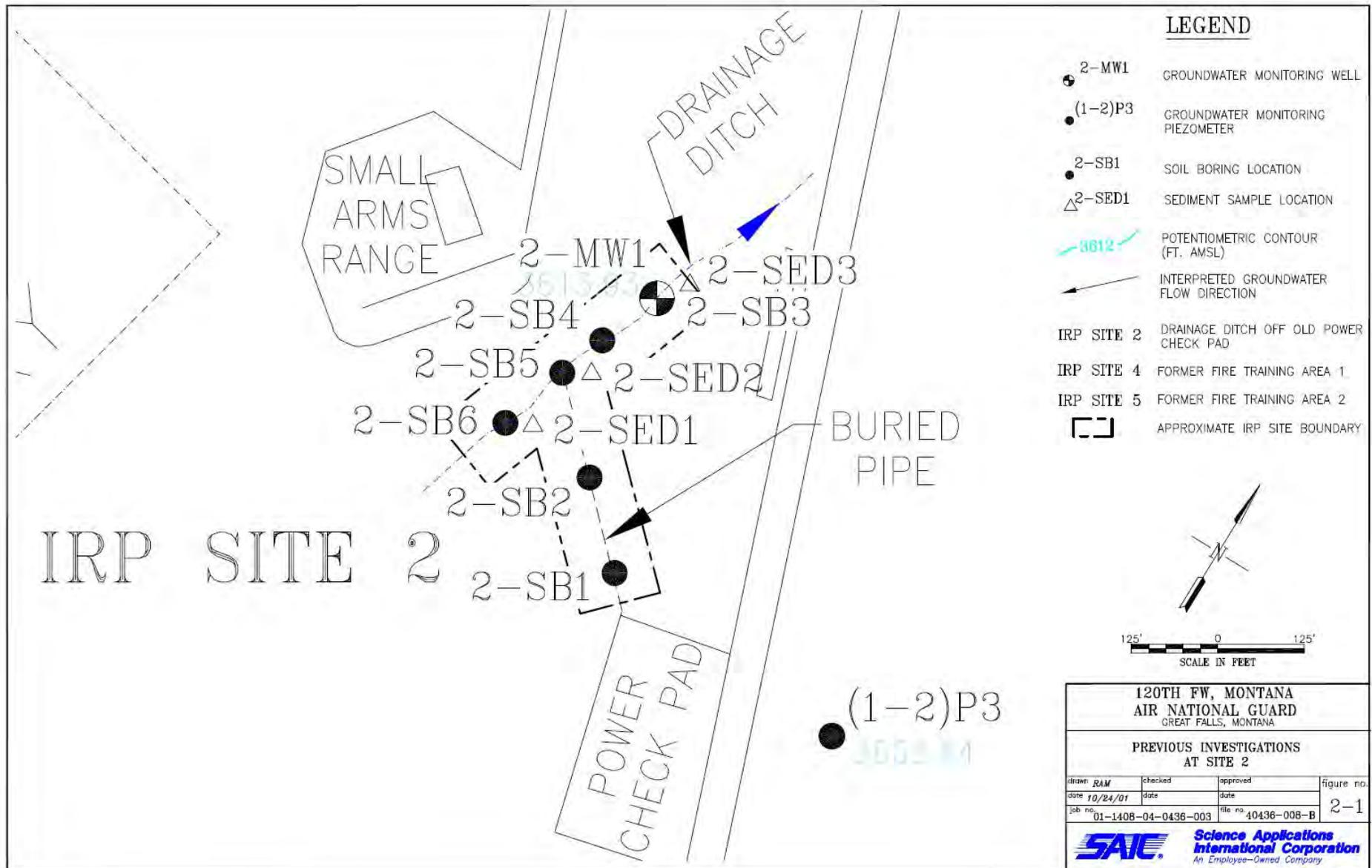
ES ENGINEERING-SCIENCE



- LEGEND**
- ▼ BENZENE DETECTED
  - TCE TCE DETECTED
  - 🌲 TOLUENE DETECTED
  - ◆ O-XYLENE DETECTED
  - SOV GRID POINT

FIGURE 3.2  
RESULTS OF SOIL  
GAS SURVEY  
SITE 1  
CURRENT FIRE  
TRAINING AREA

**Figure B2-1**  
**Source: SAIC, 2004a**



**LEGEND**

- 2-MW1 GROUNDWATER MONITORING WELL
- (1-2)P3 GROUNDWATER MONITORING PIEZOMETER
- 2-SB1 SOIL BORING LOCATION
- △ 2-SED1 SEDIMENT SAMPLE LOCATION
- 361.2 POTENTIOMETRIC CONTOUR (FT. AMSL)
- ↖ INTERPRETED GROUNDWATER FLOW DIRECTION
- IRP SITE 2 DRAINAGE DITCH OFF OLD POWER CHECK PAD
- IRP SITE 4 FORMER FIRE TRAINING AREA 1
- IRP SITE 5 FORMER FIRE TRAINING AREA 2
- APPROXIMATE IRP SITE BOUNDARY

120TH FW, MONTANA AIR NATIONAL GUARD GREAT FALLS, MONTANA			
PREVIOUS INVESTIGATIONS AT SITE 2			
drawn: RAM	checked:	approved:	figure no.
date: 10/24/01	date:	date:	2-1
job no. 01-1408-04-0436-003		file no. 40436-008-B	
		<b>Science Applications International Corporation</b> <i>An Employee-Owned Company</i>	

**Table B2-1**  
**Source: SAIC, 2004a**

**Table 2-1. Chemical Constituents Detected in Surface Soil (0 to 2 feet BLS)**  
**Site 2 – Drainage Ditch Off Old Power Check Pad**  
**120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical	MANG-2 SB1-1.5 <sup>c</sup>	MANG-2 SB2-1.5	MANG-2 SB3-1	MANG-2 SB5-1	MANG-2 SB6-1	Background Comparison	
						Background Range <sup>b</sup>	Max Exceeds Background?
<b>VOCs (µg/kg):</b> Acetone <sup>d</sup>	120 J	72 J	ND	70 J	ND	ND-160	No
<b>SVOCs (mg/kg)</b> DNBP <sup>d</sup>	ND	ND	ND	ND	<b>4.9 B</b>	ND	Yes (4.9)
Butylbenzylphthalate <sup>d</sup>	ND	ND	ND	ND	<b>1.4 J</b>	ND	Yes (1.4)
B2EHP <sup>d</sup>	ND	ND	ND	ND	<b>2.0</b>	ND	Yes (2.0)
<b>Metals (mg/kg)</b>							
Arsenic	4.9	7.8	4.4	8.7	5.9	5.5 – 16.5 <sup>a</sup>	No
Barium	218	193	160	231	219	101 – 971	No
Cadmium	ND	ND	ND	ND	ND	ND	No
Chromium	10.2	8.7	9.7	11.5	12.3	12.9 – 20.7	No
Copper	13.5*	8.3*	5.5*	12.7*	<b>29.6*</b>	6.9 – 18.7	Yes (29.6)
Lead	<b>14.5</b>	3.7 B	10.2	<b>12.4</b>	<b>17.7</b>	5.5 – 12.2	Yes (17.7)
Mercury	ND	ND	ND	ND	ND	ND	No
Nickel	13.5	9.5*	ND	<b>19.4*</b>	7.4 B*	6.4 – 14.8	Yes (19.4)
Selenium	ND	ND	ND	<b>0.5 B</b>	ND	ND - 0.43	Yes (0.5)
Zinc	36.6	35.6	36.5	<b>58.6</b>	<b>82.3</b>	30.4 – 54.7	Yes (82.3)
<b>TPH (mg/kg)</b>	ND	ND	ND	ND	<b>46</b>	ND	Yes (46)

<sup>a</sup> Regional background range for arsenic provided by MTDEQ.

<sup>b</sup> Background range is based on the six soil samples from the background borings (SB1, SB2, and SB3) (ES 1992).

<sup>c</sup> The format of "MANG-2-SB1-1.5" refers to "Montana Air National Guard, Site 2, Soil Boring 1, 1.5-foot depth."

<sup>d</sup> Acetone and phthalate are common laboratory and sampling contaminants.

ND – Not Detected.

**Bolded** values indicate contaminant concentrations above the background range.

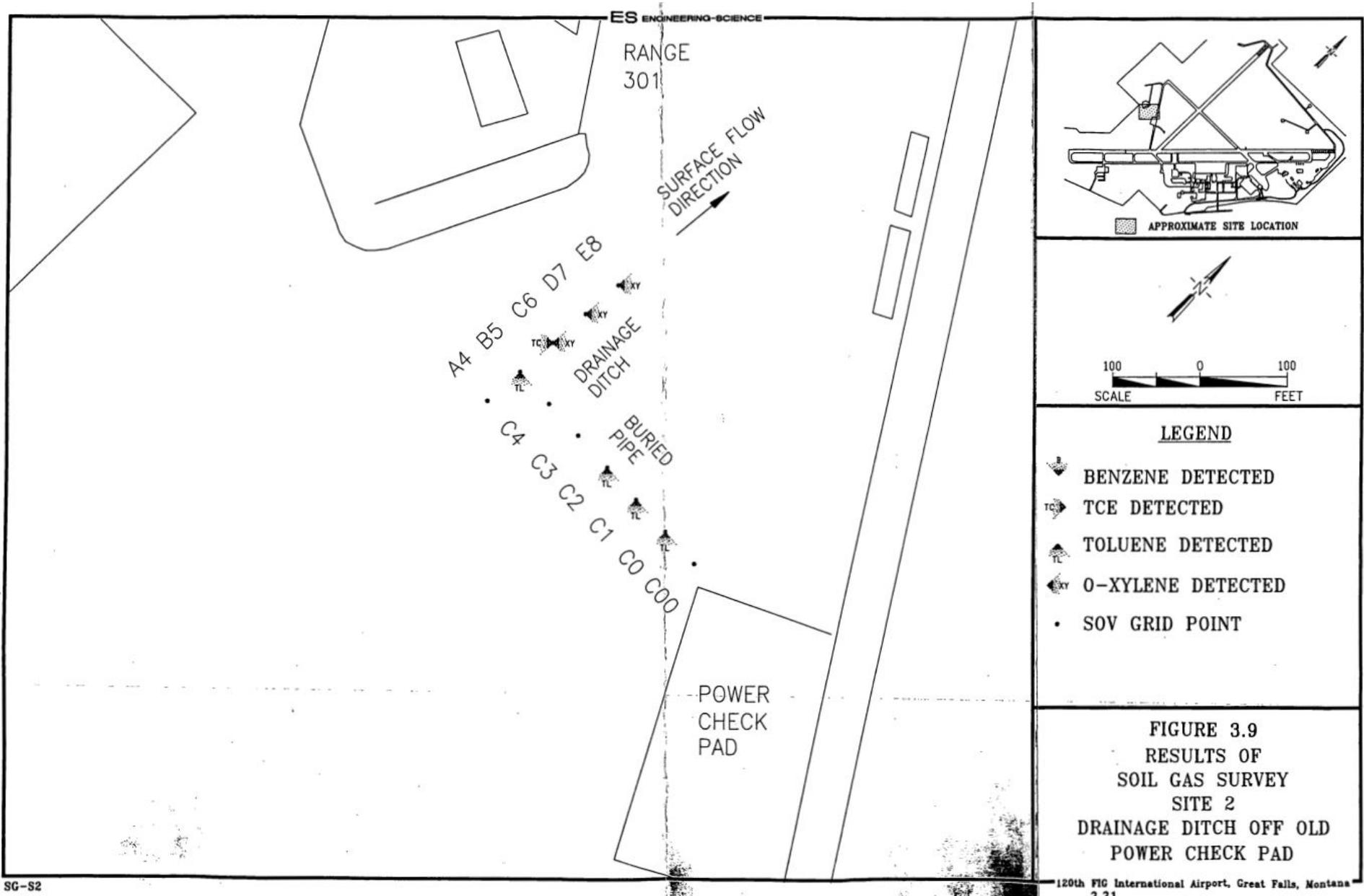
Data qualifiers follow the data. The qualifiers are:

J – The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

B – Reported value is less than the reporting limit, but greater than the instrument detection limit.

\* – Duplicate analysis was not within the control limits set by laboratory QA/QC.

Figure B2-2  
 Source: ES, 1992a



**Table B2-2**  
**Source: SAIC, 2004a**

**Table 2-2. Chemical Constituents Detected in Subsurface Soil (>2 feet BLS)  
 Site 2 – Drainage Ditch off Old Power Creek Pad  
 120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical	MANG-2 SB2-3 <sup>c</sup>	MANG-2 SB4-2	MANG-2 SB5-2	MANG-2 SB6-2	Background Comparison	
					Background Range <sup>b</sup>	Max Exceeds Background?
<b>VOCs (µg/kg):</b> Acetone <sup>d</sup>	ND	ND	170	70 J	ND-160	Yes (170)
<b>SVOCs (mg/kg)</b> DNBP <sup>d</sup>	ND	ND	ND	3.4 B	ND	Yes (3.4)
Butylbenzylphthalate <sup>d</sup>	ND	ND	ND	0.66	ND	Yes (0.66)
B2EHP <sup>d</sup>	ND	ND	ND	0.57	ND	Yes (0.57)
<b>Metals (mg/kg)</b> Arsenic	6.4	7.4	3	2.9	5.5 – 16.5 <sup>a</sup>	No
Barium	409	215	91.9	174	101 – 971	No
Cadmium	<b>0.38 B</b>	ND	ND	ND	ND	Yes (0.38)
Chromium	11.2	4.8	10.7	11.5	12.9 – 20.7	No
Copper	14.8*	7.7*	10.9*	5.3	6.9 – 18.7	No
Lead	12	11.5	8.7	9.1	5.5 – 12.2	No
Mercury	<b>0.055 B</b>	ND	ND	ND	ND	Yes (0.055)
Nickel	7.8*	ND	ND	ND	6.4 – 14.8	No
Selenium	ND	ND	ND	ND	ND - 0.43	No
Zinc	36	32.3	41.5	33.6	30.4 – 54.7	No
<b>TPH (mg/kg)</b>	ND	ND	ND	ND	ND	No

<sup>a</sup> Regional background range for arsenic provided by MTDEQ.

<sup>b</sup> Background range is based on the six soil samples from the background borings (SB1, SB2, and SB3) (ES 1992).

<sup>c</sup> The format of "MANG-2-SB2-3" refers to "Montana Air National Guard, Site 2, Soil Boring 2, 3-foot depth."

<sup>d</sup> Acetone and phthalate are common laboratory and sampling contaminants.

ND – Not Detected.

**Bolded** values indicate contaminant concentrations above the background range.

Data qualifiers follow the data. The qualifiers are:

- J – The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.
- B – Reported value is less than the reporting limit, but greater than the instrument detection limit.
- \* – Duplicate analysis was not within the control limits set by laboratory QA/QC.

**Table B2-3**  
**Source: SAIC, 2004a**

**Table 2-3. Chemical Constituents Detected in Sediment**  
**Site 2 – Drainage Ditch Off Old Power Check Pad**  
**120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical	MANG-2 SED1	MANG-2 SED2	MANG-2 SED3	Background Comparison	
				Background Range <sup>a</sup>	Max Exceeds Background?
VOCs (µg/kg):	ND	ND	ND	ND	No
SVOCs (mg/kg)					
Benzo(b)fluoranthene	ND	<b>2.0 J</b>	ND	ND	Yes (2.0)
Bis(2-ethylhexyl)phthalate	ND	<b>1.7 J</b>	ND	ND	Yes (1.7)
<b>Metals (mg/kg)</b>					
Arsenic	6.5S	<b>10.3 S</b>	5.8	5.5 – 16.5 <sup>b</sup>	No
Barium	241	246	150	101 – 971	No
Cadmium	ND	<b>24.2</b>	<b>0.76 B</b>	ND	Yes (24.2)
Chromium	13.8	<b>64.9</b>	14.5	12.9 – 20.7	Yes (64.9)
Copper	16.1	<b>66.9</b>	<b>22.1</b>	6.9 – 18.7	Yes (66.9)
Lead	<b>14.5</b>	<b>131</b>	<b>22.6</b>	5.5 – 12.2	Yes (131)
Mercury	<b>0.04 B</b>	<b>0.19</b>	ND	ND	Yes (0.19)
Nickel	6.2 B	<b>37.5</b>	ND	6.4 – 14.8	Yes (37.5)
Selenium	0.27 B	<b>1.1</b>	<b>0.43 B</b>	ND - 0.43	Yes (1.1)
Zinc	<b>63.1</b>	<b>555</b>	<b>120</b>	30.4 – 54.7	Yes (555)
<b>TPH (mg/kg)</b>	<b>82</b>	<b>590</b>	<b>140</b>	ND	Yes (590)

<sup>a</sup> Background range is based on the six soil samples from the background borings (SB1, SB2, and SB3) (ES 1992).

<sup>b</sup> Regional background range for arsenic provided by MTDEQ.

ND – Not Detected.

**Bolded** values indicate contaminant concentrations above the background range.

Data qualifiers follow the data. The qualifiers are:

B – Reported value is less than the reporting limit, but greater than the instrument detection limit.

N – Spiked sample recovery was not within the control limits set by laboratory QA/QC.

S – Reported value was determined by the method of standard additions.

J – The value reported in an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

Table 2-4. Chemical Constituents Detected in Groundwater (Rounds 1 and 2)  
Site 2 – Drainage Ditch Off Old Power Check Pad  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana

Chemical	Background		Round 1	Round 2		Max Exceeds Background?
	Round 1 MANG-BG MW1	Round 2 MANG-BG MW1	MANG-2 MW1	MANG-2 MW1	MANG-2 MW1-D	
VOCs (µg/L)	ND	ND	ND	ND	ND	No
SVOCs (µg/L) B2EHP	ND	ND	ND	13 J	4 J	Yes (13)
Metals (µg/L)						
Arsenic	1.1 JB	ND	ND	ND	2.5 B	Yes (2.5)
Barium	56 JB	62.2 B	42 JB	57.8 JB	57.8 B	No
Copper	ND	ND	ND	ND	4.7 B	Yes (4.7)
Lead	4.9 J	4.3 JN	4.7 J	4.2 JN	3.7 JN	No
Selenium	ND	ND	14.2 S	9.7	10.1	Yes (14.2)
Zinc	15 JB*	9.8 JB	37 J*	15 JB	12.8 JB	Yes (37)
Petroleum Hydrocarbons (µg/L)						
TPH	1,000	ND	7,000	ND	ND	Yes (7,000)

Round 1 – Groundwater samples collected in October 1990.

Round 2 – Groundwater samples collected in February 1991.

ND – Not Detected.

Bolded values indicate contaminant concentrations above the background range.

Data qualifiers follow the data. The qualifiers are:

B Reported value is less than the reporting limit, but greater than the instrument detection limit.

N Spike sample recovery is not within the control limits set by laboratory QA/QC.

\* Duplicate analysis is not within the control limits set by laboratory QA/QC.

S Reported value was determined by the method of standard additions.

J The value reported is an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

Table 2-5. Chemical Constituents Detected in Groundwater (Rounds 3 and 4)  
Site 2 – Drainage Ditch Off Old Power Check Pad  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana

Chemical	Round 3		Round 4		Max Exceeds Background?
	MANG-2 MW1	MANG-2 (1-2)P3	MANG-2 MW1	MANG-2 (1-2)P3	
Petroleum Hydrocarbons (µg/L)					
Extractable Petroleum Hydrocarbons (EPH)	ND	ND	ND	ND	No
Volatile Petroleum Hydrocarbons (VPH)	ND	ND	ND	ND	No

Round 3 – Samples collected in April 2000.

Round 4 – Samples collected in July 2000.

ND – Not Detected.

**Table 3.15 Organic Constituents Detected in Soil Gas Survey**  
**Site 2: Drainage Ditch Off Old Power Check Pad**  
(ppb by volume, GC)

Sample ID	Grid Coordinates		TCE	Toluene	o-Xylene
E8	0	-300	ND	ND	71
D7	50	-300	ND	ND	54,000
C6	100	-300	346	ND	20,000
C4	150	-250	ND	ND	ND
C3	150	-200	ND	ND	ND
C2	150	-150	ND	13	ND
C1	150	-100	ND	15	ND
C0	150	-50	ND	19	ND
C00	150	0	ND	ND	ND
B5	150	-300	ND	14	ND
A4	200	-300	ND	ND	ND

320SA\AU23409\T3-15.WK1

ND = not detected

Figure B3-1  
Source: ES, 1992a

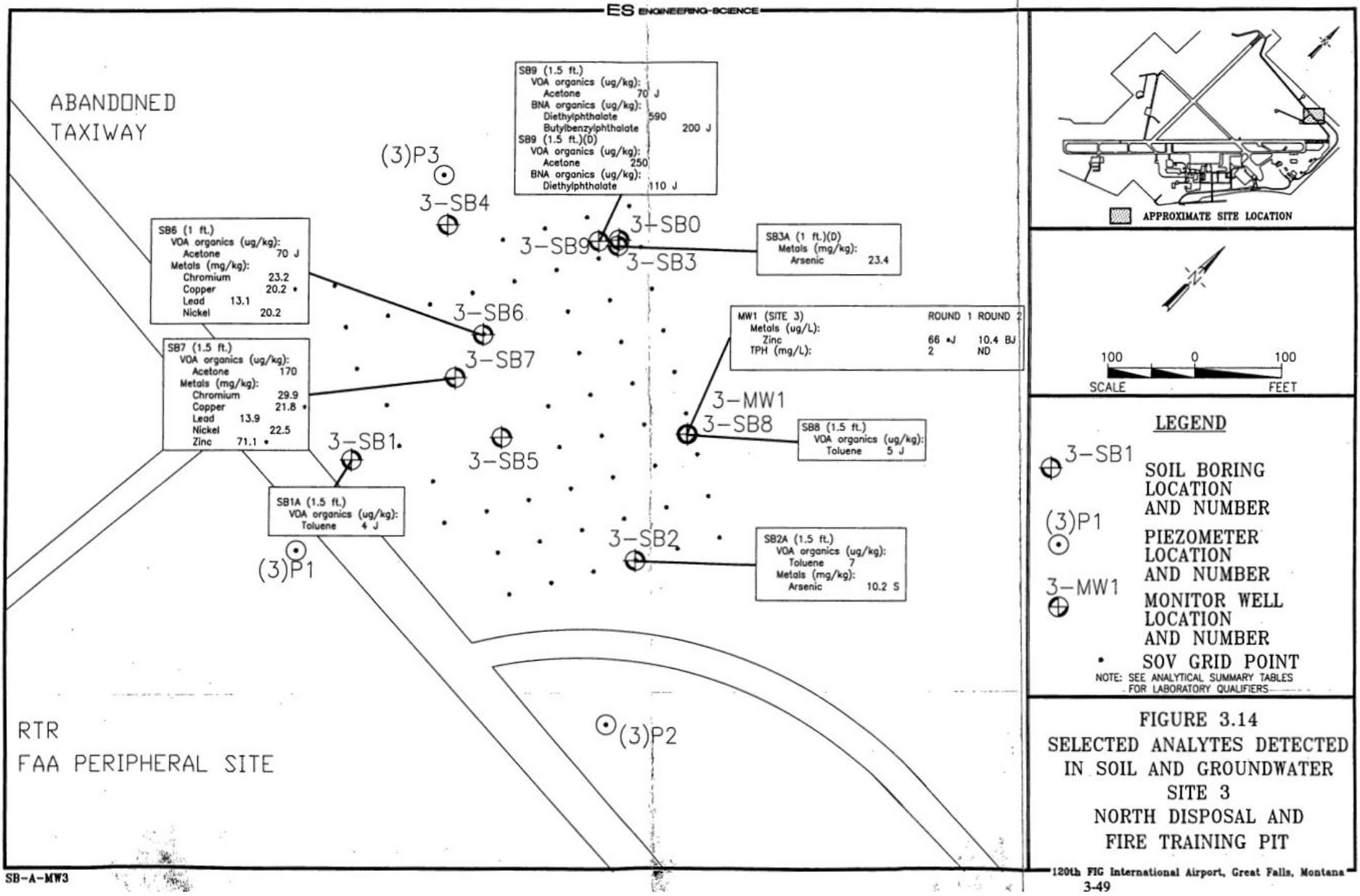


Table B3-1  
Source: ES, 1992a

Table 3.23 Chemical Constituents Detected in Soil  
Site 3: North Disposal and Fire Training Pit  
(CLP Laboratory Analysis)

Chemical	Background (1)	MANG-3 SB1A-1.5	MANG-3 SB2A-1.5	MANG-3 SB2A-3.5	MANG-3 SB3A-1	MANG-3 SB3A-1(D)	MANG-3 SB5A-1.5	MANG-3 SB6-1	MANG-3 SB7-1.5	MANG-3 SB8-1.5	MANG-3 SB9-1.5	MANG-3 SB9(D)-1.5	Health (2) Criteria
<b>Volatile organics (µg/kg):</b>													
Acetone	ND-157	ND	ND	ND	ND	ND	ND	70 J	170	ND	70 J	250	8E06
Toluene	ND-9	4 J	7	ND	ND	ND	ND	ND	ND	5 J	ND	ND	1.6E07
<b>BNA organics (µg/kg):</b>													
Diethylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	590	110 J	6.4E07
Butylbenzylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200 J	ND	1.6E07
<b>Metals (mg/kg):</b>													
Arsenic	1.9-9.9	7.3	10.2 S	9.2 B	5.4	23.4	6.9	6.9	9.5	2.6	7.2	7.9	80
Barium	ND-1,231	173	665	124	44.7	55.7	181	259	202	51	176	274	5,600
Chromium	8.7-22.7	14.8 *	17.5 *	12.2 *	6.2 *	7.3 *	20.8 *	23.2	29.9	4.8	15.5	13.8	8E04
Copper	3.3-19.7	19.3	17.3	13.3	3.9 B	21.4	15.5	20.2 *	21.8 *	13.4 *	17.6 *	17.2 *	--
Lead	3.4-13.0	9.1	10.5	9.7	3.7 B	5.2 B	9.9	13.1	13.9	3.5 B	9	8.9	500
Nickel	3.6-17.6	16.8	16.2	15	ND	ND	16.2	20.2	22.5	ND	9.5	15.7	1,600
Selenium	ND-0.66	ND	0.46 B	ND	ND	0.32 B	ND	ND	ND	ND	ND	ND	240
Zinc	21.6-61.3	51.4	56.8	44.5	24.8	33.8	44.9	58.4 *	71.1 *	24 *	46.4 *	60.2 *	1.6E04
Total petroleum hydrocarbons (mg/kg)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--

320SA\AU23409\T3-23\WK1

(1) Background is the average background concentration +/- two standard deviations.

(2) Based on soil ingestion, see section 4.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Organics:**

J The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

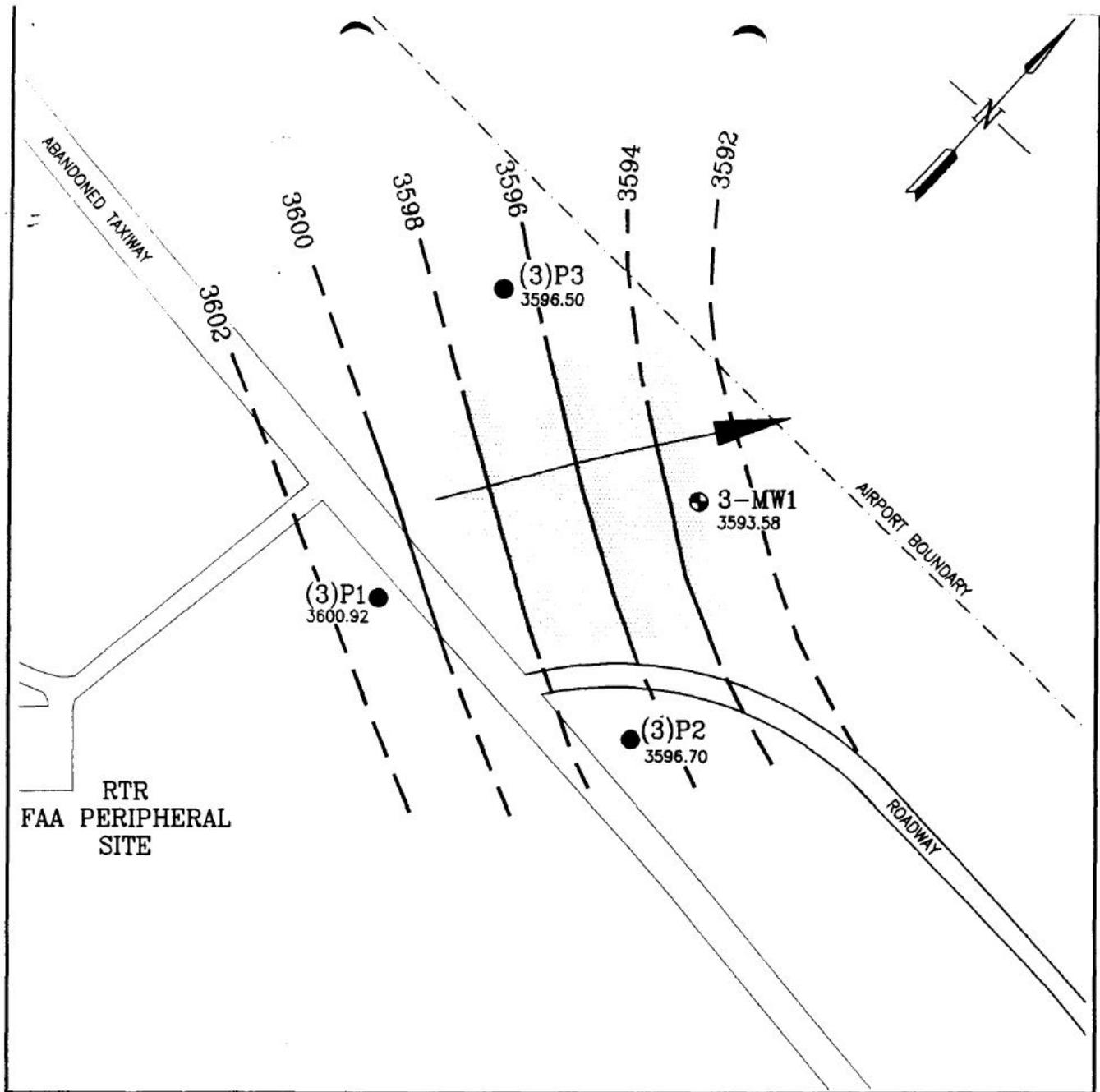
**Metals:**

B Reported value is less than reporting limit but greater than the instrument detection limit.

S Reported value was determined by the method of standard additions.

\* Duplicate analysis not within control limits set by lab QA/QC.

Figure B3-2  
 Source: SAIC, 1999a



**LEGEND**

- 3-MW1 MONITORING WELL LOCATION
- (3)P1 3600.92 PIEZOMETER LOCATION WITH POTENTIOMETRIC SURFACE (FT. AMSL)
- 3598 — GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT. AMSL)
- INTERPRETED DIRECTION OF GROUNDWATER FLOW
- APPROXIMATE SITE LOCATION



**120th FW-MONTANA  
 AIR NATIONAL GUARD  
 GREAT FALLS, MT**

**GROUNDWATER POTENTIOMETRIC  
 CONTOUR MAP - SITE 3  
 APRIL 28, 1999**

Drawn <i>RAM</i>	Checked	Approved	Figure no.
Date 06/12/99	Date	Date	2
Job no. 01-1408-04-0436-003	Rev. no. 41891-012-A		

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Table 3.24 Chemical Constituents Detected in Groundwater  
Site 3: North Disposal and Fire Training Pit  
(CLP Laboratory Analysis)

Chemical	Round 1 MANG-3 MW1	Round 2 MANG-3 MW1	Background		ARARs (1)
			Round 1 MANG-BG MW1	Round 2 MANG-BG MW1	
GC volatile organics ( $\mu\text{g/L}$ ):	ND	ND	ND	ND	NA
CLP semivolatile organics ( $\mu\text{g/L}$ ):	ND	ND	ND	ND	NA
Metals ( $\mu\text{g/L}$ ):					
Arsenic	ND	ND	1.1 JB	ND	50
Barium	36 BJ	44.2 B	56 JB	62.2 B	1,000
Lead	4.9 J	3.3 JN	4.9 J	4.3 JN	50
Zinc	66 J*	10.4 JB	15 JB*	9.8 JB	5,000
Total petroleum hydrocarbons (mg/L)	2	ND	1	ND	NA

320SA\AU23409\T3-24.WK1

(1) ARARs are proposed only. These are MCL's where available, otherwise WQC.

ND = not detected.

NA = not applicable.

Data qualifiers follow the data. The qualifiers are:

**Metals:**

**B** Reported value is less than reporting limit but greater than the instrument detection limit.

**N** Spiked sample recovery not within control limits set by lab QA/QC.

**\*** Duplicate analysis not within control limits set by lab QA/QC.

**J** The value reported is an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

Figure B3-3  
 Source: ES, 1992a

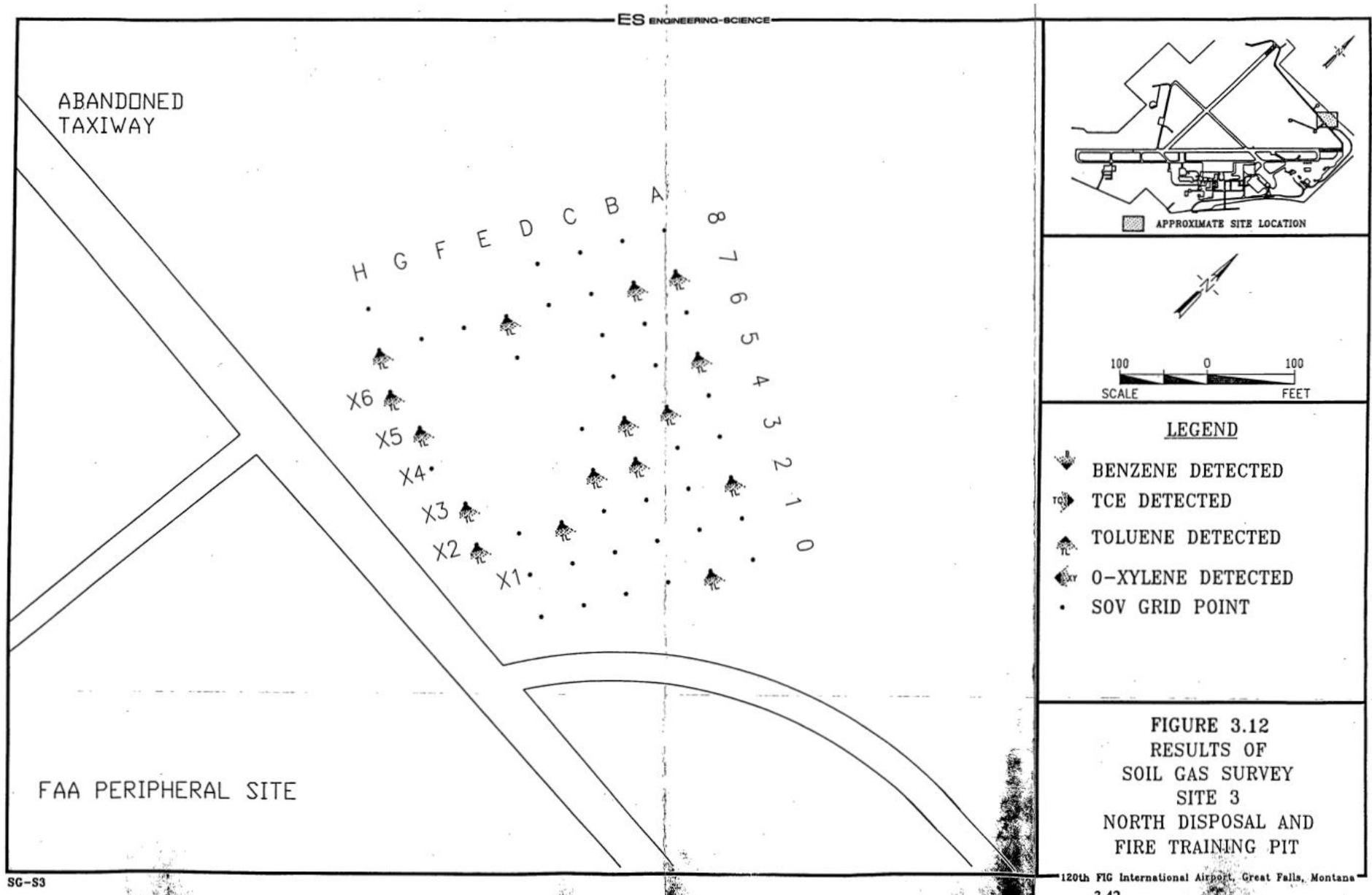


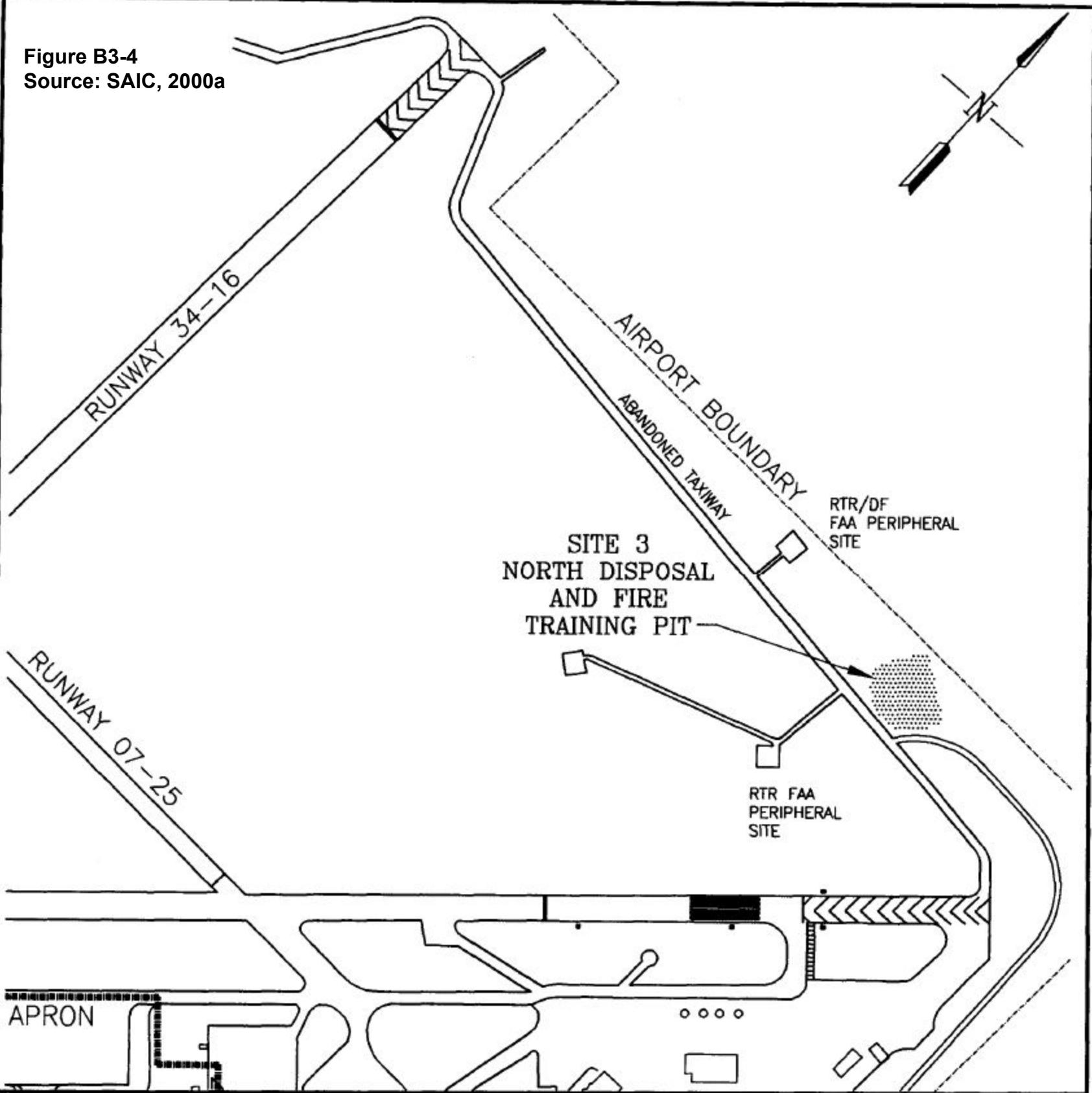
Table 3.20 Organic Constituents Detected in Soil Gas Survey  
Site 3: North Disposal and Fire Training Pit  
(ppb by volume, GC)

Sample ID	Grid Coordinates	Toluene
A0	0 0	ND
A1	0 -50	ND
A2	0 -100	7
A3	0 -150	ND
A4	0 -200	ND
A5	0 -250	6
A6	0 -300	ND
A7	0 -350	9
A8	0 -400	ND
B0	50 0	19
B1	50 -50	ND
B2	50 -100	ND
B3	50 -150	ND
B4	50 -200	21
B5	50 -250	ND
B6	50 -300	ND
B7	50 -350	14
B8	50 -400	ND
C0	100 0	ND
C1	100 -50	ND
C2	100 -100	ND
C3	100 -150	8
C4	100 -200	9
C5	100 -250	ND
C6	100 -300	ND
C7	100 -350	ND

Sample ID	Grid Coordinates	Toluene
C8	100 -400	ND
D0	150 0	ND
D1	150 -50	ND
D2	150 -100	ND
D3	150 -150	19
D4	150 -200	ND
D7	150 -350	ND
D8	150 -400	ND
E0	200 0	ND
E1	200 -50	ND
E2	200 -100	6
E6	200 -300	ND
E7	200 -350	18
E8	250 0	ND
F1	250 -50	ND
F2	250 -100	ND
F7	250 -350	ND
G7	300 -350	ND
H0	350 0	ND
H7	350 -350	14
H8	350 -400	ND
X2	300 -100	9
X3	300 -150	25
X4	327 -200	ND
X5	328 -250	13
X6	350 -300	37

ND = not detected

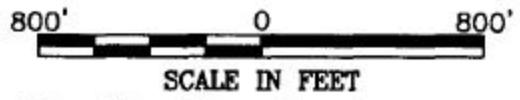
Figure B3-4  
Source: SAIC, 2000a



**LEGEND**



APPROXIMATE SITE LOCATION



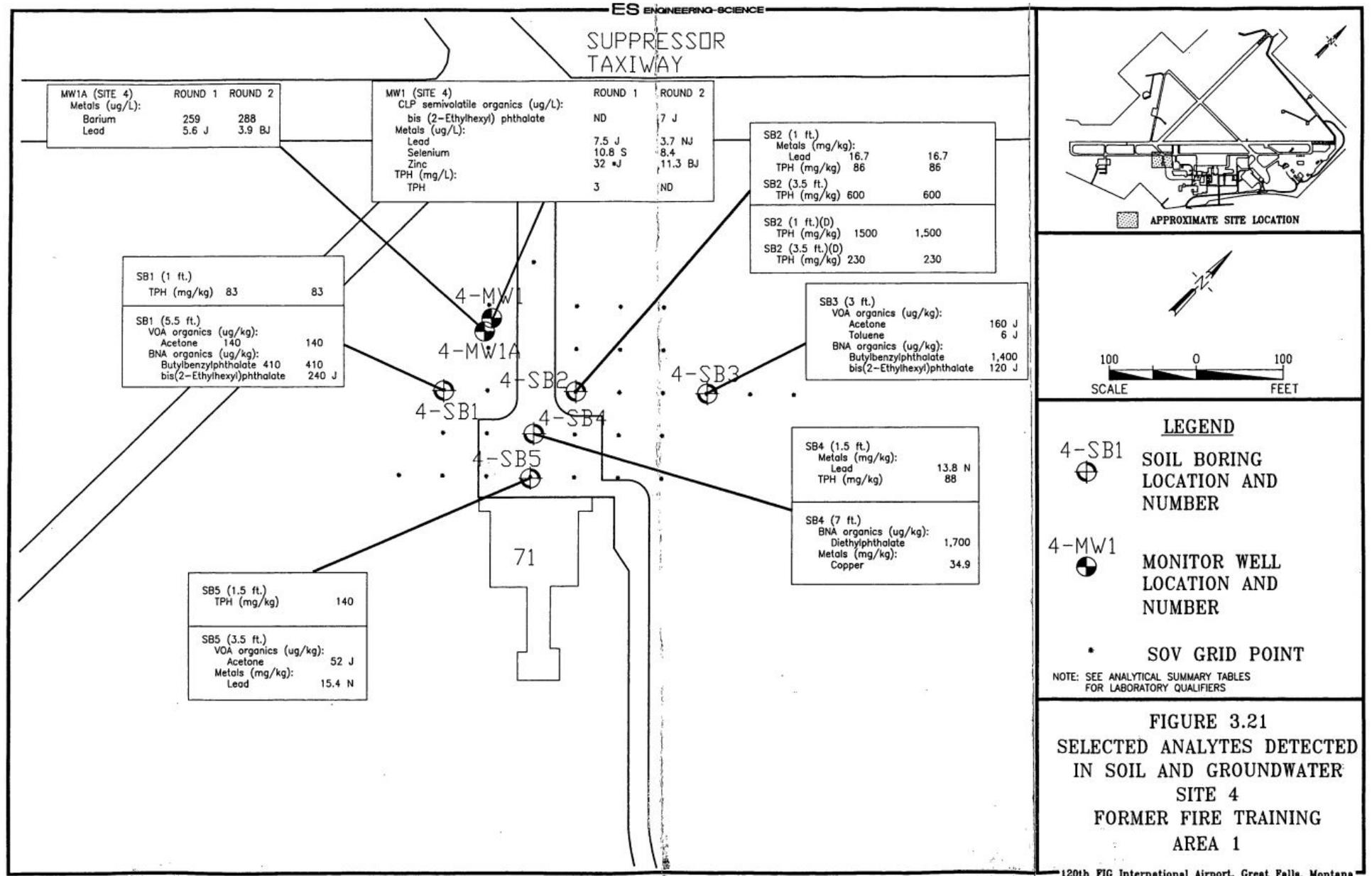
**120th FW-MONTANA  
AIR NATIONAL GUARD  
GREAT FALLS, MT**

**LOCATION OF IRP SITE 3**

drawn <i>RAM</i>	checked <i>FJC</i>	approved	figure no. <b>1-2</b>
date <i>06/18/99</i>	date <i>08/23/99</i>	date	
job no. <i>01-1408-04-0438-003</i>	file no. <i>41891-013-A</i>		

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**Figure B4-1**  
**Source: ES, 1992a**



**FIGURE 3.21**  
**SELECTED ANALYTES DETECTED**  
**IN SOIL AND GROUNDWATER**  
**SITE 4**  
**FORMER FIRE TRAINING**  
**AREA 1**

Table B4-1  
Source: ES, 1992a

Table 3.29 Chemical Constituents Detected in Soil  
Site 4: Former Fire Training Area 1  
(CLP Laboratory Analysis)

Chemical	Background (1)	MANG-4 SB1-1	MANG-4 SB1-5.5	MANG-4 SB2-1	MANG-4 SB2-1(D)	MANG-4 SB2-3.5	MANG-4 SB2-3.5(D)	MANG-4 SB3-3	MANG-4 SB3-7	MANG-4 SB4-1.5	MANG-4 SB4-7	MANG-4 SB5-1.5	MANG-4 SB5-3.5	Health (2) Criteria
<b>Volatile organics (µg/kg):</b>														
Acetone	ND-157	ND	140	ND	ND	ND	ND	160 J	ND	ND	ND	ND	52 J	8E06
Toluene	ND-9.0	ND	ND	ND	ND	ND	ND	6 J	ND	ND	ND	ND	ND	1.6E07
<b>BNA organics (µg/kg):</b>														
Diethylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,700	ND	ND	6.4E07
Butylbenzylphthalate	ND	ND	410	ND	ND	ND	ND	1,400	ND	ND	ND	ND	ND	1.6E04
bis(2-Ethylhexyl)phthalate	ND	ND	240 J	ND	ND	ND	ND	120 J	ND	ND	ND	ND	ND	5E04
<b>Metals (mg/kg):</b>														
Arsenic	1.9-9.9	6.5 S	3.9	7.4	5	3.8	5.3	7.9	3.6	6.3	4.5	6.3	7	80
Barium	ND-1,231	214	219	219	170	165	214	290	138	238	1190	260	205	5,600
Chromium	8.7-22.7	9.8	10.5	17	9.3	6.4	11.6	8.4	9.6	12.4	10.6	13.6	20.6	8E04
Copper	3.3-19.7	10.6 *	10.9 *	15.1 *	7.4 *	11.8 *	10.1	7.8 *	7 *	14.2	34.9	18.5	16.1	--
Lead	3.4-13.0	10.5	10.6	16.7	9.3	8.7 B	7.6 N	10.2	9.1	13.8 N	7.5 N	12.2 N	15.4 N	500
Nickel	3.6-17.6	8.4 *	ND	13.8 *	ND	7.5 B*	8.4	9 *	ND	ND	ND	7.1 B	12.1	1,600
Zinc	21.6-61.3	35.8	47.4	48.4	34.3	36	36.5 *	47.5 *	48.8	38.8 *	47.1 *	45.4 *	46.8 *	1.6E04
Total petroleum hydrocarbons (mg/kg)	ND	83	ND	86	1500	600	230	ND	ND	88	ND	140	ND	--

320SA\AU23409\T3-29.WK1

(1) Background is the average background concentration +/- two standard deviations.

(2) Based upon soil ingestion, see section 4.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Organics:**

J The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit. For toluene on sample MANG-4-SB3-3, the surrogates were outside QA limits.

**Metals:**

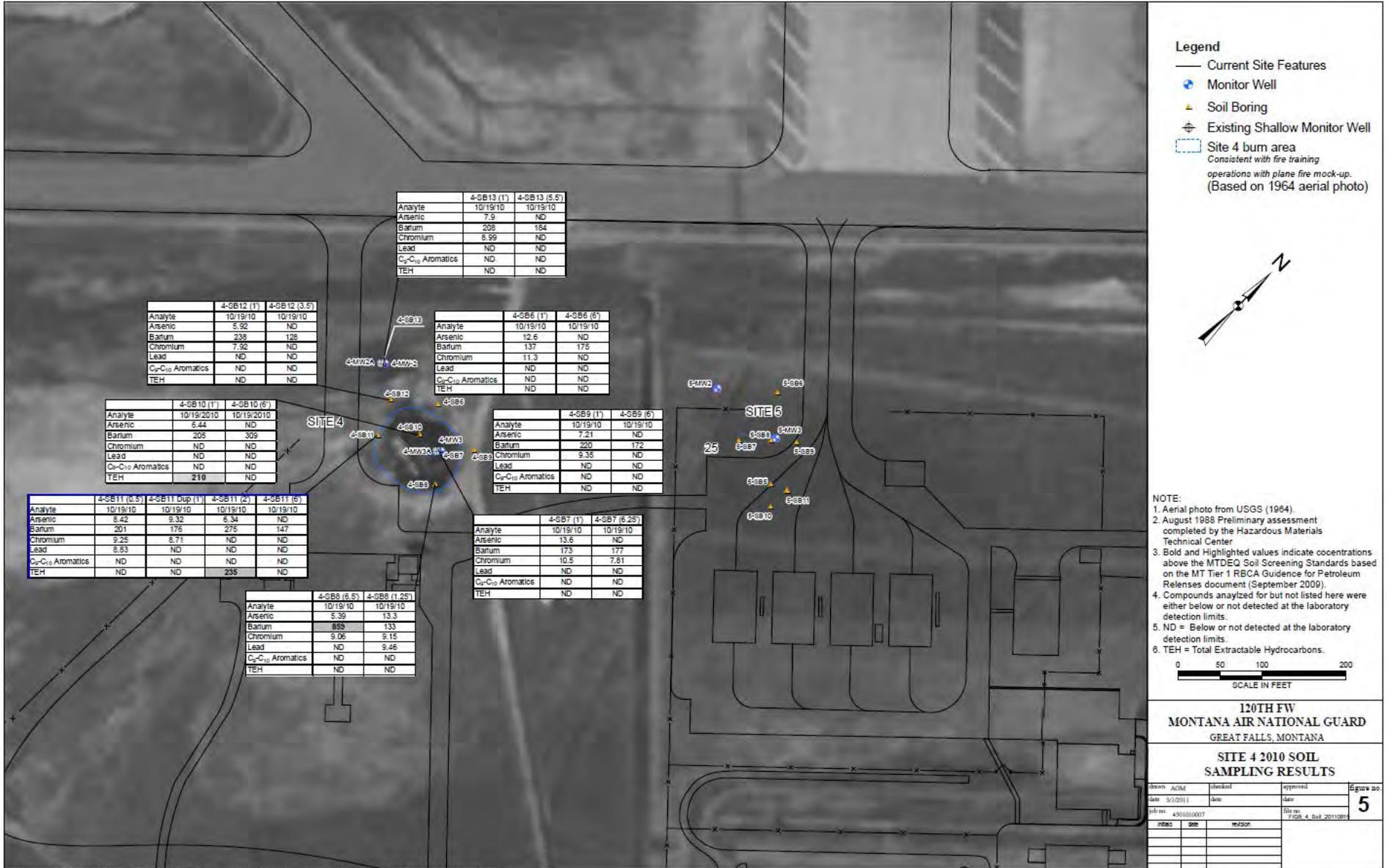
B Reported value is less than reporting limit but greater than the instrument detection limit.

N Spiked sample recovery not within control limits set by lab QA/QC.

S Reported value was determined by the method of standard additions.

\* Duplicate analysis not within control limits set by lab QA/QC.

**Figure B4-2**  
**Source: SAIC, 2011a**



**Table B4-2**  
**Source: SAIC, 2011a**

**Table 3**  
**VOC/SVOC/RCRA Metals Soils Chemistry**  
**Montana Air National Guard**  
**Great Falls, Montana**

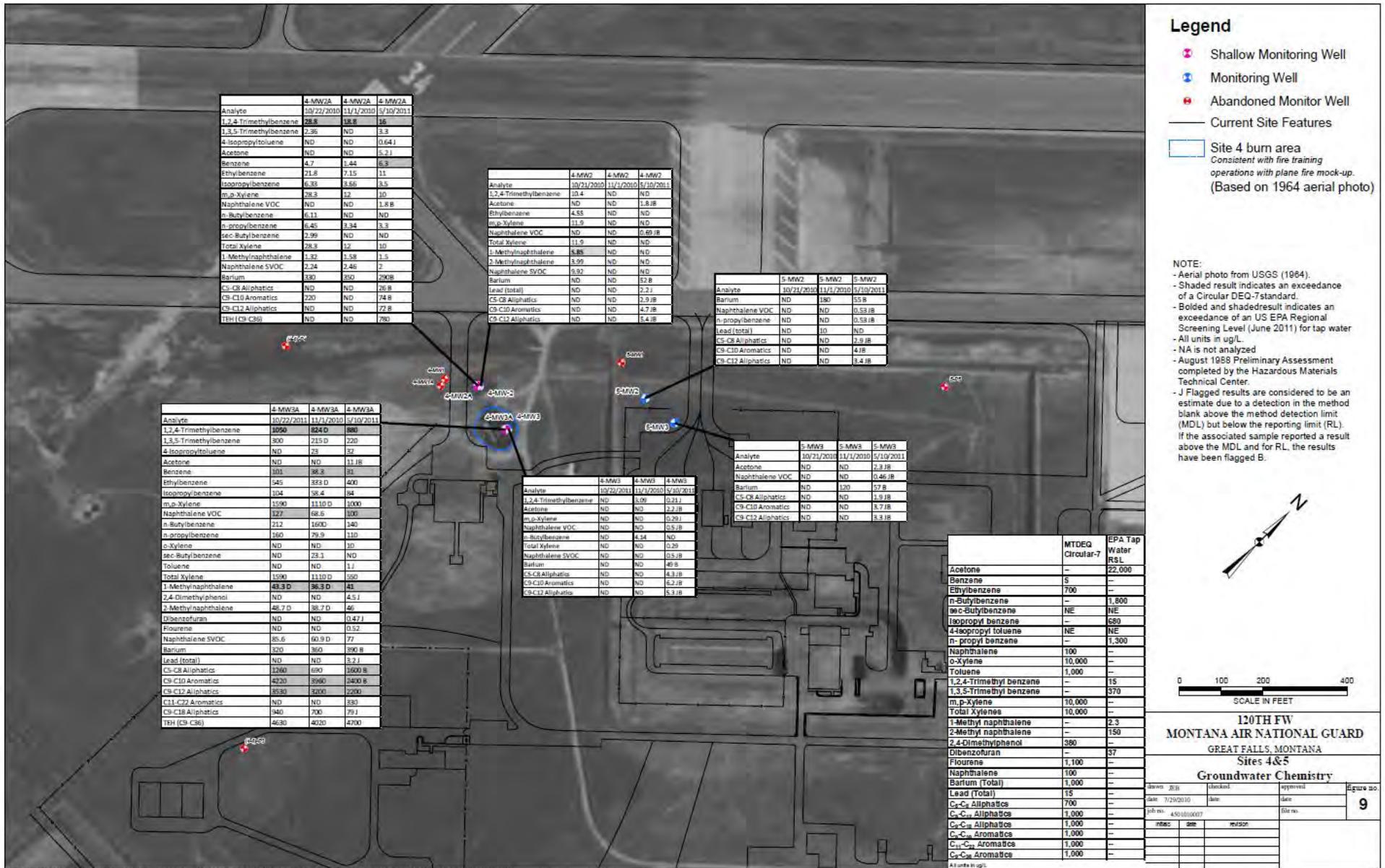
Sample ID	Sample Date	RCRA Metals				Petroleum Hydrocarbons	
		Arsenic (Total) (mg/Kg)	Barium (Total) (mg/Kg)	Chromium (Total) (mg/Kg)	Lead (Total) (mg/Kg)	C <sub>9</sub> -C <sub>10</sub> Aromatics (mg/Kg)	TEH C <sub>9</sub> -C <sub>38</sub> Aromatics (mg/Kg)
4-SB6 (1')	10/19/10	12.6	137	11.3	ND	ND	ND
4-SB6 (6')	10/19/10	ND	175	ND	ND	ND	ND
4-SB7 (1')	10/19/10	13.6	173	10.5	ND	ND	ND
4-SB7 (6.25')	10/19/10	ND	177	7.81	ND	ND	ND
4-SB8 (6.5')	10/19/10	5.39	859	9.06	ND	ND	ND
4-SB8 (1.25')	10/19/10	13.3	133	9.15	9.46	ND	ND
4-SB9 (1')	10/19/10	7.21	220	9.35	ND	ND	ND
4-SB9 (6')	10/19/10	ND	172	ND	ND	ND	ND
4-SB10 (1')	10/19/10	6.44	205	ND	ND	ND	210
4-SB10 (6')	10/19/10	ND	309	ND	ND	ND	ND
4-SB11 (0.5')	10/19/10	8.42	201	9.25	8.83	ND	ND
4-SB110 (1')	10/19/10	9.32	176	8.71	ND	ND	ND
4-SB11 (2')	10/19/10	6.34	275	ND	ND	ND	235
4-SB11 (6')	10/19/10	ND	147	ND	ND	ND	ND
4-SB12 (1')	10/19/10	5.92	238	7.92	ND	ND	ND
4-SB12 (3.5')	10/19/10	ND	128	ND	ND	ND	ND
4-SB13 (1')	10/19/10	7.9	208	8.99	ND	ND	ND
4-SB13 (5.5')	10/19/10	ND	184	ND	ND	ND	ND
5-SB5 (1.75')	10/18/10	17.6	105	9.62	8.89	ND	ND
5-SB5 (4')	10/18/10	7.2	678	ND	ND	ND	ND
5-SB5 (6')	10/18/10	ND	ND	ND	ND	ND	ND
5-SB6 (1')	10/18/10	6.66	177	10.8	ND	ND	ND
5-SB6 (5')	10/18/10	ND	594	ND	ND	ND	ND
5-SB7 (1')	10/18/10	14.0	158	9.59	10.90	ND	ND
5-SB7 (5.5')	10/18/10	7.66	1,120 E	9.86	ND	ND	ND
5-SB8 (1.5')	10/18/10	16.1	139	10.8	ND	ND	ND
5-SB8 (9')	10/18/10	ND	154	12.7	ND	ND	ND
5-SB9 (1')	10/18/10	ND	489	10.2	ND	50.6	378
5-SB9 (2')	10/18/10	6.55	140	12.6	ND	ND	ND
5-SB9 (5.5')	10/18/10	5.96	209	ND	ND	ND	ND
5-SB10 (1')	10/20/10	20.9	153	10.8	ND	ND	ND
5-SB100 (2')	10/20/10	19.2	157	10.7	ND	ND	ND
5-SB10 (5.5')	10/20/10	ND	517	8.28	ND	ND	ND
5-SB11 (1.5')	10/20/10	17.7	142	10.1	9.42	ND	ND
5-SB11 (5.5')	10/20/10	ND	359	7.82	ND	ND	ND

Montana Department of Environmental Quality Soil Standards	40	820	280	400	700	200
--	----	-----	-----	-----	-----	-----

**NOTES:**

- 1) **Bold and highlighted** values indicate the concentrations are above the MTDEQ Soil Screening Standards based on either the MT Tier 1 RBCA Guidance for Petroleum Releases document (Sept 2009) or applicable USEPA regional screening levels (June 2011)
- 2) Compounds analyzed for but not listed here were either below or not detected at the laboratory detection limits
- 3) ND = Not detected at or above the laboratory detection limit.
- 4) E = The target analyte response exceeded the calibration range and is an estimated value.
- 5) TEH = Total Extractable Hydrocarbons.
- 6) A trailing 0 in the sample ID represents the duplicate sample

**Figure B4-3**  
**Source: SAIC, 2011a**



C:\CAD\B01\ENV\016\_Data\Air\National\_Guard\Montana Air National\_Guard\ANS Structure Project\Site\_4\_5\_Tech\_Mem\_4\_5\_C Draft 2\Fig03\_45\_gw\_20110333.mxd

Table 3.30 Chemical Constituents Detected in Groundwater  
Site 4: Former Fire Training Area 1  
(CLP Laboratory Analysis)

Chemical	Round 1 MANG-4 MW1	Round 2 MANG-4 MW1	Round 1 MANG-4 MW1A	Round 2 MANG-4 MW1A	Background		ARARs (1)
					Round 1 MANG-BG MW1	Round 2 MANG-BG MW1	
GC volatile organics ( $\mu\text{g/L}$ )	ND	ND	ND	ND	ND	ND	NA
CLP semivolatile organics ( $\mu\text{g/L}$ ): bis(2-Ethylhexyl)phthalate	ND	7 J	ND	ND	ND	ND	4
Metals ( $\mu\text{g/L}$ ):							
Arsenic	ND	ND	ND	ND	1.1 JB	ND	50
Barium	52 JB	55.4 B	259	288	56 JB	62.2 B	1,000
Lead	7.5 J	3.7 JN	5.6 J	3.9 JB	4.9 J	4.3 JN	50
Selenium	10.8 S	8.4	ND	ND	ND	ND	10
Zinc	32 J*	11.3 JB	12 JB*	8.1 JB	15 JB*	9.8 JB	5,000
Total petroleum hydrocarbons (mg/L)	3	ND	ND	ND	1	ND	NA

320SA\AU23409\T3--30.WK1

(1) ARARs are proposed only. These are MCLs where available, otherwise WQC.

ND = not detected.

NA = not applicable.

Data qualifiers follow the data. The qualifiers are:

**Organics:**

**J** The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

**Metals:**

**B** Reported value is less than reporting limit but greater than the instrument detection limit.

**N** Spiked sample recovery not within control limits set by lab QA/QC.

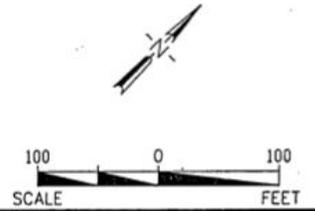
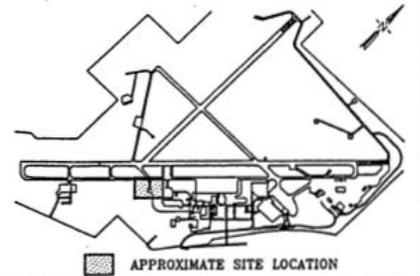
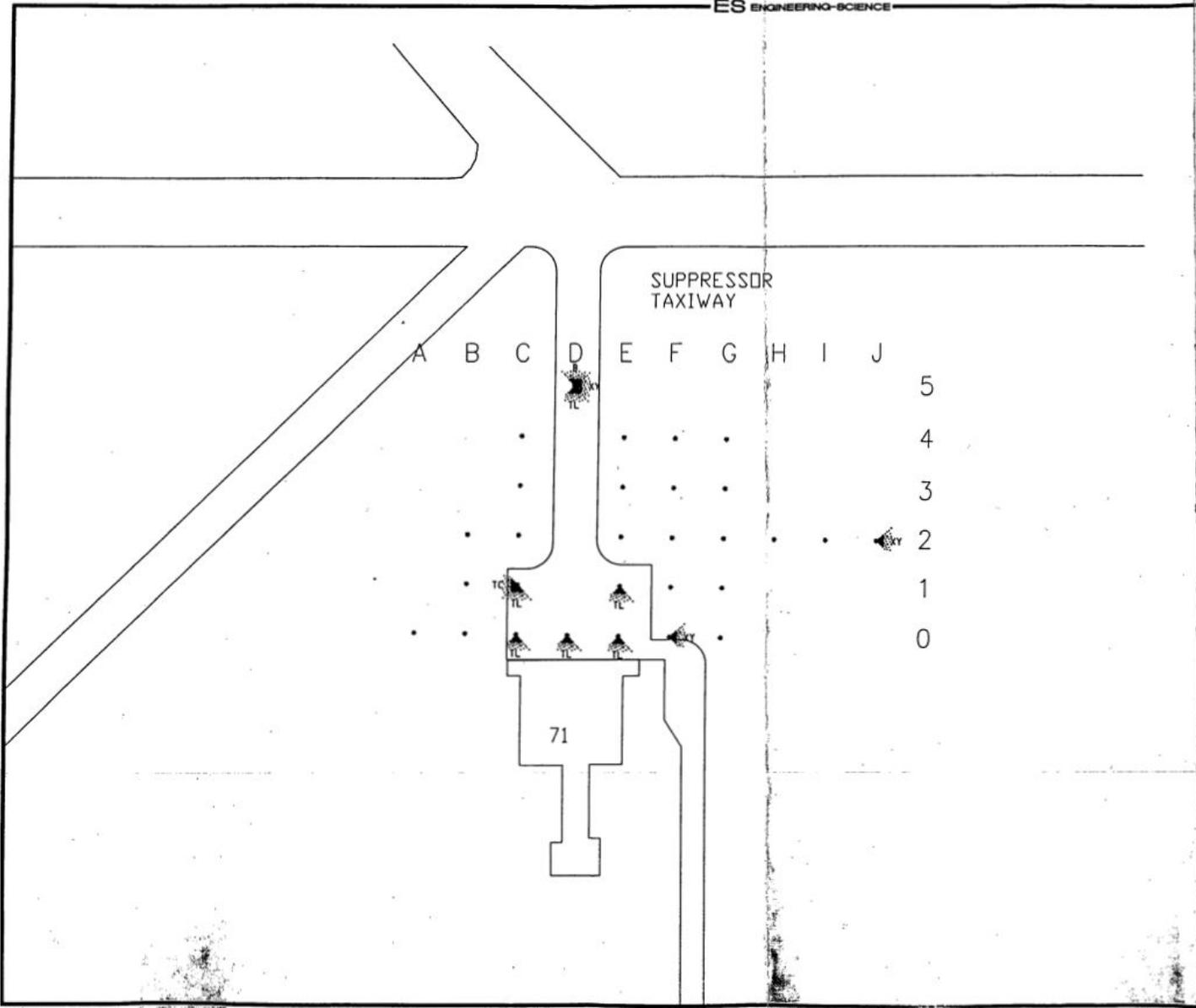
**S** Reported value was determined by the method of standard additions.

**\*** Duplicate analysis not within control limits set by lab QA/QC.

**J** The value reported is an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

Figure B4-4  
 Source: ES, 1992a

ES ENGINEERING-SCIENCE



- LEGEND**
- ▼ BENZENE DETECTED
  - ↙ TCE DETECTED
  - ▲ TOLUENE DETECTED
  - ↘ O-XYLENE DETECTED
  - SOV GRID POINT

FIGURE 3.19  
 RESULTS OF  
 SOIL GAS SURVEY  
 SITE 4  
 FORMER FIRE  
 TRAINING AREA 1

**Table B4-4**  
**Source: SAIC, 2011a**

**Table 4**  
**VOC/SVOC/RCRA Metals Groundwater Chemistry**  
**Montana Air National Guard**  
**Great Falls, Montana**

Sample ID	Sample Date	VOC														
		Acetone (ug/L)	Benzene (ug/L)	Ethylbenzene (ug/L)	n-Butylbenzene (ug/L)	sec-Butylbenzene (ug/L)	Isopropylbenzene (ug/L)	4-Isopropyl toluene (ug/L)	n-propylbenzene (ug/L)	Naphthalene (ug/L)	o-Xylene (ug/L)	Toluene (ug/L)	1,2,4-Trimethylbenzene (ug/L)	1,3,5-Trimethylbenzene (ug/L)	m,p-Xylene (ug/L)	Total Xylenes (ug/L)
4-MW2	10/21/10	ND	ND	4.55	ND	ND	ND	ND	ND	ND	ND	10.4	ND	11.9	11.9	
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	05/10/11	1.8 J,B	ND	ND	ND	ND	ND	ND	0.69 J,B	ND	ND	ND	ND	ND	ND	
4-MW20	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4-MW2A	10/21/10	ND	4.77	21.8	6.11	2.99	6.33	ND	6.45	ND	ND	28.8	2.36	28.3	28.3	
	11/01/10	ND	1.44	7.15	ND	ND	3.66	ND	3.34	ND	ND	18.8	ND	12.0	12.0	
	05/10/11	5.2 J,B	6.3	11	ND	ND	3.5	0.64 J	3.3	1.8 B	ND	16	3.3	10	10.0	
4-MW3	10/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	11/01/10	ND	ND	ND	4.14	ND	ND	ND	ND	ND	ND	3.09	ND	ND	ND	
	05/10/11	2.2 J,B	ND	ND	ND	ND	ND	ND	ND	0.50 J,B	ND	0.21 J	ND	0.29 J	0.29 J	
4-MW3A	10/22/10	ND	101	545	212	ND	104	ND	160	127	ND	1,050	300	1,590	1,590	
	11/01/10	ND	38.3	333 D	160 D	23.1	58.4	23.0	79.9	68.6	ND	824 D	215 D	1,110 D	1,110 D	
	05/10/11	11 J,B	31	400	140	ND	84	32.0	110	100	10	1.0 J	880	220	1,000	550
4-MW3A0	10/22/10	ND	72.3	434	192	ND	86.2	ND	132	120	ND	886	248	1,390	1,390	
	05/10/11	12 J,B	32	320	ND	ND	34	23	16	86	10	1.3 J	830	230	980	530
5-MW2	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	05/10/11	ND	ND	ND	ND	ND	ND	ND	0.53 J,B	0.53 J,B	ND	ND	ND	ND	ND	
5-MW3	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	05/10/11	2.3 J,B	ND	ND	ND	ND	ND	ND	ND	0.46 J,B	ND	ND	ND	ND	ND	
5-MW30	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Seep	05/09/11	ND	ND	ND	ND	ND	ND	ND	ND	0.63 J,B	ND	ND	ND	ND	ND	
MTDEQ Circular-7		--	5	700	--	NE	--	NE	--	100	10,000	1,000	--	--	10,000	10,000
EPA Tap Water RSL		22,000	--	--	1,800	NE	680	NE	1,300	--	--	--	15	370	--	--

**NOTES:**

- 1) Bold and highlighted values indicate the concentrations are above the MTDEQ Circular-7 or USEPA June 2011 RSL for tap water
- 2) Compounds analyzed for but not listed here were either below or not detected at the laboratory detection limits
- 3) ND = Not detected at or above the laboratory detection limit.
- 4) J = Estimated result due to a detection in the method blank above the method detection limit (MDL) but below the reporting limit (RL). If the associated sample reported a results above the MDL and/or RL the result has been B flagged.
- 5) D = The target analyte was diluted and re-analyzed.
- 6) A trailing 0 in the sample ID represents the duplicate sample
- 7) TEH = Total Extractable Hydrocarbons.
- 8) NE = Not Established

**Table B4-4**  
**Source: SAIC, 2011a**

**Table 4**  
**VOC/SVOC/RCRA Metals Groundwater Chemistry**  
**Montana Air National Guard**  
**Great Falls, Montana**

Sample ID	Sample Date	SVOC						RCRA Metals		Petroleum Hydrocarbons					
		1-Methyl naphthalene (ug/L)	2-Methyl naphthalene (ug/L)	2,4-Dimethylphenol (ug/L)	Dibenzofuran (ug/L)	Flourene (ug/L)	Naphthalene (ug/L)	Barium (Total) (ug/L)	Lead (Total) (ug/L)	C <sub>5</sub> -C <sub>8</sub> Aliphatics (ug/L)	C <sub>9</sub> -C <sub>12</sub> Aliphatics (ug/L)	C <sub>9</sub> -C <sub>18</sub> Aliphatics (ug/L)	C <sub>9</sub> -C <sub>10</sub> Aromatics (ug/L)	C <sub>11</sub> -C <sub>22</sub> Aromatics (ug/L)	TEH C <sub>9</sub> -C <sub>36</sub> Aromatics (ug/L)
4-MW2	10/21/10	5.85	3.99	ND	ND	ND	9.92	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	05/10/11	ND	ND	ND	ND	ND	ND	52 B	2.2 J	2.9 J,B	5.4 J,B	ND	4.7 J,B	ND	ND
4-MW20	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-MW2A	10/21/10	1.32	ND	ND	ND	ND	2.24	330	ND	ND	ND	ND	220	ND	ND
	11/01/10	1.58	ND	ND	ND	ND	2.46	350	ND	ND	ND	ND	ND	ND	ND
	05/10/11	1.5	ND	ND	ND	ND	2.0	290 B	ND	26 B	72 B	ND	74 B	ND	780
4-MW3	10/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	05/10/11	ND	ND	ND	ND	ND	0.50 J,B	49 B	ND	4.3 J,B	5.3 J,B	ND	6.2 J,B	ND	ND
4-MW3A	10/22/10	43.3 D	48.7 D	ND	ND	ND	85.6	320	ND	1,260	3,530	940	4,220	ND	4,630
	11/01/10	36.3 D	38.7 D	ND	ND	ND	60.9 D	360	ND	690	3,200	700	3,960	ND	4,020
	05/10/11	41	46	4.5 J	0.47 J	0.52	77	390 B	3.2 J	1,600 B	2,200	79 J	2,400 B	330	4,700
4-MW3A0	10/22/10	39.0 D	43.9 D	ND	ND	ND	81.2 D	ND	ND	1,260	2,550	690	3,940	ND	4,670
	05/10/11	40	46	4.2 J	0.47 J	0.40	75	390 B	ND	1,400 B	2,100	93 J	2,500 B	280	4,300
5-MW2	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	180	10	ND	ND	ND	ND	ND	ND
	05/10/11	ND	ND	ND	ND	ND	ND	55 B	ND	2.9 J,B	3.4 J,B	ND	4.0 J,B	ND	ND
5-MW3	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	120	ND	ND	ND	ND	ND	ND	ND
	05/10/11	ND	ND	ND	ND	ND	ND	57 B	ND	1.9 J,B	3.3 J,B	ND	3.7 J,B	ND	ND
5-MW30	10/21/10	ND	ND	ND	ND	ND	ND	310	ND	ND	ND	ND	ND	ND	ND
Seep	05/09/11	ND	ND	ND	ND	ND	ND	ND	ND	3.0 J,B	6.3 J,B	ND	6.4 J,B	ND	ND
MTDEQ Circular-7		--	--	380	--	1,100	100	1,000	15	700	1,000	1,000	1,000	1,000	1,000
EPA Tap Water RSL		2.3	150	--	37	--	--	--	--	--	--	--	--	--	--

**NOTES:**

- 1) Bold and highlighted values indicate the concentrations are above the MTDEQ Circular-7 or USEPA June 2011 RSL for tap water
- 2) Compounds analyzed for but not listed here were either below or not detected at the laboratory detection limits
- 3) ND = Not detected at or above the laboratory detection limit.
- 4) J = Estimated result due to a detection in the method blank above the method detection limit (MDL) but below the reporting limit (RL). If the associated sample reported a results above the MDL and/or RL the result has been B flagged.
- 5) D = The target analyte was diluted and re-analyzed.
- 6) A trailing 0 in the sample ID represents the duplicate sample
- 7) TEH = Total Extractable Hydrocarbons.
- 8) NE = Not Established

Table 3.26 Organic Constituents Detected in Soil Gas Survey  
 Site 4: Former Fire Training Area 1  
 (ppb by volume, GC)

Sample ID	Grid Coordinates		Benzene	TCE	Toluene	o-Xylene
A0	0	0	ND	ND	ND	ND
B0	0	-50	ND	ND	ND	ND
C0	0	-100	ND	ND	6	ND
D0	0	-150	ND	ND	18	ND
E0	0	-200	ND	ND	540	ND
F0	0	-250	ND	ND	ND	100
G0	0	-300	ND	ND	ND	ND
B1	50	-50	ND	ND	ND	ND
C1	50	-100	ND	9	260	ND
E1	50	-200	ND	ND	***	ND
F1	50	-250	ND	ND	ND	ND
G1	50	-300	ND	ND	ND	ND
B2	100	-50	ND	ND	ND	ND
C2	100	-100	ND	ND	ND	ND
E2	100	-200	ND	ND	ND	ND
F2	100	-250	ND	ND	ND	ND
G2	100	-300	ND	ND	ND	ND
H2	100	-350	ND	ND	ND	ND
I2	100	-400	ND	ND	ND	ND
J2	100	-450	ND	ND	ND	25
C3	150	-100	ND	ND	ND	ND
E3	150	-200	ND	ND	ND	ND
F3	150	-250	ND	ND	ND	ND
G3	150	-300	ND	ND	ND	ND
C4	200	-100	ND	ND	ND	ND
E4	200	-200	ND	ND	ND	ND
F4	200	-250	ND	ND	ND	ND
G4	200	-300	ND	ND	ND	ND
D5	250	-150	8	ND	47	194

3205A/AU23409/T3-26.WK1

ND = Not detected  
 \*\*\* Too high to quantify

**Figure B5-1**  
**Source: ES, 1992a**

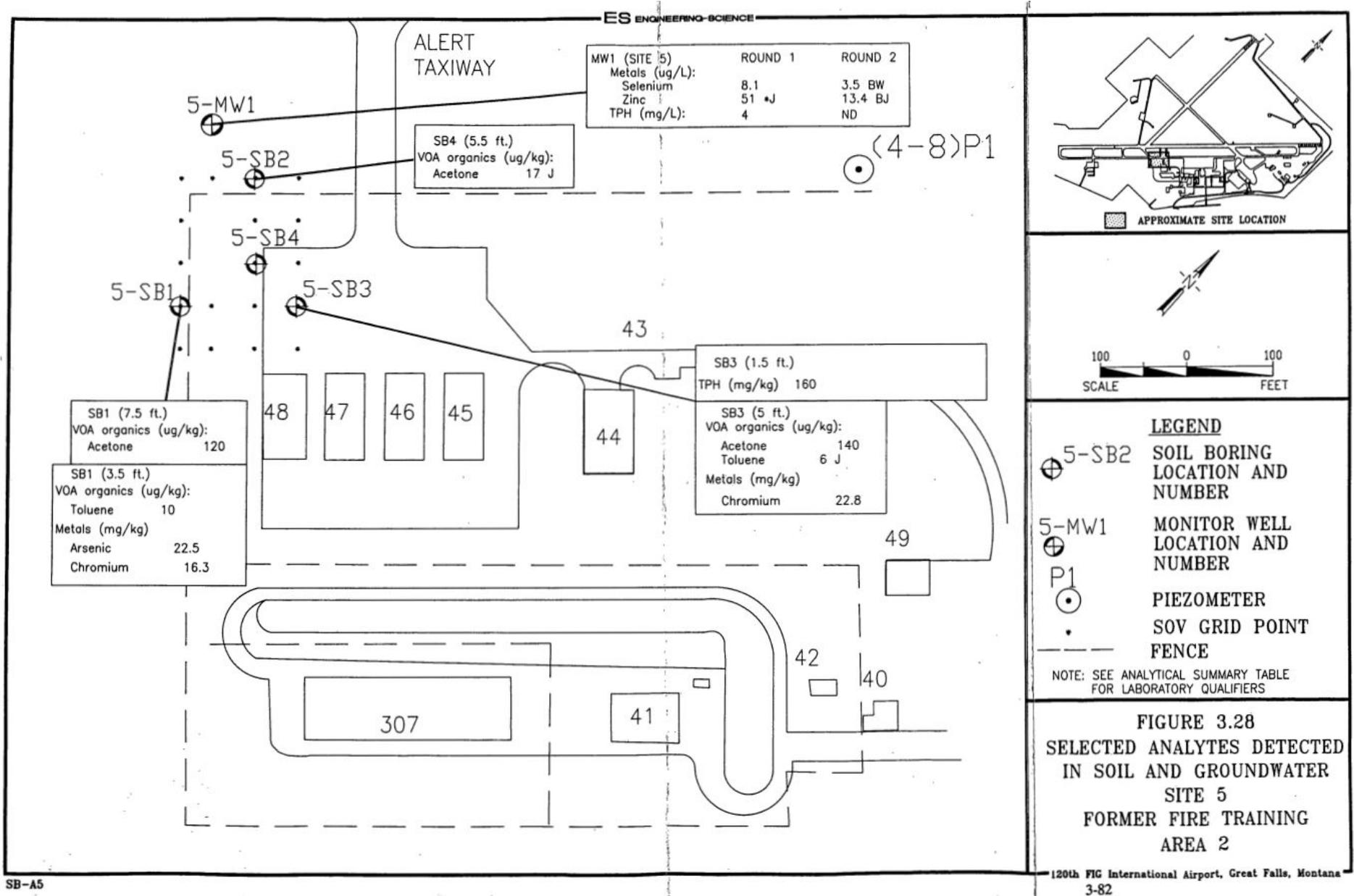


Table 3.35 Chemical Constituents Detected in Soil  
Site 5: Former Fire Training Area 2  
(CLP Laboratory Analysis)

Chemical	Background (1)	MANG-5 SB1-3.5	MANG-5 SB1-7.5	MANG-5 SB2-1	MANG-5 SB3-1.5	MANG-5 SB3-5	MANG-5 SB4-5.5	Health (2) Criteria
<b>Volatile organics (<math>\mu\text{g}/\text{kg}</math>):</b>								
Acetone	ND-157	ND	120	ND	ND	140	17 J	8E06
Toluene	ND-9	10	ND	ND	ND	6 J	ND	1.6E07
<b>BNA organics (<math>\mu\text{g}/\text{kg}</math>)</b>								
	ND	ND	ND	ND	ND	ND	ND	--
<b>Metals (mg/kg)</b>								
Arsenic	1.9-9.9	22.5	3.1	6.5	7 S	7.3	4.2	80
Barium	ND-1,231	155	187	218	258	285	437	5,600
Chromium	8.7-22.7	16.3	9.5	12.7	12	22.8	9.7	8E04
Copper	3.3-19.7	31.6 *	5.7 *	11.5 *	31 *	14.8 *	8.7 *	--
Lead	3.4-13.0	12.7	5.2 B	9.5	7.5	11.4	5.4	500
Nickel	3.6-17.6	ND	ND	9.4	9.7	16.1	ND	1,600
Selenium	ND-0.66	ND	ND	ND	0.29 BW	ND	ND	240
Zinc	21.6-61.3	61.2 *	40.7 *	38.8 *	47 *	50.6 *	26.4 *	1.6E04
Total petroleum hydrocarbons (mg/kg)	ND	ND	ND	ND	160	ND	ND	--

320SA\AU23409\T3-35.WK1

(1) Background is the average background concentration +/- two standard deviations.

(2) Based upon soil ingestion, see section 4.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Organics:**

J The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

**Metals:**

B Reported value is less than reporting limit but greater than the instrument detection limit.

S Reported value was determined by the method of standard additions.

\* Duplicate analysis not within control limits set by lab QA/QC.

W Postdigestion spike for furnace AA analysis out of control limits (85 to 115%), while sample absorbance is less than 50% of spike absorbance.

**Figure B5-2**  
**Source: SAIC, 2011a**



**Table B5-2**  
**Source: SAIC, 2011a**

**Table 3**  
**VOC/SVOC/RCRA Metals Soils Chemistry**  
**Montana Air National Guard**  
**Great Falls, Montana**

Sample ID	Sample Date	RCRA Metals				Petroleum Hydrocarbons	
		Arsenic (Total) (mg/Kg)	Barium (Total) (mg/Kg)	Chromium (Total) (mg/Kg)	Lead (Total) (mg/Kg)	C <sub>8</sub> -C <sub>10</sub> Aromatics (mg/Kg)	TEH C <sub>8</sub> -C <sub>38</sub> Aromatics (mg/Kg)
4-SB6 (1')	10/19/10	12.6	137	11.3	ND	ND	ND
4-SB6 (6')	10/19/10	ND	175	ND	ND	ND	ND
4-SB7 (1')	10/19/10	13.6	173	10.5	ND	ND	ND
4-SB7 (6.25')	10/19/10	ND	177	7.81	ND	ND	ND
4-SB8 (6.5')	10/19/10	5.39	859	9.06	ND	ND	ND
4-SB8 (1.25')	10/19/10	13.3	133	9.15	9.46	ND	ND
4-SB9 (1')	10/19/10	7.21	220	9.35	ND	ND	ND
4-SB9 (6')	10/19/10	ND	172	ND	ND	ND	ND
4-SB10 (1')	10/19/10	6.44	205	ND	ND	ND	210
4-SB10 (6')	10/19/10	ND	309	ND	ND	ND	ND
4-SB11 (0.5')	10/19/10	8.42	201	9.25	8.83	ND	ND
4-SB110 (1')	10/19/10	9.32	176	8.71	ND	ND	ND
4-SB11 (2')	10/19/10	6.34	275	ND	ND	ND	235
4-SB11 (6')	10/19/10	ND	147	ND	ND	ND	ND
4-SB12 (1')	10/19/10	5.92	238	7.92	ND	ND	ND
4-SB12 (3.5')	10/19/10	ND	128	ND	ND	ND	ND
4-SB13 (1')	10/19/10	7.9	208	8.99	ND	ND	ND
4-SB13 (5.5')	10/19/10	ND	184	ND	ND	ND	ND
5-SB5 (1.75')	10/18/10	17.6	105	9.62	8.89	ND	ND
5-SB5 (4')	10/18/10	7.2	678	ND	ND	ND	ND
5-SB5 (6')	10/18/10	ND	ND	ND	ND	ND	ND
5-SB6 (1')	10/18/10	6.66	177	10.8	ND	ND	ND
5-SB6 (5')	10/18/10	ND	594	ND	ND	ND	ND
5-SB7 (1')	10/18/10	14.0	158	9.59	10.90	ND	ND
5-SB7 (5.5')	10/18/10	7.66	1,120 E	9.86	ND	ND	ND
5-SB8 (1.5')	10/18/10	16.1	139	10.8	ND	ND	ND
5-SB8 (9')	10/18/10	ND	154	12.7	ND	ND	ND
5-SB9 (1')	10/18/10	ND	489	10.2	ND	50.6	378
5-SB9 (2')	10/18/10	6.55	140	12.6	ND	ND	ND
5-SB9 (5.5')	10/18/10	5.96	209	ND	ND	ND	ND
5-SB10 (1')	10/20/10	20.9	153	10.8	ND	ND	ND
5-SB100 (2')	10/20/10	19.2	157	10.7	ND	ND	ND
5-SB10 (5.5')	10/20/10	ND	517	8.28	ND	ND	ND
5-SB11 (1.5')	10/20/10	17.7	142	10.1	9.42	ND	ND
5-SB11 (5.5')	10/20/10	ND	359	7.82	ND	ND	ND
<b>Montana Department of Environmental Quality Soil Standards</b>		<b>40</b>	<b>820</b>	<b>280</b>	<b>400</b>	<b>700</b>	<b>200</b>

**NOTES:**

- 1) **Bold and highlighted values** indicate the concentrations are above the MTDEQ Soil Screening Standards based on either the MT Tier 1 RBCA Guidance for Petroleum Releases document (Sept 2009) or applicable USEPA regional screening levels (June 2011)
- 2) Compounds analyzed for but not listed here were either below or not detected at the laboratory detection limits
- 3) ND = Not detected at or above the laboratory detection limit.
- 4) E = The target analyte response exceeded the calibration range and is an estimated value.
- 5) TEH = Total Extractable Hydrocarbons.
- 6) A trailing 0 in the sample ID represents the duplicate sample

**Figure B5-3**  
**Source: SAIC, 2011a**

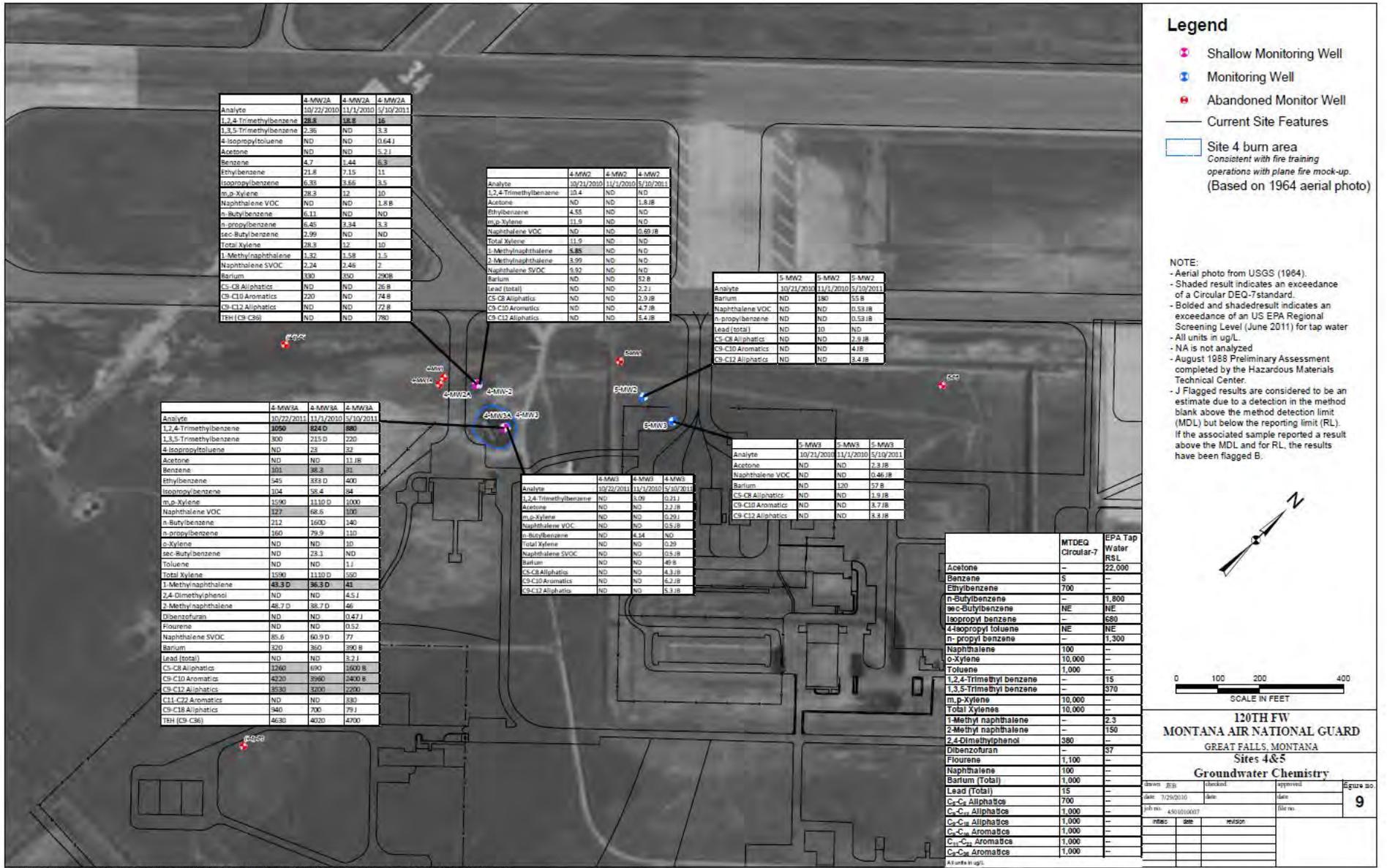


Table 3.36 Chemical Constituents Detected in Groundwater  
Site 5: Former Fire Training Area 2  
(CLP Laboratory Analysis)

Chemical	Round 1 MANG-5 MW1	Round 2 MANG-5 MW1	Background		ARARs (1)
			Round 1 MANG-BG MW1	Round 2 MANG-BG MW1	
GC volatile organics ( $\mu\text{g/L}$ )	ND	ND	ND	ND	NA
CLP semivolatile organics ( $\mu\text{g/L}$ )	ND	ND	ND	ND	NA
<b>Metals (<math>\mu\text{g/L}</math>):</b>					
Arsenic	ND	ND	1.1 BJ	ND	50
Barium	46 JB	44.9 B	56 BJ	62.2 B	1,000
Lead	4.6 J	4.2 JN	4.9 J	4.3 NJ	50
Selenium	8.1	3.5 BW	ND	ND	10
Zinc	51 J*	13.4 JB	15 B*J	9.8 BJ	5,000
Total petroleum hydrocarbons (mg/L)	4	ND	1	ND	NA

320SA\AU23409\T3-36.WK1

(1) ARARs are proposed only. These are MCLs where available, otherwise WQC.

NA = not applicable.

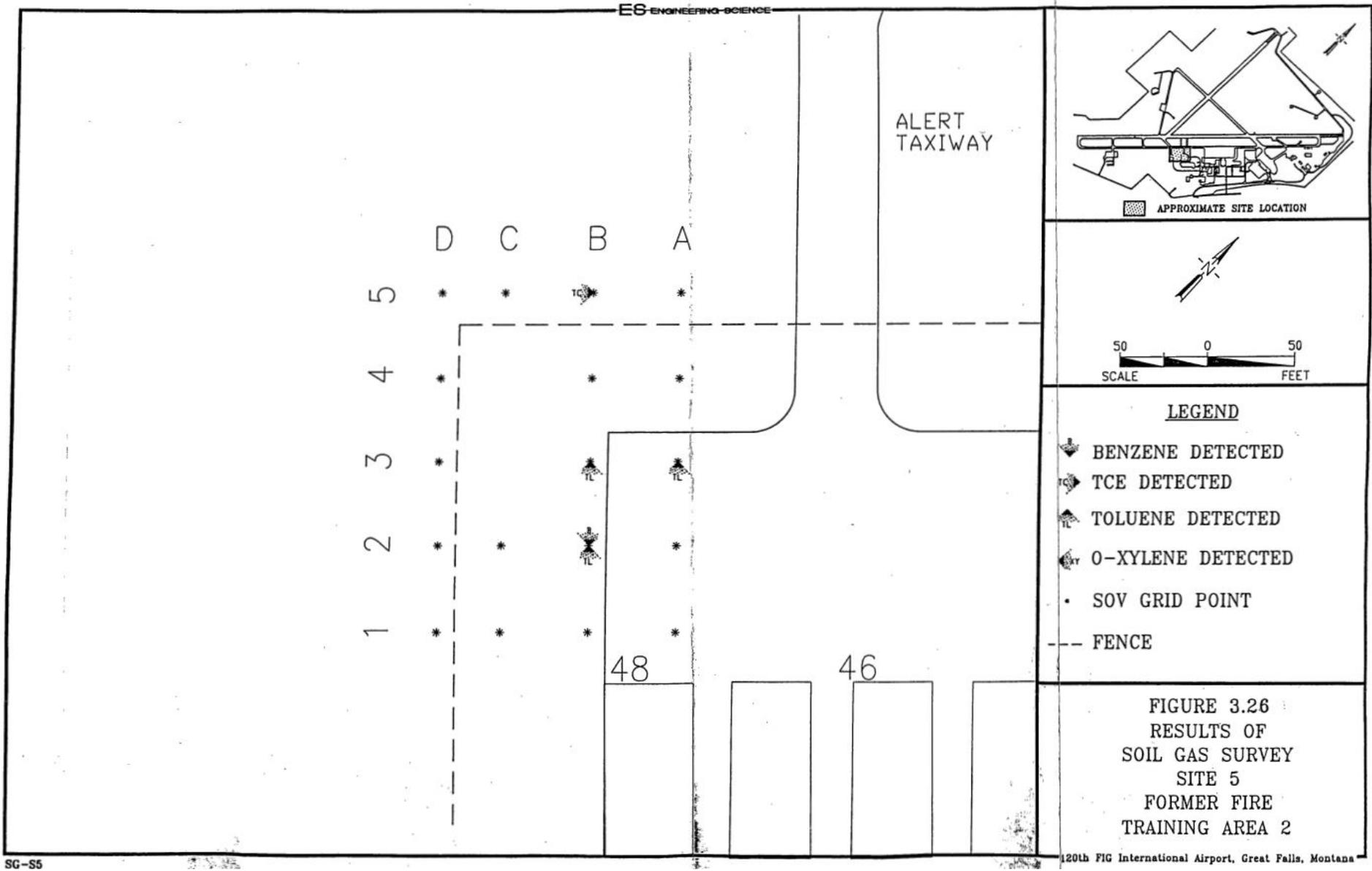
ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Metals:**

- B** Reported value is less than reporting limit but greater than the instrument detection limit.
- N** Spiked sample recovery not within control limits set by lab QA/QC.
- \*** Duplicate analysis not within control limits set by lab QA/QC.
- W** Postdigestion spike for furnace AA analysis out of control limits (85 to 115%), while sample absorbance is less than 50% of spike absorbance.
- J** The value reported is an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

Figure B5-4  
 Source: ES, 1992a



**Table B5-4**  
**Source: SAIC, 2011a**

**Table 4**  
**VOC/SVOC/RCRA Metals Groundwater Chemistry**  
**Montana Air National Guard**  
**Great Falls, Montana**

Sample ID	Sample Date	VOC														
		Acetone (ug/L)	Benzene (ug/L)	Ethylbenzene (ug/L)	n-Butylbenzene (ug/L)	sec-Butylbenzene (ug/L)	Isopropyl benzene (ug/L)	4-Isopropyl toluene (ug/L)	n-propyl benzene (ug/L)	Naphthalene (ug/L)	o-Xylene (ug/L)	Toluene (ug/L)	1,2,4-Trimethyl benzene (ug/L)	1,3,5-Trimethyl benzene (ug/L)	m,p-Xylene (ug/L)	Total Xylenes (ug/L)
4-MW2	10/21/10	ND	ND	4.55	ND	ND	ND	ND	ND	ND	ND	ND	10.4	ND	11.9	11.9
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	05/10/11	1.8 J,B	ND	ND	ND	ND	ND	ND	ND	0.69 J,B	ND	ND	ND	ND	ND	ND
4-MW20	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-MW2A	10/21/10	ND	4.77	21.8	6.11	2.99	6.33	ND	6.45	ND	ND	ND	28.8	2.36	28.3	28.3
	11/01/10	ND	1.44	7.15	ND	ND	3.66	ND	3.34	ND	ND	ND	18.8	ND	12.0	12.0
	05/10/11	5.2 J,B	6.3	11	ND	ND	3.5	0.64 J	3.3	1.8 B	ND	ND	16	3.3	10	10.0
4-MW3	10/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	4.14	ND	ND	ND	ND	ND	ND	ND	3.09	ND	ND	ND
	05/10/11	2.2 J,B	ND	ND	ND	ND	ND	ND	ND	0.50 J,B	ND	ND	0.21 J	ND	0.29 J	0.29 J
4-MW3A	10/22/10	ND	101	545	212	ND	104	ND	160	127	ND	ND	1,050	300	1,590	1,590
	11/01/10	ND	38.3	333 D	160 D	23.1	58.4	23.0	79.9	68.6	ND	ND	824 D	215 D	1,110 D	1,110 D
	05/10/11	11 J,B	31	400	140	ND	84	32.0	110	100	10	1.0 J	880	220	1,000	550
4-MW3A0	10/22/10	ND	72.3	434	192	ND	86.2	ND	132	120	ND	ND	886	248	1,390	1,390
	05/10/11	12 J,B	32	320	ND	ND	34	23	16	86	10	1.3 J	830	230	980	530
5-MW2	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	05/10/11	ND	ND	ND	ND	ND	ND	ND	0.53 J,B	0.53 J,B	ND	ND	ND	ND	ND	ND
5-MW3	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	05/10/11	2.3 J,B	ND	ND	ND	ND	ND	ND	ND	0.46 J,B	ND	ND	ND	ND	ND	ND
5-MW30	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Seep	05/09/11	ND	ND	ND	ND	ND	ND	ND	ND	0.63 J,B	ND	ND	ND	ND	ND	ND
MTDEQ Circular-7		--	5	700	--	NE	--	NE	--	100	10,000	1,000	--	--	10,000	10,000
EPA Tap Water RSL		22,000	--	--	1,800	NE	680	NE	1,300	--	--	--	15	370	--	--

**NOTES:**

- 1) Bold and highlighted values indicate the concentrations are above the MTDEQ Circular-7 or USEPA June 2011 RSL for tap water
- 2) Compounds analyzed for but not listed here were either below or not detected at the laboratory detection limits
- 3) ND = Not detected at or above the laboratory detection limit.
- 4) J = Estimated result due to a detection in the method blank above the method detection limit (MDL) but below the reporting limit (RL) If the associated sample reported a results above the MDL and/or RL the result has been B flagged.
- 5) D = The target analyte was diluted and re-analyzed.
- 6) A trailing 0 in the sample ID represents the duplicate sample
- 7) TEH = Total Extractable Hydrocarbons.
- 8) NE = Not Established

**Table B5-4**  
**Source: SAIC, 2011a**

**Table 4**  
**VOC/SVOC/RCRA Metals Groundwater Chemistry**  
**Montana Air National Guard**  
**Great Falls, Montana**

Sample ID	Sample Date	SVOC						RCRA Metals		Petroleum Hydrocarbons					
		1-Methyl naphthalene (ug/L)	2-Methyl naphthalene (ug/L)	2,4-Dimethylphenol (ug/L)	Dibenzofuran (ug/L)	Flourene (ug/L)	Naphthalene (ug/L)	Barium (Total) (ug/L)	Lead (Total) (ug/L)	C <sub>5</sub> -C <sub>8</sub> Aliphatics (ug/L)	C <sub>9</sub> -C <sub>12</sub> Aliphatics (ug/L)	C <sub>9</sub> -C <sub>18</sub> Aliphatics (ug/L)	C <sub>9</sub> -C <sub>10</sub> Aromatics (ug/L)	C <sub>11</sub> -C <sub>22</sub> Aromatics (ug/L)	TEH C <sub>9</sub> -C <sub>36</sub> Aromatics (ug/L)
4-MW2	10/21/10	5.85	3.99	ND	ND	ND	9.92	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	05/10/11	ND	ND	ND	ND	ND	ND	52 B	2.2 J	2.9 J,B	5.4 J,B	ND	4.7 J,B	ND	ND
4-MW20	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-MW2A	10/21/10	1.32	ND	ND	ND	ND	2.24	330	ND	ND	ND	ND	220	ND	ND
	11/01/10	1.58	ND	ND	ND	ND	2.46	350	ND	ND	ND	ND	ND	ND	ND
	05/10/11	1.5	ND	ND	ND	ND	2.0	290 B	ND	26 B	72 B	ND	74 B	ND	780
4-MW3	10/22/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	05/10/11	ND	ND	ND	ND	ND	0.50 J,B	49 B	ND	4.3 J,B	5.3 J,B	ND	6.2 J,B	ND	ND
4-MW3A	10/22/10	43.3 D	48.7 D	ND	ND	ND	85.6	320	ND	1,260	3,530	940	4,220	ND	4,630
	11/01/10	36.3 D	38.7 D	ND	ND	ND	60.9 D	360	ND	690	3,200	700	3,960	ND	4,020
	05/10/11	41	46	4.5 J	0.47 J	0.52	77	390 B	3.2 J	1,600 B	2,200	79 J	2,400 B	330	4,700
4-MW3A0	10/22/10	39.0 D	43.9 D	ND	ND	ND	81.2 D	ND	ND	1,260	2,550	690	3,940	ND	4,670
	05/10/11	40	46	4.2 J	0.47 J	0.40	75	390 B	ND	1,400 B	2,100	93 J	2,500 B	280	4,300
5-MW2	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	180	10	ND	ND	ND	ND	ND	ND
	05/10/11	ND	ND	ND	ND	ND	ND	55 B	ND	2.9 J,B	3.4 J,B	ND	4.0 J,B	ND	ND
5-MW3	10/21/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	11/01/10	ND	ND	ND	ND	ND	ND	120	ND	ND	ND	ND	ND	ND	ND
	05/10/11	ND	ND	ND	ND	ND	ND	57 B	ND	1.9 J,B	3.3 J,B	ND	3.7 J,B	ND	ND
5-MW30	10/21/10	ND	ND	ND	ND	ND	ND	310	ND	ND	ND	ND	ND	ND	ND
Seep	05/09/11	ND	ND	ND	ND	ND	ND	ND	ND	3.0 J,B	6.3 J,B	ND	6.4 J,B	ND	ND
MTDEQ Circular-7		--	--	380	--	1,100	100	1,000	15	700	1,000	1,000	1,000	1,000	1,000
EPA Tap Water RSL		2.3	150	--	37	--	--	--	--	--	--	--	--	--	--

**NOTES:**

- 1) Bold and highlighted values indicate the concentrations are above the MTDEQ Circular-7 or USEPA June 2011 RSL for tap water
- 2) Compounds analyzed for but not listed here were either below or not detected at the laboratory detection limits
- 3) ND = Not detected at or above the laboratory detection limit.
- 4) J = Estimated result due to a detection in the method blank above the method detection limit (MDL) but below the reporting limit (RL) If the associated sample reported a results above the MDL and/or RL the result has been B flagged.
- 5) D = The target analyte was diluted and re-analyzed.
- 6) A trailing 0 in the sample ID represents the duplicate sample
- 7) TEH = Total Extractable Hydrocarbons.
- 8) NE = Not Established

**Table 3.33 Organic Constituents Detected in Soil Gas Survey**  
**Site 5: Former Fire Training Area 2**  
 (ppb by volume, GC)

Sample ID	Grid Coordinates		1,1-DCE	Benzene	TCE	Toluene
A1	0	-50	0	0	0	0
B1	50	-50	0	0	0	0
C1	100	-50	0	0	0	0
D1	150	-50	48	0	0	0
A2	0	-100	0	0	0	0
B2	50	-100	0	11	0	35
C2	100	-100	14	0	0	0
D2	150	-100	0	0	0	0
A3	0	-150	0	0	0	27
B3	50	-150	0	0	0	10
D3	150	-150	0	0	0	0
A4	0	-200	0	0	0	0
B4	50	-200	0	0	0	0
D4	150	-200	0	0	0	0
A5	0	-250	0	0	0	0
B5	50	-250	0	0	8	0
C5	100	-250	0	0	0	0
D5	150	-250	0	0	0	0

Figure B6-1  
Source: ES, 1992a

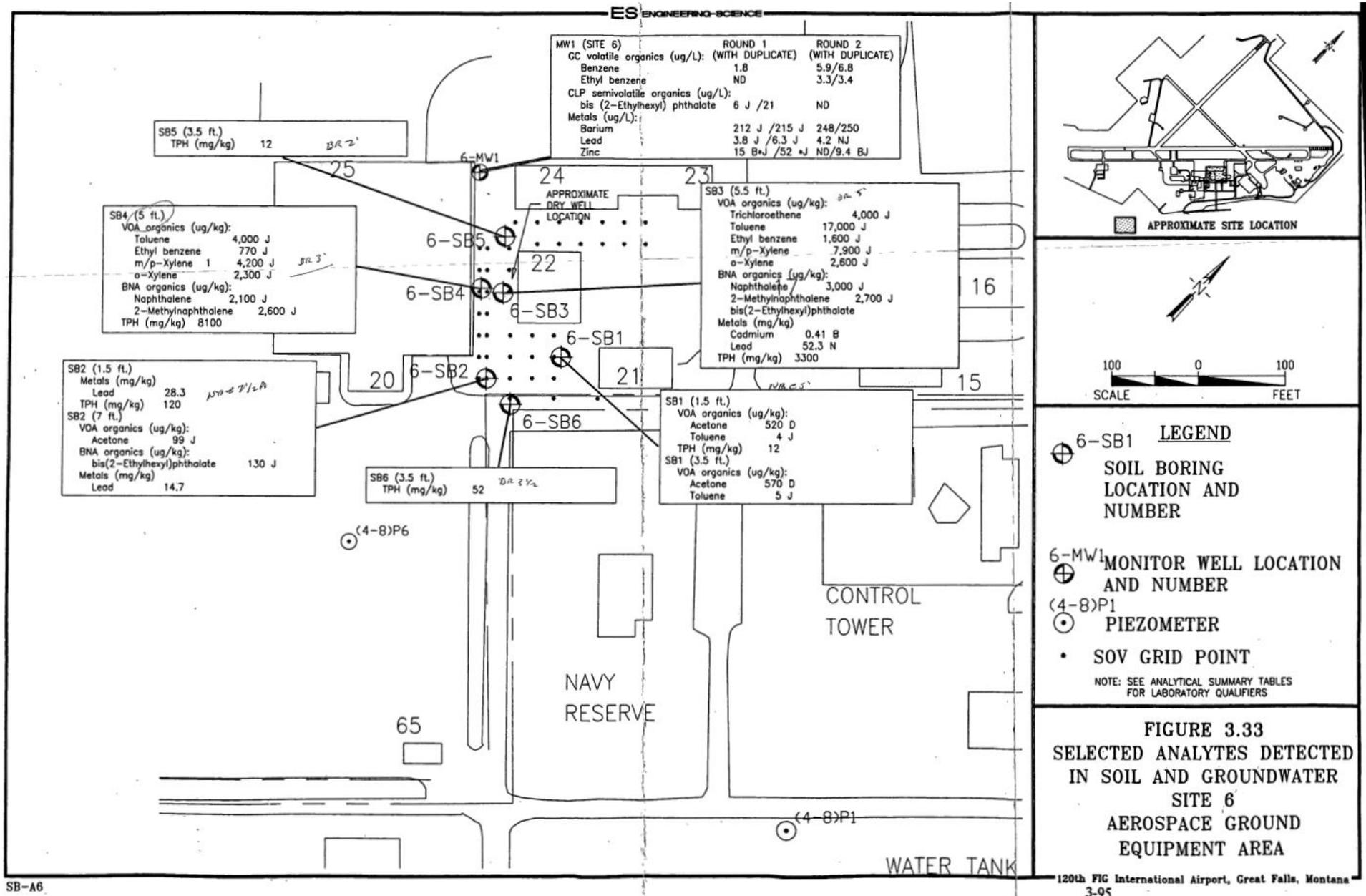


Table B6-1  
Source: ES, 1992a

Table 3.39 Chemical Constituents Detected in Soil  
Site 6: Aerospace Ground Equipment (AGE, Bldg. 22) Area  
(CLP Laboratory Analysis)

Chemical	Background (1)	MANG-6 SB1-1.5	MANG-6 SB1-3.5	MANG-6 SB2-1.5	MANG-6 SB2-7	MANG-6 SB3-5.5	MANG-6 SB4-5	MANG-6 SB5-3.5	MANG-6 SB6-3.5	Health (2) Criteria
<b>Volatile organics (µg/kg):</b>										
Acetone	ND-157	520 D	570 D	ND	99 J	ND	ND	ND	ND	8E06
Trichloroethene	ND	ND	ND	ND	ND	4,000 J	ND	ND	ND	6.4E04
Toluene	ND-9	4 J	5 J	ND	ND	17,000 J	4,000 J	ND	ND	1.6E07
Ethyl benzene	ND	ND	ND	ND	ND	1,600 J	770 J	ND	ND	8E06
m/p-Xylene (3)	ND	ND	ND	ND	ND	7,900 J	4,200 J	ND	ND	1.6E08
o-Xylene	ND	ND	ND	ND	ND	2,600 J	2,300 J	ND	ND	1.6E08
<b>BNA organics (µg/kg):</b>										
Naphthalene	ND	ND	ND	ND	ND	3,000 J	2,100 J	ND	ND	3.2E05
2-Methylnaphthalene	ND	ND	ND	ND	ND	2,700 J	2,600 J	ND	ND	--
bis(2-Ethylhexyl)phthalate	ND	ND	ND	ND	130 J	ND	ND	ND	ND	5E04
<b>Metals (mg/kg)</b>										
Arsenic	1.9-9.9	6.2	4.5	4.4	3.4	3.2 B	2.6	2.2	2.1	80
Barium	ND-1,231	187	189	155	73	145	164	261	333	5,600
Cadmium	ND	ND	ND	ND	ND	0.41 B	ND	ND	ND	40
Chromium	8.7-22.7	12.2	10.4	12.3	7.7	18.3	8.1	9.5	11.5	8E04
Copper	3.3-19.7	18.5 *	14.4 *	12.3 *	4.2 B*	7.4	8.5	4.7 B	6.1	--
Lead	3.4-13.0	11.7	12.6	28.3	14.7	52.3 N	12 N	7.5 N	7.6 N	500
Nickel	3.6-17.6	10.4 *	ND	ND	ND	ND	11	ND	7.7 B	1,600
Selenium	ND-0.66	ND	ND	ND	ND	ND	ND	ND	ND	240
Zinc	21.6-61.3	51.1	38.5	36.8	10.1	33.7 *	35.8 *	17.7 *	15.6 *	1.6E04
Total petroleum hydrocarbons (mg/kg)	ND	12	ND	120	ND	3,300	8,100	12	52	--

3208A\AU23409\T3-39.WK1

(1) Background is the average background concentration +/- two standard deviations.

(2) Based upon soil ingestion, see section 4.

(3) Meta- and para-xylene coelute and are not distinguishable by this method.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Organics:**

**J** The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit. For samples MANG-6-5.3-5.5 and MANG-6-5B4-5, hold time was exceeded.

The data are still usable, but should be considered estimates.

**D** This flag identifies a compound whose reported analytical results are calculated from a greater dilution than the primary analysis.

**Metals:**

**B** Reported value is less than reporting limit but greater than the instrument detection limit.

**N** Spiked sample recovery not within control limits.

**\*** Duplicate analysis not within control limits.

**W** Postdigestion spike for furnace AA analysis out of control limits (85 to 115%), while sample absorbance is less than 50% of spike absorbance.

Table B6-2

Source: HAZWRAP, 1997

Table 5.7. Soils Organic Analytical Data-Site 6 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION	Diluted Sample			Diluted Sample			Diluted Sample			Diluted Sample		
	6DW1	6DW1	6DW1	SB15	SB15	SB15	SB15	SB15	SB15	SB16	SB16	SB16
Location	4.1-4.6ft	4.1-4.6ft	7.3-7.6ft	0.5-2.5 ft	0.5-2.5 ft	2.5-4ft	7.7-8.1 ft	7.7-8.1 ft	0.9-3.9 ft	3.9-4.5 ft	8.5-9.5 ft	
Depth	4.1-4.6ft	4.1-4.6ft	7.3-7.6ft	0.5-2.5 ft	0.5-2.5 ft	2.5-4ft	7.7-8.1 ft	7.7-8.1 ft	0.9-3.9 ft	3.9-4.5 ft	8.5-9.5 ft	
Sample Number	6-DW1-4.1-4.6	6-DW1-4.1-4.6	6-DW1-7.3-7.6	6-SB15-0.5-2.5	6-SB15-0.5-2.5DL	6-SB15-2.5-4	6-SB-15-7.7-8.1	6-SB15-7.7-8.1DL	6-SB15-0.9-3.9	6-SB16-3.9-4.5	6-SB16-8.5-9.5	
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	
Date Sampled	4/27/96	4/27/96	4/27/96	4/26/96	4/26/96	4/26/96	4/26/96	4/26/96	4/30/96	5/1/96	5/2/96	
<b>ANALYTICAL INFORMATION</b>												
<b>VOCs</b>												
Date Analyzed	5/2/96	5/9/96	5/2/96	5/3/96	5/7/96	4/30/96	4/30/96	5/7/96	5/3/96	5/3/96	5/2/96	
Analyte	CRQL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
Acetone	10	ND	ND	ND	1600J	ND	180J	1000J	1300J	130	140	2000
Carbon Disulfide	10	ND	ND	ND	ND	ND	ND	2J	ND	ND	ND	ND
Methylene Chloride	10	ND	250J	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	10	ND	ND	ND	43J	ND	8J	7J	ND	8J	9J	ND
Chloroform	10	ND	ND	ND	ND	ND	ND	ND	ND	1J	ND	ND
Trichloroethene	10	280J	230J	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	10	ND	ND	ND	ND	ND	ND	ND	ND	11J	ND	ND
Toluene	10	60,000J	55,000J	4500	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	10	ND	ND	ND	ND	ND	4J	ND	ND	5J	5J	ND
Ethylbenzene	10	5400	5900J	1900	2J	ND	ND	ND	ND	ND	ND	100J
1,2-Dichloroethene	10	350J	250J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	10	34,000	37,000J	14,000	5J	ND	ND	ND	ND	ND	ND	510J
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
<b>SVOCS</b>												
Date Analyzed		5/10/96		5/10/96	5/15/96		5/14/96	5/14/96				
Analyte	CRQL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Napthalene	330	11,000		1500	ND	ND	ND	ND	ND	ND	ND	200
2-Methylnapthalene	330	12,000		1500	ND	ND	ND	ND	ND	ND	ND	170J
Fluorene	330	ND		40J	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	330	220J		120J	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	330	2900J		190J	ND	ND	ND	58J	280J	560J	190J	ND
Di-n-octylphthalate	330	ND		ND	ND	ND	ND	ND	19J	50J	ND	ND
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Date Analyzed		5/10-20/96		5/10-20/96	5/9/96		5/9/96	5/9/96				
Petroleum Hydrocarbons	RL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
JP-4	10	5700		1300	ND	ND	95	ND	ND	ND	ND	270
Disel Range, as diesel	10	1900		400	ND	ND	290	ND	ND	17	ND	130
Oil Range, as oil	100	10,000		540	ND	ND	79	ND	ND	ND	ND	300
Gasoline Range	5	7300NJ		1700NJ	ND	ND	ND	ND	ND	ND	ND	460NJ
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
<b>Legend</b>												
MCLs	Federal Drinking Water Standard Maximum Contaminant Level											
MDEQ	Montana Department of Environmental Quality Human Health Standards											
NE	ARAs Not Established											
DW	Dry Well											
SB	Soil Boring											
SS	Sediment/Surface Soil											
(DISS)	Dissolved Sample (total metals)											
	Concentration > or = MCLs OR MEDQ, ARARs, or Avge + 2 Standard Dev.											
CRQL	Contract Required Quantitation Limit											
RL	Reporting Limit											
ND	Compound Not Detected											
J	Concentration Estimated											
R	Results Rejected on Basis of Laboratory QA/QC											
N	Presumptive Evidence of Compound											

Table B6-2 (Con't)  
Source: HAZWRAP, 1997

Table 5.7. Soils Organic Analytical Data-Site 6 - 120th FW, MANG, Great Falls, Montana (cont)

SAMPLE INFORMATION							Diluted Sample	Diluted Sample	
Location		SB17	SB17	SB17	SB18	SB18	SB18	SB18	SB18
Depth		0.5-2.5 ft	4.5-5.8 ft	9.5-9.9 ft	0.5-2.5	6.4-7.3 ft	6.4-7.3 ft	8-8.3	8-8.3
Sample Number		6-SB17-0.5-2.5	6-SB17-4.5-5.8	6-SB17-9.5-9.9	6-SB18-0.5-2.5	6-SB18-6.4-7.3	6-SB18-6.4-7.3DL	6-SB18-8-8.3	6-SB18-8-8.3DL
Matrix		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date Sampled		4/26/96	4/26/96	4/26/96	4/26/96	4/26/96	4/26/96	4/26/96	4/26/96
<b>ANALYTICAL INFORMATION</b>									
<b>VOCs</b>									
Date Analyzed		5/7/96	5/2/96	5/2/96	4/30/96	4/30/96	5/7/96	4/30/96	5/2/96
Analyte	CRQL	Result	Result	Result	Result	Result	Result	Result	Result
Acetone	10	ND	1800	ND	ND	2000J	2600J	1300J	2100J
Carbon Disulfide	10	ND	ND	ND	1J	2J	ND	2J	ND
Methylene Chloride	10	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	10	ND	ND	ND	9J	5J	ND	25J	ND
Toluene	10	19,000	6400	5100	ND	ND	ND	ND	ND
2-Hexanone	10	ND	ND	ND	4J	ND	ND	ND	ND
Ethylbenzene	10	3600	640J	1200J	ND	ND	ND	ND	ND
1,2-Dichloroethene	10	440J	130J	ND	ND	ND	ND	ND	ND
Xylene	10	26,000	4600	8100	ND	ND	ND	ND	ND
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
<b>SVOCs</b>									
Date Analyzed		5/8/96	5/10/96	5/10/96	5/14/96	5/14/96		5/15/96	
Analyte	CRQL	Result	Result	Result	Result	Result		Result	
Napthalene	330	420	13,000	2000	ND	ND		ND	
2-Methylnapthalene	330	110J	12,000	1300	ND	ND		ND	
Di-n-butylphthalate	330	ND	ND	120J	ND	ND		ND	
bis(2-Ethylhexyl)phthalate	330	ND	1200J	160J	59J	90J		51J	
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg		ug/kg	
Date Analyzed		5/13/96	5/13/96	5/13/96	5/9/96	5/10/96		5/9/96	
Petroleum Hydrocarbons	RL	Result	Result	Result	Result	Result		Result	
JP-4	10	1300	7800	2600	ND	50		76	
Diesel Range, as diesel	10	18NJ	2800	690	ND	20		71	
Oil Range, as oil	100	ND	14,000	1100	ND	89		ND	
Gasoline Range	5	2600NJ	17,000NJ	2900NJ	ND	ND		110	
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	
<b>Legend</b>									
MCLs	Federal Drinking Water Standard Maximum Contaminant Level								
MDEQ	Montana Department of Environmental Quality Human Health Standards								
NE	ARAs Not Established								
DW	Dry Well								
SB	Soil Boring								
SS	Sediment/Surface Soil								
(DISS)	Dissolved Sample (total metals)								
	Concentration > = MCLs OR MEDQ, ARARs, or Avge + 2 Standard Dev.								
CRQL	Contract Required Quantitation Limit								
RL	Reporting Limit								
ND	Compound Not Detected								
J	Concentration Estimated								
R	Results Rejected on Basis of Laboratory QA/QC								
N	Presumptive Evidence of Compound								

Table B6-2 (Con't)  
Source: HAZWRAP, 1997

Table 5.8. Soil Inorganic Analytical Data - Site 6 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION	AVG. +/- TWO STD. DEV.	6	6	6	6	6	6	6	6
Site									
Location		DW1	DW1	SB15	SB15	SB15	SB16	SB16	SB16
Sample Number		6-DW1-4.1-4.6	6-DW1-7.3-7.6	6-SB15-0.5-2.5	6-SB15-2.5-4	6-SB15-7.7-8.1	6-SB16-0.9-3.9	6-SB16-3.9-4.5	6-SB16-8.5-9.5
Matrix		soil	soil	soil	soil	soil	soil	soil	soil
Date Sampled		4/27/96	4/27/96	4/26/96	4/26/96	4/26/96	4/30/96	4/30/96	4/30/96
Date Analyzed		5/9/96 - 6/14/96	5/9/96 - 6/14/96	5/7-14/96	5/7-14/96	5/7-14/96	5/9/96 - 6/14/96	5/9/96 - 6/14/96	5/9/96 - 6/14/96
ANALYTICAL INFORMATION									
INORGANICS									
Analyte		RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Arsenic	1.9 - 9.9	3.9	3.3	5.4	2.7	5.2J	15.2	7.2	3.1
Barium	ND - 1231	273	259	468	116	145	199	250	115
Beryllium	NE	0.33J	0.25J	0.28J	0.25J	0.23J	0.52J	0.37J	0.23J
Chromium	8.7 - 22.7	13.1	16.5	11.3	ND	11	10.4	12	10.5
Copper	8.7 - 19.7	14.9	14.2	17.1	13.7	9.9	41.7	17.6	8.8
Lead	3.4 - 13	58.6	19.1	5.8	6.3	5	14.8	8.5	4.6
Mercury	NE	ND	ND	ND	ND	ND	0.09	ND	ND
Nickel	3.6 - 17.6	8.6	7.8	8.9	8.2	8.4	10.7	9.4	5.6J
Thallium	NE	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	21.6 - 61.3	52.5	65.3	36.6	47.9	40.2	84.2	40.6	34.9
Units (mg/kg) Soil, (ug/L) Water									

SAMPLE INFORMATION	AVG. +/- TWO STD. DEV.	6	6	6	6	6	6
Site							
Location		SB17	SB17	SB17	SB18	SB18	SB18
Sample Number		6-SB17-0.5-2.5	6-SB17-4.5-5.8	6-SB17-9.5-9.9	6-SB18-0.5-2.5	6-SB18-6.4-7.3	6-SB18-9-9.3
Matrix		soil	soil	soil	soil	soil	soil
Date Sampled		4/26/96	4/26/96	4/26/96	4/26/96	4/26/96	4/26/96
Date Analyzed		5/8-13/97	5/8-13/97	5/8-13/97	5/7-14/96	5/7-14/96	5/7-14/96
ANALYTICAL INFORMATION							
INORGANICS							
Analyte		RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Arsenic	1.9 - 9.9	ND	ND	ND	5.9	5.7	3.7
Barium	ND - 1231	444	186	119	258	248	306
Beryllium	NE	ND	ND	ND	0.46J	0.27J	0.24J
Chromium	8.7 - 22.7	9.2	7.1	7.8	10.5	9.8	12.9
Copper	8.7 - 19.7	10.7	13.4	15.3	16.9	52.7	9.6
Lead	3.4 - 13	4.4	8.8	5.9	8.7	6.9	5.1
Mercury	NE	0.1	ND	ND	0.11	0.1	ND
Nickel	3.6 - 17.6	9.4	8.2	11.9	11.3	8.7	8.9
Thallium	NE	ND	ND	0.34	0.42	ND	ND
Zinc	21.6 - 61.3	32.8	38.9	38.7	49.4	52.3	33.2
Units (mg/kg) Soil, (ug/L) Water							

Legend

- MCLs Federal Drinking Water Standard Maximum Contaminant Level
- MDEQ Montana Department of Environmental Quality Human Health Standards
- NE ARAs Not Established
- DW Dry Well
- SB Soil Boring
- SS Sediment/Surface Soil
- (DISS) Dissolved Sample (total metals)
- Concentration > or = MCLs OR MEDQ, ARARs, or Avge + 2 Standard Dev.
- CRQL Contract Required Quantitation Limit
- RL Reporting Limit
- ND Compound Not Detected
- J Concentration Estimated
- R Results Rejected on Basis of Laboratory QA/QC
- N Presumptive Evidence of Compound

Figure B6-2  
 Source: HAZWRAP, 1997

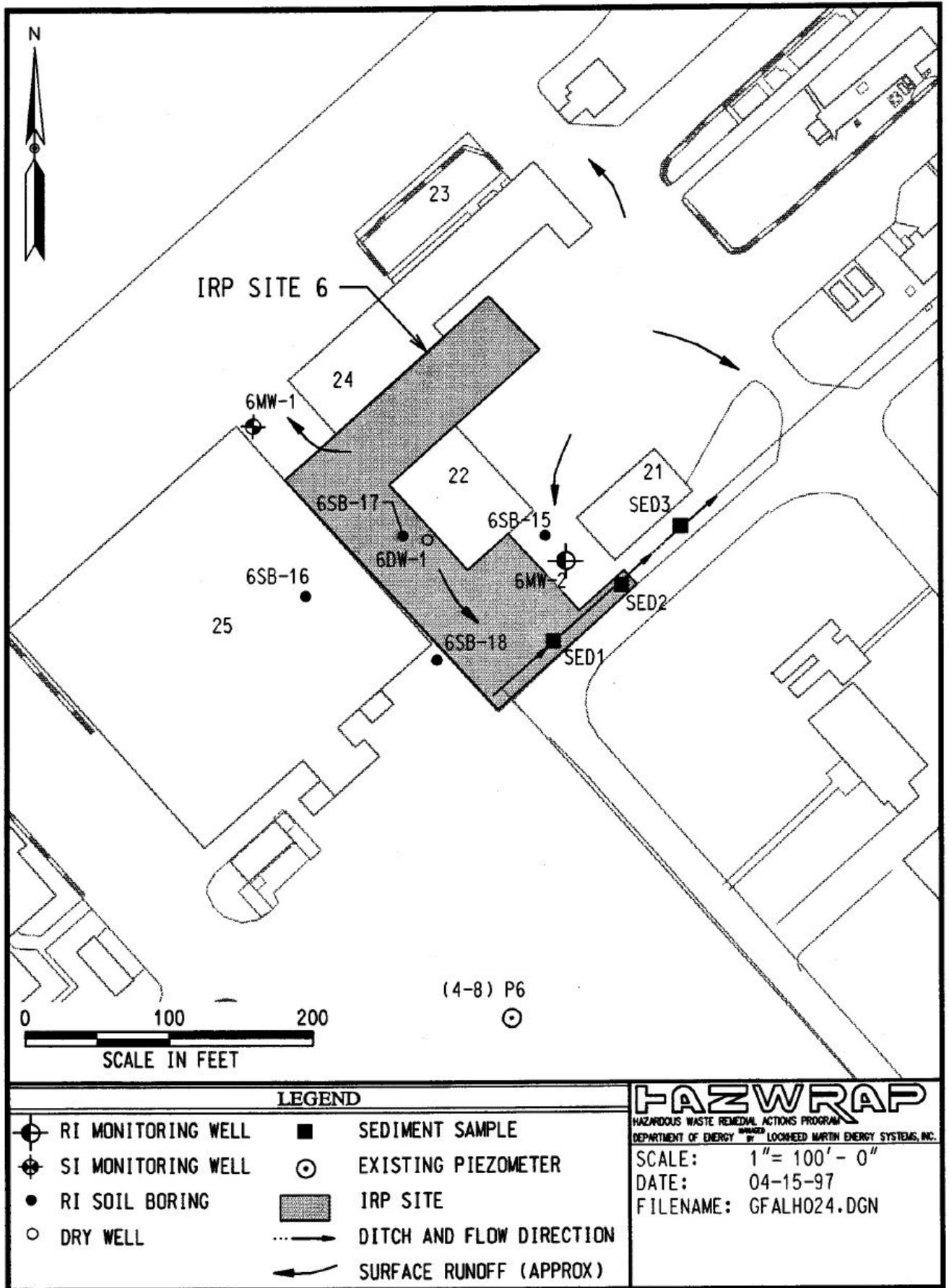


Fig. 5.9. Site 6 Soil Boring and Sediment Sample Locations.  
 120th FW Montana Air National Guard, Great Falls, Montana.

Figure B6-3  
 Source: ES, 1992a

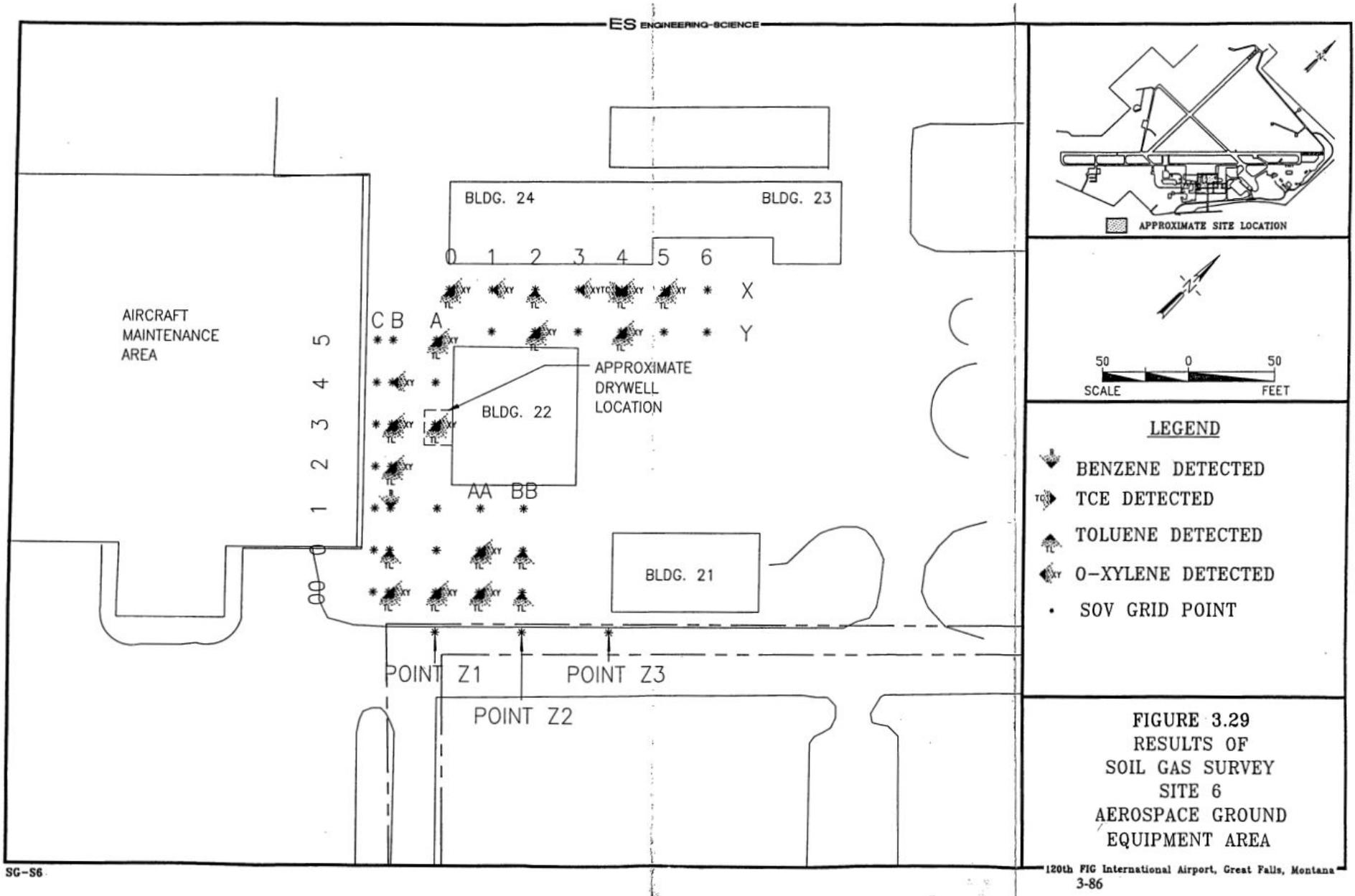


Table B6-3  
Source: ES, 1992a

Table 3.42 Chemical Constituents Detected in Groundwater  
Site 6: Aerospace Ground Equipment (AGE, Bldg. 22) Area  
(CLP Laboratory Analysis)

Chemical	Round 1		Round 1		Round 2		Round 2		Background		ARARs (1)		
	MANG-6 MW1		MANG-6 MW1-D		MANG-6 MW1		MANG-6 MW1-D		MANG-BG MW1				
GC volatile organics ( $\mu\text{g/L}$ )													
Benzene	1.8		1.8		6.8		5.9		ND	ND	5		
Ethyl benzene	ND		ND		3.3		3.4		ND	ND	700		
CLP semivolatile organics ( $\mu\text{g/L}$ ):													
bis(2-Ethylhexyl)phthalate	6	J	21		ND		ND		ND	ND	4		
Metals ( $\mu\text{g/L}$ ):													
Arsenic	ND		1.5	JB	ND		ND		1.1	JB	ND	50	
Barium	212	J	215	J	248		250		56	JB	62.2	B	1,000
Cadmium	ND		ND		2.7	B	ND		ND		ND		10
Copper	6	BJ	ND		ND		ND		ND		ND		1,300
Lead	6.3	J	3.8	J	4.2	JN	4.2	JN	4.9	J	4.3	JN	50
Mercury	0.19	B	ND		ND		ND		ND		ND		2
Zinc	52	J*	15	JB*	9.4	JB	ND		15	JB*	9.8	JB	5,000
Total petroleum hydrocarbons (mg/L)	ND		ND		ND		1		1		ND		NA

3205A/AU23409/T3-42.WK1

(1) ARARs are proposed only. These are MCLs where available, otherwise WQC.

NA = not applicable.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Organics:**

J The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

**Metals:**

B Reported value is less than reporting limit but greater than the instrument detection limit.

N Spiked sample recovery not within control limits set by lab QA/QC.

\* Duplicate analysis not within control limits set by lab QA/QC.

J The value reported is an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

Table B6-4

Source: HAZWRAP, 1997

Table 5.10. Groundwater Organic Analytical Data - Site 6 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION												
Site				6	6	6	6	6	6	6	6	Field Duplicate
Monitoring Well				DW1	MW-1	MW-1	MW1	MW-2	MW2	MW-3	MW-3	MW-3
Sample Number				-DW1-W	6-MW1-GW1	6-MW1-GW2	6-MW1-GW3	6-MW2-GW1	6-MW2-GW2	6-MW3-GW1	6-MW3-GW2	6-MW3A-GW2
Matrix				Water	Water	Water	Water	Water	Water	Water	Water	Water
Date Sampled				5/18/96	5/6/96	5/14/96	7/10/96	5/13/96	7/10/96	5/14/96	7/10/96	7/10/96
Date Analyzed				5/10/96	5/6/96	5/15/96	7/17/96	5/15/96	7/18/96	5/24/96	7/18/96	7/17/96
ANALYTICAL INFORMATION												
VOCs												
Analyte	CRQL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result
Acetone	1	NE	NE	R	R	R	R	5J	R	4.4J	R	R
1,1-Dichloroethane	1	NE	NE	ND	0.31J	0.32J	0.1J	0.28J	0.11J	0.43J	0.28J	0.3J
cis-1,2-Dichloroethene	1	70	70	R	7.4	6	1.1	ND	ND	1.3	0.24J	0.21J
2-Butanone	5	NE	NE	19J	R	R	R	1.1J	R	2.9J	R	R
Benzene	1	5	5	ND	ND	ND	0.36J	ND	ND	0.11J	ND	ND
Trichloroethene	1	5	5	90	ND	ND	ND	0.52J	0.16J	1.1	0.34J	0.28J
4-Methyl-2-pentanone	5	NE	NE	ND	ND	ND	ND	2.5J	ND	3J	ND	ND
Toluene	1	1,000	1,000	220	ND	ND	ND	ND	0.26J	ND	0.92J	1.2
1,1,2-Trichloroethane	1	5	5	ND	ND	ND	0.17J	ND	ND	ND	ND	ND
2-Hexanone	1	NE	NE	5.5J	ND	ND	R	ND	R	ND	R	R
Ethylbenzene	1	700	700	7.5J	ND	0.14J	9	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1	75	75	ND	ND	ND	ND	ND	0.52J	ND	1.1	1.1
1,2-Dibromo-3-chloropropane	1	0.2	0.2	ND	R	R	ND	R	ND	R	ND	ND
Xylenes	1	10,000	10,000	52	ND	ND	10	0.51J	ND	ND	ND	ND
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Sample Number				6DW1	6-MW1-GW2	6-MW1-GW3	6-MW2-GW1	6-MW2-GW2	6-MW3-GW1	6-MW3-GW2	6-MW3A-GW2	
Date Sampled				4/28/96	5/14/96	7/10/96	5/13/96	7/10/96	5/14/96	7/10/96	7/10/96	7/10/96
Date Analyzed				5/2/96	5/24/96	7/22/96	5/23/96	7/23/96	5/24/96	7/22/96	7/22/96	7/22/96
SVOCs												
Analyte	CRQL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result
4-Methylphenol	10	NE	NE	74J	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	10	NE	NE	ND	1J	1J	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	10	NE	NE	48J	1J	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	10	NE	20	ND	1J	1J	ND	ND	ND	ND	ND	ND
Dibenzofuran	10	NE	NE	ND	ND	1J	ND	ND	ND	ND	ND	ND
Fluorene	10	NE	13,000	ND	1J	1J	ND	ND	ND	ND	ND	ND
Diethylphthalate	10	NE	23,000	ND	1J	ND	1J	ND	1J	ND	ND	ND
Di-n-butylphthalate	10	NE	2700	30J	ND	ND	ND	ND	ND	ND	1J	ND
Phenanthrene	10	NE	NE	ND	ND	1J	ND	ND	ND	ND	ND	ND
Anthracene	10	NE	9,600	ND	ND	1J	ND	ND	ND	ND	ND	ND
Fluoranthene	10	NE	300	ND	ND	1J	ND	ND	ND	ND	ND	ND
Butylbenzylphthalate	10	NE	3000	35J	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	10	6	6	140J	ND	ND	ND	ND	ND	ND	ND	ND
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Date Sampled					5/14/96	7/10/96	5/13/96	7/10/96	5/14/96	7/10/96	7/10/96	7/10/96
Date Analyzed					5/17/96	7/17-24/96	5/20/96	7/17-24/96	5/17/96	7/17-24/1996	7/17-24/1996	7/17-24/96/1996
Petroleum Hydrocarbons												
	RL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result
JP-4	0.25	NE	NE	150	1.7NJ	1.7NJ	0.76	ND	ND	ND	1NJ	3.3NJ
Diesel range, as diesel	0.25	NE	NE	82	0.99NJ	1.8NJ	0.35NJ	ND	ND	ND	1.2NJ	3.7NJ
Oil range, as oil	1	NE	NE	78	2.3	ND	ND	ND	ND	ND	ND	ND
Gasoline range	0.25	NE	NE	59	ND	0.97	ND	ND	ND	ND	ND	ND
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
<b>Legend</b>												
MCLs	Federal Drinking Water Standard Maximum Contaminant Level											
MDEQ	Montana Department of Environmental Quality Human Health Standards											
NE	ARAs Not Established											
DW	Dry Well											
SB	Soil Boring											
SS	Sediment/Surface Soil											
(DISS)	Dissolved Sample (total metals)											
(DISS)	Concentration > or = MCLs OR MEDQ, ARARs, or Avge + 2 Standard Dev.											
CRQL	Contract Required Quantitation Limit											
RL	Reporting Limit											
ND	Compound Not Detected											
J	Concentration Estimated											
R	Results Rejected on Basis of Laboratory QA/QC											
N	Presumptive Evidence of Compound											

Table B6-4

Source: HAZWRAP, 1997

Table 5.11. Groundwater Inorganic Analytical Data - Site 6 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION				6	6	6	6	6	Field Duplicate			6	6		
Site				6-DW	MW1	MW1	MW1	MW1	MW2	MW2	MW2	MW2	MW2		
Monitoring Well				6-DW1-W1	6-MW1-GW2 (Diss.)	6-MW1-GW2	6-MW1-GW3 (Diss.)	6-MW1-GW3	6-MW2-GW1 (Diss.)	6-MW2-GW1	6-MW2-GW2 (Diss.)	6-MW2-GW2	6-MW2-GW2		
Sample Number				Water	Water	Water	Water	Water	Water	Water	Water	Water	Water		
Matrix				4/28/96	5/14/96	5/14/96	7/10/96	7/10/96	5/13/96	5/13/96	7/10/96	7/10/96	7/10/96		
Date Sampled				5/8-13/96	5/24/96 - 6/4/96	5/24/96 - 6/4/96	7/17-24/96	7/19-27/96	5/24/96 - 6/21/96	5/24/96 - 6/21/96	7/17-24/96	7/19-27/96	7/19-27/96		
Date Analyzed				ANALYTICAL INFORMATION			ANALYTICAL INFORMATION			ANALYTICAL INFORMATION			ANALYTICAL INFORMATION		
INORGANICS															
Analyte	CRDL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result		
Arsimony	16	6	6	44.5	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Arsenic	10	50	18	ND	ND	ND	1.2J	ND	ND	ND	ND	ND	ND		
Barium	200	2000	1000	578	131J	233	152J	194J	119J	202	99.9J	154J	154J		
Beryllium	4	4	40	ND	ND	ND	0.3J	0.5J	ND	0.8J	0.5J	0.7J	0.7J		
Chromium	10	100	100	945	ND	ND	ND	ND	ND	ND	ND	ND	11.1		
Copper	25	1300**	1000	1640	ND	4.3J	ND	ND	ND	11.3J	ND	5.4J	5.4J		
Lead	3	15**	15	1280	ND	5.8	ND	2.2J	ND	4.4	ND	4.3	4.3		
Nickel	40	100	100	1040	ND	ND	ND	ND	ND	ND	ND	15.7J	15.7J		
Selenium	5	50	50	ND	ND	ND	ND	ND	1.2J	ND	ND	ND	ND		
Silver	10	NE	NE	6.3J	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Thallium	2	2.0	1.7	2.1J	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Zinc	20	NE	5000	1730	ND	33.3	6.6J	ND	57.1	107	8J	42.7	42.7		
Units (mg/kg) Soil, (ug/L) Water				ug/L											

SAMPLE INFORMATION				6	6	6	6	6	6
Site				MW3	MW3	MW3	MW3	MW3A	MW3A
Monitoring Well				6-MW3-GW1 (Diss.)	6-MW3-GW1	6-MW3-GW2 (Diss.)	6-MW3-GW2	6-MW3A-GW2 (Diss.)	6-MW3A-GW2
Sample Number				Water	Water	Water	Water	Water	Water
Matrix				5/14/96	5/14/96	7/10/96	7/10/96	7/10/96	7/10/96
Date Sampled				5/24/96 - 6/4/96	5/24/96 - 6/4/96	7/17-24/96	7/19-27/96	7/17-24/96	7/19-27/96
Date Analyzed				ANALYTICAL INFORMATION			ANALYTICAL INFORMATION		
INORGANICS									
Analyte	CRDL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result
Arsenic	10	50	18	ND	ND	ND	ND	ND	ND
Barium	200	2000	1000	270	350	290	328	252	308
Beryllium	4	4	40	ND	ND	0.3J	0.5J	ND	0.6J
Chromium	10	100	100	ND	ND	ND	8.8J	ND	8.3J
Copper	25	1300**	1000	4.8J	18.7J	ND	11.1J	ND	13.8J
Lead	3	15**	15	ND	3.1	ND	3.6	ND	3.5
Nickel	40	100	100	ND	33.7J	ND	10.3J	6.7J	18.1J
Selenium	5	50	50	ND	ND	ND	ND	ND	ND
Zinc	20	NE	5000	77.4	291	5.6J	26.9	6.8J	33.3
Units (mg/kg) Soil, (ug/L) Water				ug/L					

- Legend
- MCLs Federal Drinking Water Standard Maximum Contaminant Level
  - MDEQ Montana Department of Environmental Quality Human Health Standards
  - NE ARARs Not Detected
  - DW Dry Well
  - SB Soil Boring
  - SS Sediment/Surface Soil
  - (DISS) Dissolved Sample (total metals)
  - CRQL Concentration > or = MCLs or MDEQ ARARs, or Avg. +2 Standard Dev.
  - RL Contract Required Quantitation Limit
  - ND Reporting Limit
  - J Compound Not Detected
  - R Concentration Estimated
  - N Results Rejected on Basis of Laboratory QA/QC
  - \*\* Presumptive Evidence of Compound Action Level

Table 2.16  
EE/CA 1st Round (September 9, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW9D	8-MW1D
BTEX (ug/L)																				
Benzene		7.25	14		2.3J		230J		9.0J	7.6									8.7	
Toluene					5.8J		1.4J													
Ethylbenzene		9.45	170		12J		716J	16	150J	8.4									11	
Total Xylene		16J	430		4.1J		1200J	26	300J	2.6									2.9	
TVAH		32.65	614		24.2		2147.4J	42	459J	18.6									22.6	
TPH (mg/L)																				
Gasoline Range		0.85J	4	0.25	1.2		1.70J	0.76	2.5		0.34J		0.16	0.48J					0.11	0.425
Diesel Range		0.59J	12		2.4	0.15	3.1J	0.74	1.9	0.69J									0.81J	
Metals (T/D, mg/L)																				
Silver																				
Arsenic															ND					
Beryllium																				
Cadmium																				
Chromium																				
Copper					0.01/ND															
Mercury																				
Nickel			0.02/ND	0.003/ND	0.004/ND	0.004/ND					0.003/ND	0.002/ND			0.003/ND					
Lead					0.004/ND										0.007/ND					
Antimony															0.006					
Selenium																				
Thallium																				
Zinc	0.05/ND	ND/0.33	0.005/0.11	0.06/0.02	0.03/ND	0.06/0.23		ND/1.50	0.04/ND		0.02/0.04	0.02ND	0.03/ND	0.04	0.03/0.05	.05/0.2	0.02/0.94	0.09/ND	0.11	0.02/0.03

Blank Spaces - Analysis performed but have no detection.  
D - Duplicate Sample.  
DIWI - Deionized Water.  
GF - Great Falls.  
GW1 & GW2 - 1st and 2nd Round Groundwater.  
J - Estimated Values.  
mg/L - milligrams per liter.  
MS/MSD - Matrix Spike/Matrix Spike Duplicate.  
MW - Monitoring Well.  
Result Presentation - 0.05/0.03 means Total/Dissolved Results.

ND - Not Detected.  
NA - Not Applicable.  
PWI - Potable Water  
P&DWI - Purge and Development Water.  
TB - Trip Blank.  
TPH - Total Petroleum Hydrocarbons.  
TVAH - Total Volatile Aromatic Hydrocarbons.  
ug/L - micrograms per liter.  
VOCs - Volatile Organic Compounds.  
Shaded areas indicate results above ARARs.

Table B6-5 (Con't)  
Source: OTC, 1998a

Table 2.16 (Concluded)  
EE/CA 1st Round (September 9, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW9D	8-MW1D
VOCs (ug/L)																				
Dichlorodifluoromethane																				
Chloromethane															1.2					
Vinyl chloride																				
Bromomethane																				
Chloroethane																				
Tichlorofluoromethane																				
1,1-Dichloroethene											1.1J	3.4J								
Methylene chloride			2.2							2.45			1.9J							1.6J
Trans-1,2-Dichloroethene																				
1,1-Dichloroethene										2.5		8.8J	4.2							3.1
Chloroform	3.4		1.7				9.1	1.8		3.1		5.2J	3.4	14	6.9	2.8				3.1
1,1,1-Trichloroethane										1.8	1.5J	4.7J	1.9							2
Carbon tetrachloride												1.0J								
1,2-Dichloroethane																				
2-Chloroethylvinyl ether																				
Trichloroethene			1.2							6.9	4.0J	3.8J	10		1.7	1.7				8.7
1,2-Dichloropropane																				
Bromodichloromethane							1.1								1.6					
cis-1,3-Dichloropropene																				
trans-1,3-Dichloropropene																				
1,1,2-Trichloroethane																				
Tetrachloroethene			1							2.8	3.45		2.3		1.3	18.2				2.6
Dibromochloromethane																				
Chlorobenzene																				
Bromoform																				
1,2,2,2-Tetrachloroethane																				
1,3-Dichlorobenzene																				
1,4-Dichlorobenzene																				
1,2-Dichlorobenzene																				

Blank Spaces - Analysis performed but have no detection.

D - Duplicate Sample.

DIWI - Deionized Water.

GF - Great Falls.

GW1 & GW2 - 1st and 2nd Round Groundwater.

J - Estimated Values.

mg/L - milligrams per liter.

MS/MSD - Matrix Spike/Matrix Spike Duplicate.

MW - Monitoring Well.

Result Presentation - 0.05/0.03 means Total/Dissolved Results.

NA - Not Applicable.

PW - Potable Water.

P&DWI - Purge and Development Water.

TB - Trip Blank.

TPH - Total Petroleum Hydrocarbons.

TVAH - Total Volatile Aromatic Hydrocarbons.

ug/L - micrograms per liter.

VOCs - Volatile Organic Compounds.

Shaded areas indicate results above ARARs.

Table 2.18  
EE/CA 2nd Round (September 25, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW5D	8-MW6D
BTEX (ug/L)																				
Benzene		5.3J	6J		4.1J		130J	1.2J	11J	2.8										
Toluene								1.84J												
Ethylbenzene		10J	78J		3.3J	1.4	310J	17J	290J	1.9									1.3	
Total Xylene		12J	280J		14		980J	29J	700J	1.55										
TVAH		27.3J	464J		21.4J	1.4	1420J	49	1001J	6.75									1.3	
TPH (mg/L)																				
Gasoline Range		.052J	3.0J		1.8J		3.8J	0.91J	4.6J				0.013	0.11						
Diesel Range		0.98J	7.5		5.0J		4.1J	1.2J	2.6J	0.048									0.10J	
Metals (T/D, mg/L)																				
Silver																				
Arsenic																				
Beryllium																				
Cadmium																				
Chromium																				
Copper																				
Mercury																				
Nickel																				
Lead	.003/ND		.002/ND			ND/.004			ND/.013		.006/N	.003/	.004/ND						.004/ND	
Antimony		.007/.008													.006/.005					
Selenium		.005/.006													.006/.008					
Thallium																				
Zinc	.04/.10	.06/.05	.05/.13	.06/.12	.10/.21	.36/.10	.06/0.0	.12/.45	.05/.32	.03/.20	.05/.23	.03/.33	.06/.34	.03/.49	.05/.55	.04/.33	ND/.10		0.08/.55	0.02/0.16

Blank Spaces - Analysis performed, but have no detection.  
D - Duplicate Sample.  
DIWI - Deionized Water.  
GF - Great Falls.  
GW1 & GW2 - 1st and 2nd Round Groundwater.  
J - Estimated Values.  
mg/L - milligrams per liter.  
MS/MSD - Matrix Spike/Matrix Spike Duplicate.  
MW - Monitoring Well.  
Result Presentation - 0.05/0.03 means Total/Dissolved results.

NA - Not Applicable.  
PWI - Potable Water.  
P&DWI - Purge and Development Water.  
TB - Trip Blank.  
TPH - Total Petroleum Hydrocarbons.  
TVAH - Total Volatile Aromatic Hydrocarbons.  
ug/L - micrograms per liter.  
VOCs - Volatile Organic Compounds.  
Shaded areas indicate results above ARARs.

Table B6-5 (Con't)  
Source: OTC, 1998a

Table 2.18 (Concluded)  
EE/CA 2nd Round (September 25, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW5	8-MW6D
VOCs (ug/L)																				
Dichlorodifluoromethane																				
Chloromethane						1.1	1.5							1.1						
Vinyl chloride																				
Bromomethane																				
Chloroethane																				
Tichlorofluoromethane																				
1,1-Dichloroethene												1.1	5.1	1						
Methylene chloride																				
Trans-1,2-Dichloroethene																				
1,1-Dichloroethane											1.3		13	6.7						
Chloroform	3.2			2.6				2.2	2.2		6.2	1.1	12	8.5	1.6	7.1	2.7			5.9
1,1,1-Trichloroethane											1.4	1.3	5.4	2.2						
Carbon tetrachloride																				
1,2-Dichloroethane																				
2-Chloroethylvinyl ether																				
Trichloroethene				1.4							4.1	4.1	53	20		1.7	1.6			3
1,2-Dichloropropane																				
Bromodichloromethane																				
cis-1,3-Dichloropropene																				
trans-1,3-Dichloropropene																				
1,1,2-Trichloroethane																				
Tetrachloroethene				1.1							3	6.9		2.1		1.4	4.1			1.3
Dibromochloromethane																				
Chlorobenzene																				
Bromoform																				
1,2,2,2-Tetrachloroethane																				
1,3-Dichlorobenzene																				
1,4-Dichlorobenzene																				
1,2-Dichlorobenzene																				

Blank Spaces - Analysis performed, but have no detection.  
D - Duplicate Sample.  
DIWI - Deionized Water.  
GF - Great Falls.  
GW1 & GW2 - 1st and 2nd Round Groundwater.  
J - Estimated Values.  
mg/L - milligrams per liter.  
MS/MSD - Matrix Spike/Matrix Spike Duplicate.  
MW - Monitoring Well.  
Result presentation - 0.05/0.03 means Total/Dissolved results.

NA - Not Applicable.  
PWI - Potable Water.  
P&DWI - Purge and Development Water.  
TB - Trip Blank.  
TPH - Total Petroleum Hydrocarbons.  
TVAH - Total Volatile Aromatic Hydrocarbons.  
ug/L - micrograms per liter.  
VOCs - Volatile Organic Compounds.  
Shaded areas indicate results above ARARs.

Table B6-6  
Source: ES, 1992a

Table 3.37 Organic Constituents Detected in Soil Gas Survey  
Site 6: Aerospace Ground Equipment (AGE, Bldg. 22) Area  
(ppb by volume, GC)

Sample ID	Grid Coordinates		1,1-DCE	1,2-DCE	Benzene	TCE	Toluene	o-Xylene
X0	50	0	ND	ND	ND	ND	8	1,450
X1	75	0	ND	ND	ND	ND	0	1,450
X2	100	0	ND	ND	ND	ND	32	ND
X3	125	0	ND	ND	ND	ND	ND	1,000
X4	150	0	ND	ND	ND	135,000	327,000	***
X5	175	0	ND	ND	ND	ND	***	***
C5	0	-30	ND	ND	ND	ND	ND	ND
B5	25	-30	ND	ND	ND	ND	ND	ND
A5	50	-30	ND	ND	ND	ND	18	93
Y1	75	-30	ND	ND	ND	ND	ND	ND
Y2	100	-30	ND	ND	ND	ND	210	1,100
Y3	125	-30	ND	ND	ND	ND	ND	ND
Y4	150	-30	ND	ND	ND	ND	16	340
Y5	175	-30	ND	ND	ND	ND	ND	ND
C4	0	-55	ND	ND	ND	ND	ND	ND
B4	25	-55	ND	ND	ND	ND	ND	458
A4	50	-55	ND	ND	ND	ND	ND	ND
C3	0	-80	ND	ND	ND	ND	ND	ND
B3	25	-80	ND	ND	ND	ND	***	***
A3	50	-80	ND	ND	ND	ND	***	***
C2	0	-105	ND	ND	ND	ND	ND	ND
B2	25	-105	ND	ND	ND	ND	***	***
C1	0	-130	ND	ND	ND	ND	ND	ND
B1	25	-130	ND	ND	21	ND	ND	ND
A1	50	-130	ND	ND	ND	ND	ND	ND
C0	0	-155	ND	ND	ND	ND	ND	ND
B0	25	-155	1,670	ND	ND	ND	660	ND
A0	50	-155	ND	58	ND	ND	ND	ND
C00	0	-180	ND	ND	ND	ND	ND	ND
B00	25	-180	ND	ND	ND	ND	***	***
A00	50	-180	ND	ND	ND	ND	***	***
AA1	75	-130	ND	ND	ND	ND	ND	ND
BB1	100	-130	ND	ND	ND	ND	ND	ND
AA0	75	-155	ND	ND	ND	ND	3,100	2,000
BB0	100	-155	ND	ND	ND	ND	104	ND
AA00	75	-180	ND	ND	ND	ND	170,000	***
BB00	100	-180	ND	ND	ND	ND	***	ND

5205A\AU25409\T3-37.WK1

ND = not detected

Figure B7-1  
Source: ES, 1992a

ES ENGINEERING-SCIENCE

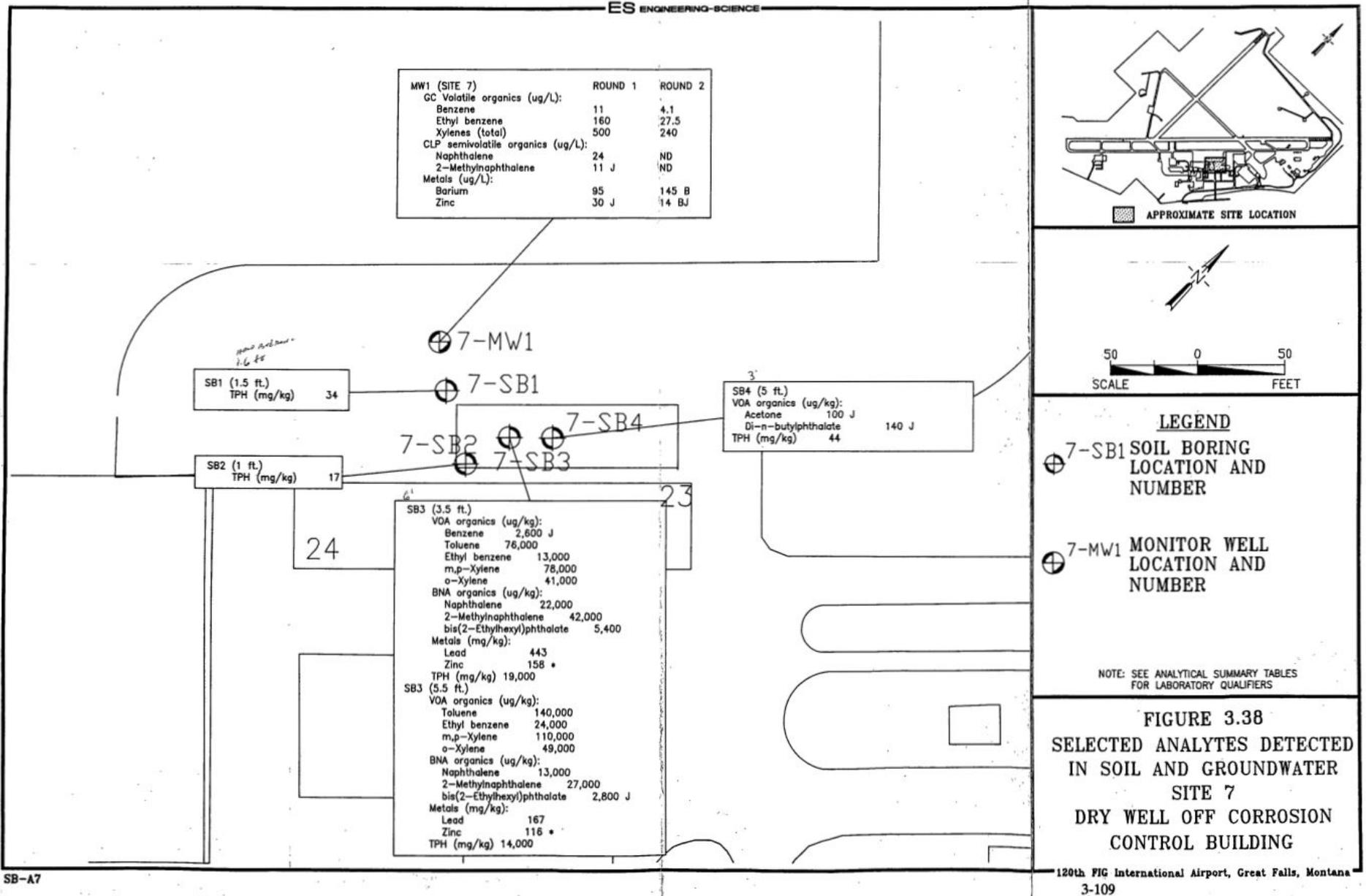


Table 3.45 Chemical Constituents Detected in Soil  
Site 7: Dry Well Off Corrosion Control Building  
(CLP Laboratory Analysis)

Chemical	Background (1)	MANG-7 SB1-1.5	MANG-7 SB2-1	MANG-7 SB3-3.5	MANG-7 SB3-5.5	MANG-7 SB4-5	Health (2) Criteria
<b>Volatile organics (µg/kg):</b>							
Acetone	ND-157	ND	ND	ND	ND	J	8E06
Benzene	ND	ND	ND	2,600 J	ND	ND	2.4E04
Toluene	ND-9	ND	ND	76,000	140,000	ND	1.6E07
Ethyl benzene	ND	ND	ND	13,000	24,000	ND	8E06
m/p-Xylene (3)	ND	ND	ND	78,000	110,000	ND	1.6E08
o-Xylene	ND	ND	ND	41,000	49,000	ND	1.6E08
<b>BNA organics (µg/kg):</b>							
Naphthalene	ND	ND	ND	22,000	13,000	ND	3.2E05
2-Methylnaphthalene	ND	ND	ND	42,000	27,000	ND	--
Di-n-butylphthalate	ND	ND	ND	ND	ND	140 J	8E06
bis(2-Ethylhexyl)phthalate	ND	ND	ND	5,400	2,800 J	ND	5E04
<b>Metals (mg/kg):</b>							
Arsenic	1.9-9.9	2.7	4.5	4.6	5.8	6.2	80
Barium	ND-1,231	250	178	257	253	11	5,600
Chromium	8.7-22.7	9.7	16.5	15.7	12.3	7.9	8E04
Copper	3.3-19.7	19	15.3	17 *	17 *	17.1 *	--
Lead	3.4-13.0	8 N	10.7 N	443	167	9.9	500
Nickel	3.6-17.6	ND	10.1	10.5	7.8	ND	1,600
Selenium	ND-0.66	ND	ND	0.6 B	0.42 BW	0.37 B	240
Zinc	21.6-61.3	30.4 *	43.2 *	158 *	116 *	39.6 *	1.6E04
Total petroleum hydrocarbons (mg/kg)	ND	34	17	19,000	14,000	44	--

320SA\AU23409\T3-45.WK1

- (1) Background range is the average +/- two standard deviations.
- (2) Based upon soil ingestion, see section 4.
- (3) Meta- and para-xylene coelute and are not distinguishable by this method.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Organics:**

- J The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

**Metals:**

- B Reported value is less than reporting limit but greater than the instrument detection limit.
- N Spiked sample recovery not within control limits set by lab QA/QC.
- \* Duplicate analysis not within control limits set by lab QA/QC.
- W Postdigestion spike for furnace AA analysis out of control limits (85 to 115%), while sample absorbance is less than 50% of spike absorbance.

Figure B7-2  
 Source: HAZWRAP, 1997

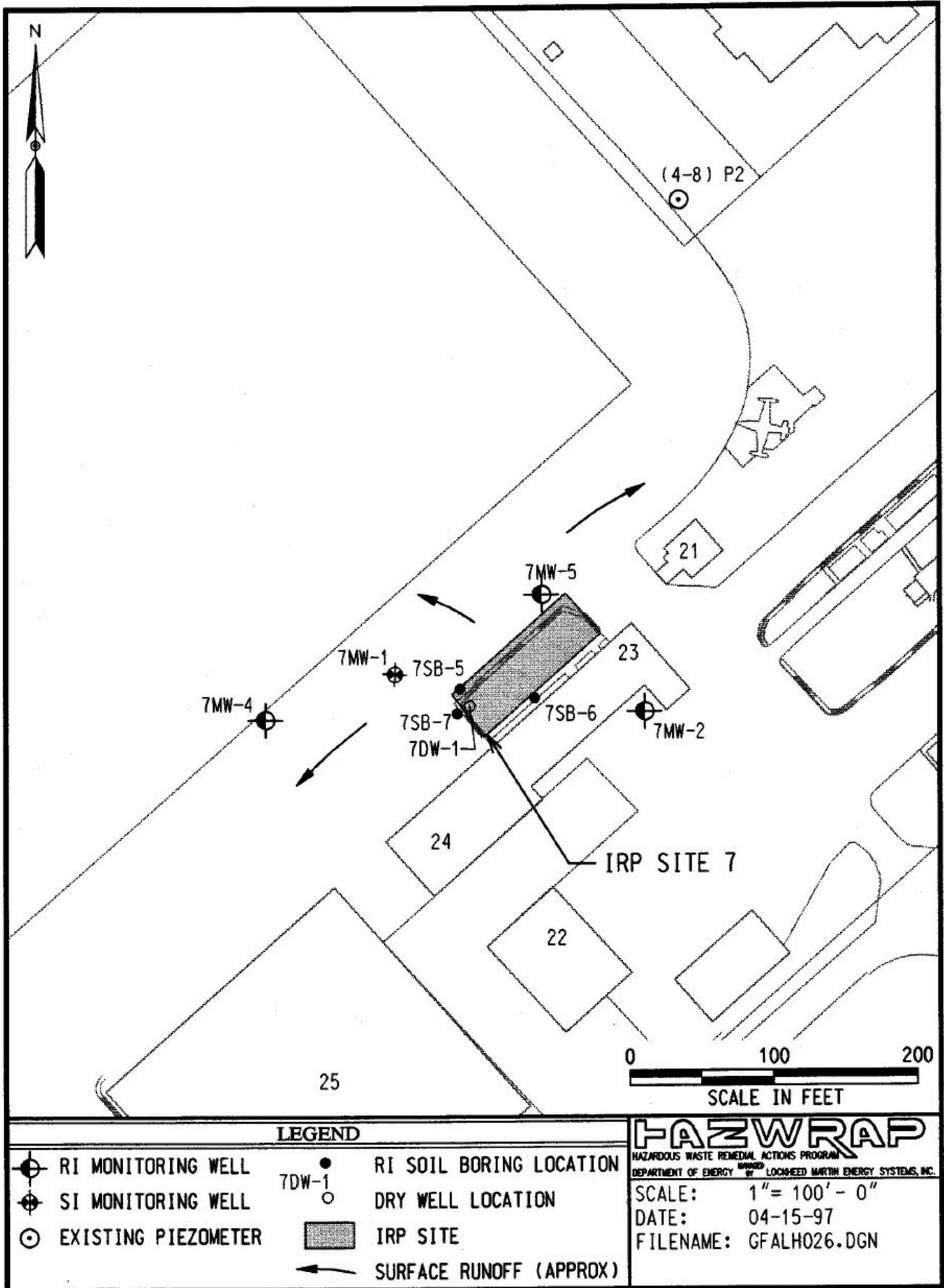


Fig. 5.11. Site 7 Soil Boring Location Map.  
 120th FW Montana Air National Guard, Great Falls, Montana.

Table B7-2

Source: HAZWRAP, 1997

Table 5.12. Soils Organic Analytical Data - Site 7 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION		Diluted Sample		Diluted Sample		Diluted Sample		Diluted Sample		Diluted Sample		Diluted Sample		Diluted Sample		Diluted Sample		
Location		7DW1	7DW1	7DW1	7DW1	SB5	SB5	SB5	SB5	SB6	SB6	SB6	SB6	SB7	SB7	SB7	SB7	
Depth		1.2-3.2R	1.2-3.2R	2.2-4.2R	3.2-4.2R	1-3 ft	1-3 ft	4.5-5.4 ft	8-8.6 ft	0-2 ft	0-2 ft	3.5-5.5 ft	7.2-8 ft	1-3 ft	1-3 ft	3.4-5.2 ft	3.4-5.2 ft	8-8.3 ft
Sample Number		7-DW1-1.2-3.2	7-DW1-1.2-3.2DL	7-DW1-3.2-4.2	7-DW1-3.2-4.2DL	7-SB5-1-3	7-SB5-1-3DL	7-SB5-4.5-5.4 ft	7-SB5-8-8.6 ft	7-SB6-0-2	7-SB6-0-2DL	7-SB6-3.5-5.5	7-SB6-7.2-8	7-SB7-1-3	7-SB7-1-3 DL	7-SB7-3.4-5.2	7-SB7-3.4-5.2 DL	7-SB7-8-8.3
Matrix		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date Sampled		4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	4/27/96
<b>ANALYTICAL INFORMATION</b>																		
<b>VOCs</b>																		
Date Analyzed		5/6/96	5/7/96	5/3/96	5/7/96	5/8/96	5/9/96	5/2/96	5/2/96	5/3/96	5/7/96	5/3/96	5/2/96	5/3/96	5/7/96	5/3/96	5/7/96	5/2/96
Analyte		CRQL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Acetone		10	590J	820J	800J	820J	750J	850J	920J	ND	460J	130J	1400J	1200J	1490J	900J	1800	1700
Carbon Disulfide		10	ND	ND	1J	ND	ND	ND	ND	ND	ND	ND	ND	2J	ND	ND	ND	ND
Methylene Chloride		10	ND	ND	ND	ND	ND	28J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone		10	2J	ND	15	ND	8J	57J	ND	ND	6J	ND	5J	ND	12J	ND	5J	ND
Chloroform		10	ND	ND	1J	ND	ND	ND	736J	ND	ND	1J	ND	ND	ND	ND	ND	ND
Benzene		10	ND	ND	ND	ND	5J	ND	830J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene		10	ND	ND	ND	ND	4J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone		10	ND	ND	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene		10	ND	ND	ND	ND	2J	6J	ND	5700	ND	ND	1100J	ND	ND	ND	ND	146J
2-Hexanone		10	ND	ND	7J	ND	ND	ND	ND	1J	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene		10	ND	ND	ND	ND	1J	ND	190J	13,000	ND	ND	500J	ND	ND	ND	ND	180J
Xylene		10	ND	ND	ND	ND	4J	4J	1800	80,000	1J	ND	3300	ND	ND	ND	ND	1500
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
<b>SVOCs</b>																		
Date Analyzed		5/6/96	5/7/96	5/21/96	5/24/96	5/10/96	5/10/96	5/10/96	5/9/96	5/9/96	5/9/96	5/9/96	5/9/96	5/9/96	5/9/96	5/9/96	5/9/96	5/9/96
Analyte		CRQL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Naphthalene		330	ND	16J	7J	3300	950J	ND	ND	1800	ND	ND	1800	ND	ND	ND	2300	ND
2-Methylnaphthalene		330	ND	19J	4J	5100	1800	ND	ND	3800	ND	ND	3800	ND	ND	ND	3700	ND
Fluorene		330	ND	ND	ND	38J	58J	ND	ND	60J	ND	ND	60J	ND	ND	ND	83J	ND
Phenanthrene		330	ND	ND	ND	ND	ND	93J	ND	140J	ND	ND	140J	ND	ND	ND	170J	ND
Flouranthrene		330	ND	17J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene		330	ND	18J	5J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate		330	ND	820	ND	580J	ND	ND	ND	ND	ND	130J	ND	140J	ND	200J	ND	ND
Di-n-octylphthalate		330	ND	43J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Date Analyzed		5/6-13/96	5/6-13/96	5/17/96	5/18/96	5/18/96	5/18/96	5/13/96	5/10/96	5/13/96	5/10/96	5/13/96	5/10/96	5/13/96	5/10/96	5/13/96	5/13/96	5/13/96
Petroleum Hydrocarbons		RL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
JP-4		10	ND	ND	ND	780	530	ND	ND	470	ND	ND	470	ND	ND	9500	ND	9500
Diesel Range, as diesel		10	ND	13	ND	790	510	ND	ND	900	ND	ND	900	ND	ND	8000	ND	8000
Oil Range, as oil		100	ND	140	ND	7800	3800	ND	ND	8800	ND	ND	8800	ND	ND	84000	ND	84000
Gasoline Range		5	ND	ND	ND	12000J	7600J	ND	ND	9600J	ND	ND	9600J	ND	ND	8.10J	17000J	17000J
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
<b>Legend</b>																		
MCLs	Federal Drinking Water Standard Maximum Contaminant Level																	
MDEQ	Montana Department of Environmental Quality Human Health Standards																	
NE	ARAs Not Established																	
DW	Dry Well																	
SB	Soil Boring																	
SS	Sediment/Surface Soil																	
(DISS)	Dissolved Sample (total metals)																	
	Concentration > or = MCLs OR MDEQ, ARARs, or Avge + 2 Standard Dev																	
CRQL	Contract Required Quantitation Limit																	
RL	Reporting Limit																	
ND	Compound Not Detected																	
J	Concentration Estimated																	
R	Results Rejected on Basis of Laboratory QA/QC																	
N	Presumptive Evidence of Compound																	

Table B7-2 (Con't)  
Source: HAZWRAP, 1997

Table 5.13. Soil Inorganic Analytical Data - Site 7 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION		AVG. +/- TWO				
STD. DEV.		7	7	7	7	7
Site		7	7	7	7	7
Location		DW1	DW1	SB5	SB5	SB5
Sample Number		7-DW1-1.2-3.2	7-DW1-3.2-4.2	7-SB5-1-3	7-SB5-4.5-5.4	7-SB5-8-8.6
Matrix		soil	soil	soil	soil	soil
Date Sampled		4/27/96	4/27/96	4/27/96	4/27/96	4/27/96
Date Analyzed		5/8-13/97	5/8-13/97	5/9/96 - 6/14/96	5/9/96 - 6/14/96	5/9/96 - 6/14/96
ANALYTICAL INFORMATION						
INORGANICS						
Analyte		RESULT	RESULT	RESULT	RESULT	RESULT
Arsenic	1.9 - 9.9	ND	ND	11.1	1.9	3.1
Barium	ND - 1231	239	229	156	132	390
Beryllium	NE	ND	ND	0.78	0.33J	0.55J
Chromium	8.7 - 22.7	19.3	13.1	14.2	7.2	11.3
Copper	8.7 - 19.7	18.9	15.1	32.1	16	24.3
Lead	3.4 - 13	6.5	9.4	13.5	17.5	7.7
Mercury	NE	ND	0.11	ND	ND	0.09
Nickel	3.6 - 17.6	16.2	13.5	13.6	7.2	9.5
Zinc	21.6 - 61.3	45.7	50.8	88.6	55.3	65.2
Units (mg/kg) Soil, (ug/L) Water						

SAMPLE INFORMATION		AVG. +/- TWO					
STD. DEV.		7	7	7	7	7	7
Site		7	7	7	7	7	7
Location		SB6	SB6	SB6	SB7	SB7	SB7
Sample Number		7-SB6-0-2	7-SB6-3.5-5.5	7-SB6-7.2-8	7-SB7-1-3	7-SB7-3.4-5.2	7-SB7-8-8.3
Matrix		soil	soil	soil	soil	soil	soil
Date Sampled		4/27/96	4/27/96	4/27/96	4/27/96	4/27/96	#REF1
Date Analyzed		5/8-13/97	5/8-13/97	5/8-13/97	5/8-13/97	5/8-13/97	5/8-13/97
ANALYTICAL INFORMATION							
INORGANICS							
Analyte		RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Arsenic	1.9 - 9.9	ND	ND	ND	9.9	ND	ND
Barium	ND - 1231	181	167	165	292	122	729
Beryllium	NE	ND	ND	ND	ND	ND	ND
Chromium	8.7 - 22.7	10.7	6.5	10.4	17.5	6.3	10.9
Copper	8.7 - 19.7	19.7	13.1	17	13.9	10.5	13.3
Lead	3.4 - 13	7.5	4.5	11.7	9.3	5.8	9.2
Mercury	NE	ND	ND	ND	ND	ND	ND
Nickel	3.6 - 17.6	10.9	7.6J	9.3J	16.1	9.3	12.1
Zinc	21.6 - 61.3	45.8	36.6	48.2	43.5	41.5	37
Units (mg/kg) Soil, (ug/L) Water							

Legend

MCLs	Federal Drinking Water Standard Maximum Contaminant Level
MDEQ	Montana Department of Environmental Quality Human Health Standards
NE	ARARs Not Established
DW	Dry Well
SB	Soil Boring
SS	Sediment/Surface Soil
(DISS)	Dissolved Sample (total metals)
	Concentration > or = MCLs or MDEQ ARARs, or Avg. +2 Standard Dev.
CRQL	Contract Required Quantitation Limit
RL	Reporting Limit
ND	Compound Not Detected
J	Concentration Estimated
R	Results Rejected on Basis of Laboratory QA/QC
N	Presumptive Evidence of Compound

**Figure B7-3**  
**Source: SAIC, 2007a**

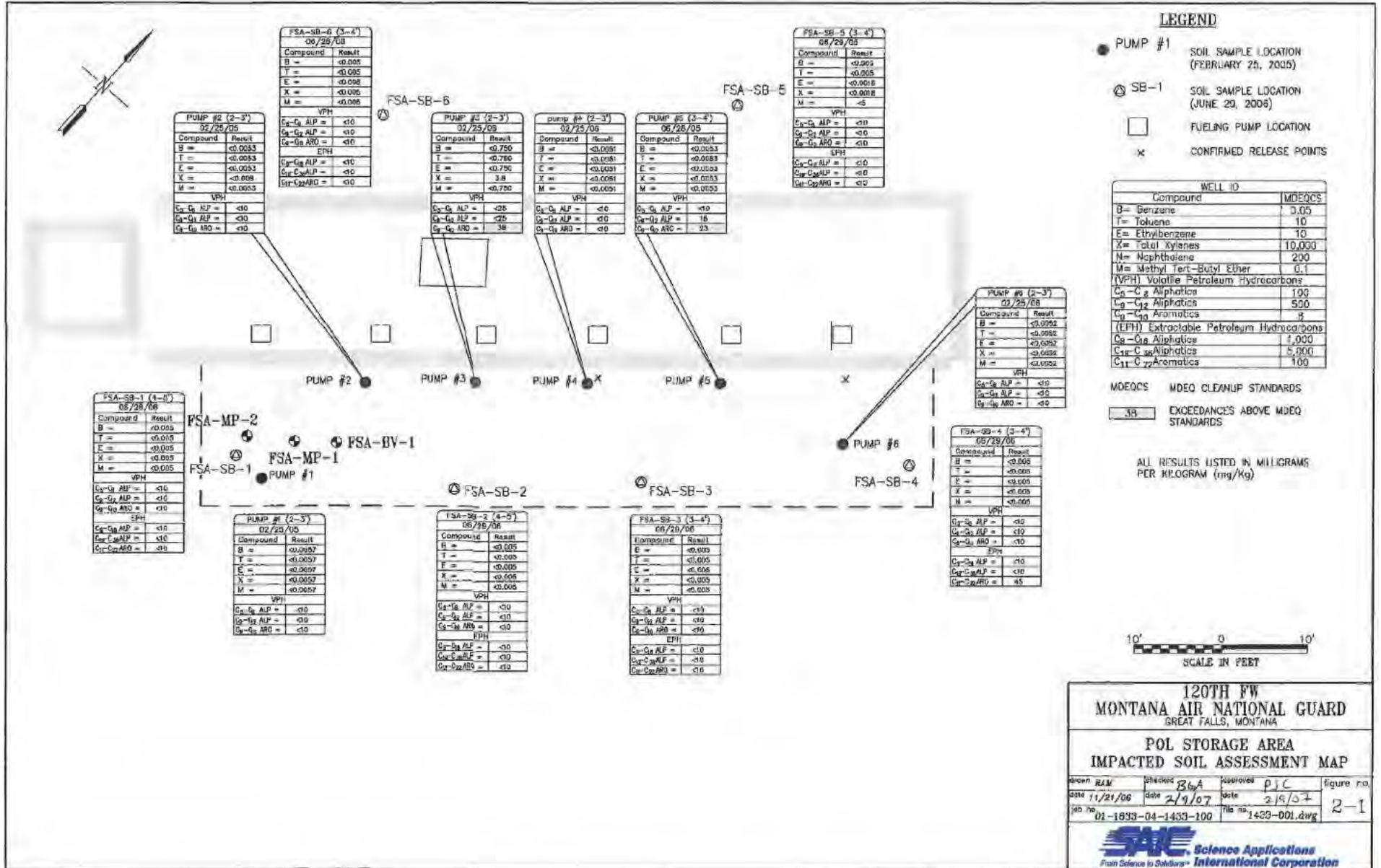


Table B7-3

Source: SAIC, 2005

**Table 3**  
**Summary of Soil Laboratory Analyses at Site 7**  
 Montana Air National Guard  
 Great Falls, Montana

Sample ID	Sample Date	Field PID Values (ppmv)	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethyl-benzene (mg/Kg)	m,p-Xylenes (mg/Kg)	o-Xylenes (mg/Kg)	Total Xylenes (mg/Kg)	Naphthalene (mg/Kg)	MTBE (mg/Kg)	Volatile Petroleum Hydrocarbons		
											C <sub>5</sub> -C <sub>8</sub> Aliphatics (mg/Kg)	C <sub>9</sub> -C <sub>12</sub> Aliphatics (mg/Kg)	C <sub>9</sub> -C <sub>10</sub> Aromatics (mg/Kg)
											<b>Pump #1</b> (2-3 ft bgs)	2/25/05	27.4
<b>Pump #2</b> (2-3 ft bgs)	2/25/05	30.9	<.0053	<.0053	<.0053	<.0053	0.0027	0.0027	<.0053	<.0053	<10	<10	<10
<b>Pump #3 DL</b> (2-3 ft bgs)	2/25/05	675	<.060	<.060	<.060	0.38	0.7	1.08	3	<.060	<25	<25	<b>38</b>
<b>Pump #3 DL2</b> (2-3 ft bgs)	2/25/05	675	<.750	<.750	<.750	0.88	3	3.88	<b>13</b>	<.750	NA	NA	NA
<b>Pump #4</b> (2-3 ft bgs)	2/25/05	49	<.0051	<.0051	<.0051	<.0051	<.0051	<.0051	<.0051	<.0051	<10	<10	<10
<b>Pump #5</b> (2-3 ft bgs)	2/25/05	148	<.0053	<.0053	<.0053	<.0053	<.0053	<.0053	<.0053	<.0053	<10	16	<b>23</b>
<b>Pump #6</b> (2-3 ft bgs)	2/25/05	33.9	<.0052	<.0052	<.0052	<.0052	<.0052	<.0052	<.0052	<.0052	<10	<10	<10
<b>Excavation Pile</b>	2/25/05	42.2	<.0056	<.0056	<.0056	<.0056	<.0056	<.0056	<.0056	<.0056	<10	<10	<10
<b>Montana Department of Environmental Quality Risk Based Screening Levels for Soil (mg/Kg)</b>													
<b>Default RBSLs<sup>1</sup></b>			0.05	10	10	NA	NA	20	9	0.1	10	70	8
<b>MANG Specific RBSLs<sup>2</sup></b>			0.2	60	60	NA	NA	60	50	0.3	50	300	40

## NOTES:

<sup>1</sup> Default RBSLs are based on residential land use, surface soil (0-2 ft), and <10 ft to groundwater.

<sup>2</sup> MANG specific RBSLs are based on commercial land use, subsurface soil (<2 ft), and >20 ft to groundwater.

**Bold and highlighted** values indicate the concentrations are above the default RBSLs

RBSLs = Risk Based Screening Levels

mg/Kg = milligrams per kilogram

PID = photoionization detection

ppmv = parts per million volume

ft bgs = feet below ground surface

Figure B7-4  
 Source: HAZWRAP, 1997

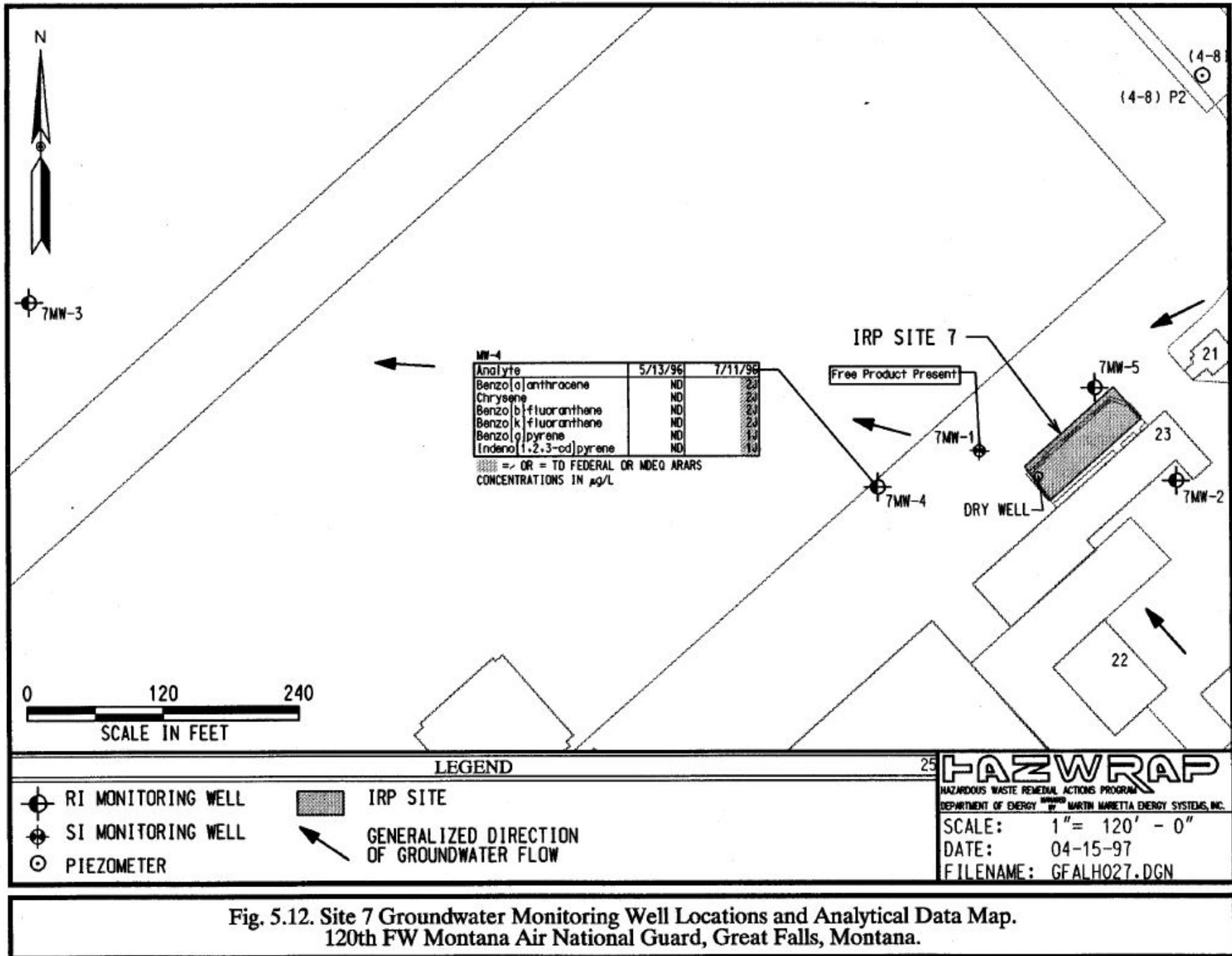


Fig. 5.12. Site 7 Groundwater Monitoring Well Locations and Analytical Data Map.  
 120th FW Montana Air National Guard, Great Falls, Montana.

Table 3-3. Summary of Soil Laboratory Analyses at the POL Storage Area

Sample ID	Sample Date	Field PID Values (ppmv)	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethylbenzene (mg/Kg)	Total Xylenes (mg/Kg)	MTBE (mg/Kg)	Volatile Petroleum Hydrocarbons			Extractable Petroleum Hydrocarbons		
								C <sub>5</sub> -C <sub>8</sub> Aliphatics	C <sub>9</sub> -C <sub>12</sub> Aliphatics	C <sub>9</sub> -C <sub>10</sub> Aromatics	C <sub>9</sub> -C <sub>13</sub> Aliphatics	C <sub>14</sub> -C <sub>36</sub> Aliphatics	C <sub>11</sub> -C <sub>22</sub> Aromatics
								(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
FSA-SB-1 (4-5 ft bgs)	6/28/06	0	<.005	<.005	<.005	<.005	<.005	<10	<10	<10	<10	<10	<10
FSA-SB-2 (4-5 ft bgs)	6/29/06	0	<.005	<.005	<.005	<.005	<.005	<10	<10	<10	<10	<10	<10
FSA-SB-3 (3-4 ft bgs)	6/29/06	0	<.005	<.005	<.005	<.005	<.005	<10	<10	<10	<10	<10	<10
FSA-SB-4 (2-3 ft bgs)	6/29/06	0	<.005	<.005	<.005	<.005	<.005	<10	<10	<10	<10	<10	45
FSA-SB-5 (3-4 ft bgs)	6/29/06	59	<.005	<.005	.0018 J	0.018	<5	<10	<10	<10	<10	<10	<10
FSA-SB-6 (3-4 ft bgs)	6/29/06	42	<.005	<.005	<.005	<.005	<.005	<10	<10	<10	<10	<10	<10
FSA-SB-6 DUP	6/29/06	42	<.005	<.005	<.005	<.005	<.005	<10	<10	<10	<10	<10	<10
<b>Motana Department of Environmental Quality Risk Based Screening Levels for Soil (mg/Kg)</b>													
<b>Default RBSLs<sup>1</sup></b>			<b>0.05</b>	<b>10</b>	<b>10</b>	<b>200</b>	<b>0.1</b>	<b>100</b>	<b>500</b>	<b>8</b>	<b>1,000</b>	<b>5,000</b>	<b>100</b>
<b>MANG Specific RBSLs<sup>2</sup></b>			<b>0.2</b>	<b>60</b>	<b>60</b>	<b>200</b>	<b>0.3</b>	<b>100</b>	<b>500</b>	<b>40</b>	<b>1,000</b>	<b>5,000</b>	<b>600</b>

## NOTES:

<sup>1</sup> Default RBSLs are based on residential land use, subsurface soil (>2 ft), and <10 ft to groundwater.

<sup>2</sup> MANG specific RBSLs are based on commercial land use, subsurface soil (>2 ft), and >20 ft to groundwater.

**Bold and highlighted values indicate the concentrations are above the default RBSLs**

RBSLs = Risk Based Screening Levels

mg/Kg = milligrams per kilogram

PID = photoionization detection

ppmv = parts per million volume

ft bgs = feet below ground surface



Table 3.46 Chemical Constituents Detected in Groundwater  
Site 7: Dry Well Off Corrosion Control Building  
(CLP Laboratory Analysis)

Chemical	Round 1		Round 2		Background		ARARs		
	MANG-7 MW1		MANG-7 MW1		MANG-BG MW1	MANG-BG MW1			
<b>GC volatile organics (<math>\mu\text{g/L}</math>):</b>									
Benzene	11		4.1		ND	ND	5		
Ethyl benzene	160		27.5		ND	ND	700		
Xylenes (total)	500		240		ND	ND	10,000		
<b>CLP semivolatile organics (<math>\mu\text{g/L}</math>):</b>									
Naphthalene	24		ND		ND	ND	--		
2-Methylnaphthalene	11	J	ND		ND	ND	--		
2,4-Dimethylphenol	ND		2	J	ND	ND	--		
<b>Metals (<math>\mu\text{g/L}</math>):</b>									
Arsenic	1.5	JB	ND		1.1	JB	ND	50	
Barium	95	JB	145	B	56	JB	62.2	B	1,000
Lead	4.7	J	4.3	JN	4.9	J	4.3	JN	50
Zinc	30	J*	14	JB	15	JB*	9.8	JB	5,000
<b>Total petroleum hydrocarbons (mg/L)</b>	ND		ND		1		ND		NA

320SA\AU23409\T3-46.WK1

NA = not applicable.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Organics:**

J The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

**Metals:**

B Reported value is less than reporting limit but greater than the instrument detection limit.

N Spiked sample recovery not within control limits set by lab QA/QC.

\* Duplicate analysis not within control limits set by lab QA/QC.

J The value reported is an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

Table B7-6  
Source: HAZWRAP, 1997

Table 6-14. Groundwater Organic Analytical Data - Site 7 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION				Diluted Sample				Field Duplicate					
Site				7	7	7	7	7	7	7	7	7	7
Monitoring Well				MW-2	MW-2	MW-2	MW-3	MW-3	MW-3	MW-3	MW-4	MW-4	MW-5
Sample Number				7-MW2-GW1	7-MW2-GW2	7-MW2-GW2DL	7-MW3-GW1	7-MW3-GW2	7-MW3-GW2A	7-MW3-GW3	7-MW4-GW1	7-MW4-GW2	7-MW5-GW1
Matrix				Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
Date Sampled				5/12/96	7/8/96	7/8/96	5/8/96	5/15/96	5/15/96	7/11/96	5/13/96	7/11/96	5/13/96
Date Analyzed				5/15/96	7/17/96	7/18/96	5/8/96	5/16/96	5/16/96	7/16/96	5/15/96	7/26/96	5/15/96
ANALYTICAL INFORMATION													
VOCs													
Analyte	CRQL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Chloromethane	1	NE	NE	ND	ND	ND	ND	ND	ND	0.18J	ND	R	ND
1,1-Dichloroethene	1	7	5.7	ND	ND	ND	ND	ND	ND	0.07J	ND	R	ND
Acetone	1	NE	NE	1.8J	R	R	R	R	R	R	1.7J	R	1.4J
1,1-Dichloroethane	1	NE	NE	ND	ND	ND	ND	ND	ND	0.13J	ND	R	ND
cis-1,2-Dichloroethene	1	70	70	ND	ND	ND	0.31J	0.3J	0.29J	0.31J	1.2	R	ND
2-Butanone	5	NE	NE	0.78J	R	R	R	R	R	R	0.66J	R	R
Chloroform	1	100	57	ND	ND	ND	0.05J	4.8	4.8	2.5J	ND	R	0.21J
1,1,1-Trichloroethane	1	200	200	ND	ND	ND	ND	0.2J	0.18J	0.2J	ND	R	ND
Carbon Tetrachloride	1	5	2.5	ND	ND	ND	ND	0.1J	ND	ND	ND	R	ND
Benzene	1	5	5	9.8	4.1	3.4	ND	ND	ND	ND	0.36J	0.44J	0.34J
Trichloroethene	1	5	5	ND	ND	ND	ND	1.1	1.1	0.87J	ND	R	ND
Bromodichloromethane	1	100	5.6	ND	ND	ND	ND	0.12J	0.13J	ND	ND	R	ND
4-Methyl-2-pentanone	5	NE	NE	0.47J	ND	ND	ND	ND	ND	ND	ND	R	0.32J
Toluene	1	1,000	1,000	ND	0.11J	ND	ND	ND	ND	1.9J	ND	1.5J	0.28J
Tetrachloroethene	1	5	5	ND	ND	ND	ND	1.9	1.9	0.45J	ND	R	ND
2-Hexanone	5	NE	NE	ND	R	R	ND	ND	ND	R	ND	R	R
Ethylbenzene	1	700	700	23	25	19	ND	ND	ND	ND	0.69J	ND	0.3J
Styrene	1	100	100	ND	0.19J	ND	ND	ND	ND	ND	R	ND	ND
Bromoform	1	100	43	ND	ND	ND	ND	ND	ND	0.18J	ND	R	ND
1,4-Dichlorobenzene	1	75	75	ND	0.1J	ND	ND	ND	ND	0.64J	ND	0.98J	0.41J
1,2-Dibromo-3-chloropropane	1	0.2	0.2	R	ND	ND	R	R	R	R	R	R	R
Xylene	1	10,000	10,000	8.8	85J	46	ND	ND	ND	ND	0.23J	0.32J	0.81J
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
SVOCs													
Analyte	CRQL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
2-Methylphenol	10	NE	NE	ND	1J	ND	ND	ND	ND	ND	ND	ND	1J
2-Methylnaphthalene	10	NE	NE	ND	ND	ND	ND	ND	ND	1J	ND	ND	ND
Acenaphthene	10	NE	20	ND	ND	ND	ND	ND	ND	1J	ND	ND	ND
Dibenzofuran	10	NE	NE	ND	ND	ND	ND	ND	ND	1J	ND	ND	ND
Fluorene	10	NE	13,000	ND	ND	ND	ND	ND	ND	1J	1J	ND	ND
Diethylphthalate	10	NE	23,000	ND	ND	ND	1J	ND	ND	1J	ND	1J	ND
Anthracene	10	NE	6,800	ND	ND	ND	ND	ND	ND	1J	ND	1J	ND
Di-n-butylphthalate	10	NE	2,700	ND	1J	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	10	NE	300	ND	ND	ND	ND	ND	ND	ND	10J	ND	ND
Pyrene	10	NE	6,800	ND	ND	ND	ND	ND	ND	ND	6J	ND	ND
Benzo[a]anthracene	10	NE	0.044	ND	ND	ND	ND	ND	ND	ND	2J	ND	ND
Chrysene	10	NE	0.044	ND	ND	ND	ND	ND	ND	ND	2J	ND	ND
3,3'-Dichlorobenzidine	10	NE	0.39	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-ethylhexyl)phthalate	10	6	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo[b]fluoranthene	10	NE	0.044	ND	ND	ND	ND	ND	ND	ND	2J	ND	ND
Benzo[k]fluoranthene	10	NE	0.044	ND	ND	ND	ND	ND	ND	ND	2J	ND	ND
Benzo[a]pyrene	10	0.2	0.2	ND	ND	ND	ND	ND	ND	ND	1J	ND	ND
Indeno[1,2,3-cd]pyrene	10	NE	0.044	ND	ND	ND	ND	ND	ND	ND	1J	ND	ND
Benzo[g,h,i]perylene	10	NE	NE	ND	ND	ND	ND	ND	ND	ND	1J	ND	ND
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Date Sampled				5/12/96	7/8/96		5/15/96	5/15/96	7/11/96	5/13/96	7/11/96	5/13/96	7/8/96
Date Analyzed				5/20/96	7/17-24/96		5/23/96	5/17/96	7/18-24/96	5/20/96	7/18-25/96	5/20/96	7/17-25/1996
Petroleum Hydrocarbons													
Analyte	RL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
JP-4	0.25	NE	NE	0.27	ND	ND	0.27NJ	ND	0.52	7.7	0.29	ND	ND
Diesel range, as diesel	0.25	NE	NE	ND	ND	ND	0.26NJ	0.34	1.8	ND	0.25NJ	ND	ND
Gasoline range	0.25	NE	NE	0.34NJ	0.68	ND	ND	ND	1.4NJ	0.48J	ND	ND	ND
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Legend													
MCLs	Federal Drinking Water Standard Maximum Contaminant Level												
MDEQ	Montana Department of Environmental Quality Human Health Standards												
NE	ARAs Not Established												
DW	Dry Well												
SB	Soil Boring												
SS	Sediment/Surface Soil												
(DISS)	Dissolved Sample (total metals)												
•••••	Concentration > or = MCLs OR MDEQ, ARAs, or Ave + 2 Standard Dev.												
CRQL	Contract Required Quantitation Limit												
RL	Reporting Limit												
ND	Compound Not Detected												
J	Concentration Estimated												
R	Results Rejected on Basis of Laboratory QA/QC												
N	Presumptive Evidence of Compound												

Table B7-6 (Con't)

Source: HAZWRAP, 1997

Table 5.15. Groundwater Inorganic Analytical Data - Site 7 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION															
Site	7			7			7			7			7		
Monitoring Well	MW2			MW2			MW3			MW3			MW3		
Sample Number	7-MW2-GW1 (Diss.)			7-MW2-GW1			7-MW3-GW2A (Diss.)			7-MW3-GW2A			7-MW3-GW2 (Diss.)		
Matrix	water			water			water			water			water		
Date Sampled	5/12/96			5/12/96			7/9/96			7/9/96			5/15/96		
Date Analyzed	5/24/96 - 8/21/96			5/24/96 - 8/21/96			7/17-24/96			7/19-27/96			5/24/96 - 8/4/96		
ANALYTICAL INFORMATION															
INORGANICS															
Analyte	CRDL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result		
Arsenic	10	50	18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Barium	200	2000	1000	96J	108J	108J	118J	88.4J	138J	91.7J	127J	53.4J	102J		
Beryllium	4	4	40	ND	ND	0.3J	0.3J	ND	ND	ND	ND	ND	0.4J		
Chromium	10	100	100	ND	ND	ND	7J	ND	ND	ND	ND	9.7J	11.3		
Copper	25	1300**	1000	ND	ND	ND	ND	ND	4.6J	ND	4.8J	ND	ND		
Lead	3	15**	15	ND	ND	ND	1.2J	ND	1.9J	ND	1.3J	ND	1.8J		
Nickel	40	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Zinc	20	NE	5000	60.8	73.7	9.1J	ND	22.8	52.8	19.8J	44.8	ND	43.8		
Units (mg/kg) Soil, (ug/L) Water	ug/L														

SAMPLE INFORMATION															
Site	7			7			7			7			7		
Monitoring Well	MW4			MW4			MW5			MW5			MW5		
Sample Number	7-MW4-GW1 (Diss.)			7-MW4-GW1			7-MW5-GW1 (Diss.)			7-MW5-GW1			7-MW5-GW2 (Diss.)		
Matrix	water			water			water			water			water		
Date Sampled	5/13/96			5/13/96			7/11/96			7/11/96			5/13/96		
Date Analyzed	5/24/96 - 8/21/96			5/24/96 - 8/21/96			7/23/96 - 8/2/96			7/23/96 - 8/2/96			5/24/96 - 8/21/96		
ANALYTICAL INFORMATION															
INORGANICS															
Analyte	CRDL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result		
Arsenic	10	50	18	ND	ND	1.5J	2.3J	ND	ND	ND	ND	ND	ND		
Barium	200	2000	1000	180J	380	269	371	103J	147J	152J	222	ND	ND		
Beryllium	4	4	40	ND	1.6J	ND	0.5J	ND	0.3J	ND	1.1J	ND	ND		
Chromium	10	100	100	ND	ND	7.7J	21.8	ND	ND	ND	10.8	ND	ND		
Copper	25	1300**	1000	ND	27.9	ND	7.8J	ND	6.8J	ND	6.7J	ND	ND		
Lead	3	15**	15	ND	10	ND	2.7J	ND	2.2J	ND	4	ND	ND		
Nickel	40	100	100	ND	60.4	ND	13.5J	ND	ND	ND	6.1J	ND	ND		
Zinc	20	NE	5000	42.8	206	ND	50.5	ND	ND	5J	40.7	ND	ND		
Units (mg/kg) Soil, (ug/L) Water	ug/L														

- Legend
- MCLS Federal Drinking Water Standard Medium Contaminant Level
  - MDEQ Montana Department of Environmental Quality Human Health Standards
  - NE ARARs Not Established
  - DW Dry Well
  - SB Soil Boring
  - SS Sediment/Surface Soil
  - (DISS) Dissolved Sample (total metals)
  - Concentration > or = MCLs or MDEQ ARARs, or Avg. +2 Standard Dev.
  - CRDL Contract Required Quantitation Limit
  - RL Reporting Limit
  - ND Compound Not Detected
  - J Concentration Estimated
  - R Results Rejected on Basis of Laboratory QA/QC
  - N Presumptive Evidence of Compound

Table 2.16  
EE/CA 1st Round (September 9, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW9D	8-MW1D
BTEX (ug/L)																				
Benzene		7.25	14		2.3J		230J		9.0J	7.6									8.7	
Toluene					5.8J		1.4J													
Ethylbenzene		9.45	170		12J		716J	16	150J	8.4									11	
Total Xylene		16J	430		4.1J		1200J	26	300J	2.6									2.9	
TVAH		32.65	614		24.2		2147.4J	42	459J	18.6									22.6	
TPH (mg/L)																				
Gasoline Range		0.85J	4	0.25	1.2		1.70J	0.76	2.5		0.34J		0.16	0.48J					0.11	0.425
Diesel Range		0.59J	12		2.4	0.15	3.1J	0.74	1.9	0.69J									0.81J	
Metals (T/D, mg/L)																				
Silver																				
Arsenic																				ND
Beryllium																				
Cadmium																				
Chromium																				
Copper					0.01/ND															
Mercury																				
Nickel			0.02/ND	0.003/ND	0.004/ND	0.004/ND					0.003/ND	0.002/ND			0.003/ND					
Lead					0.004/ND										0.007/ND					
Antimony															0.006					
Selenium																				
Thallium																				
Zinc	0.05/ND	ND/0.33	0.005/0.11	0.06/0.02	0.03/ND	0.06/0.23		ND/1.50	0.04/ND		0.02/0.04	0.02ND	0.03/ND	0.04	0.03/0.05	.05/0.02	0.02/0.94	0.09/ND	0.11	0.02/0.03

Blank Spaces - Analysis performed but have no detection.  
D - Duplicate Sample.  
DIWI - Deionized Water.  
GF - Great Falls.  
GW1 & GW2 - 1st and 2nd Round Groundwater.  
J - Estimated Values.  
mg/L - milligrams per liter.  
MS/MSD - Matrix Spike/Matrix Spike Duplicate.  
MW - Monitoring Well.  
Result Presentation - 0.05/0.03 means Total/Dissolved Results.

ND - Not Detected.  
NA - Not Applicable.  
PWI - Potable Water  
P&DWI - Purge and Development Water.  
TB - Trip Blank.  
TPH - Total Petroleum Hydrocarbons.  
TVAH - Total Volatile Aromatic Hydrocarbons.  
ug/L - micrograms per liter.  
VOCs - Volatile Organic Compounds.  
Shaded areas indicate results above ARARs.

Table B7-7 (Con't)  
Source: OTC, 1998a

Table 2.16 (Concluded)  
EE/CA 1st Round (September 9, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW9D	8-MW1D
VOCs (ug/L)																				
Dichlorodifluoromethane																				
Chloromethane																1.2				
Vinyl chloride																				
Bromomethane																				
Chloroethane																				
Tichlorofluoromethane																				
1,1-Dichloroethene											1.1J	3.4J								
Methylene chloride				2.2							2.45			1.9J						1.6J
Trans-1,2-Dichloroethene																				
1,1-Dichloroethene											2.5		8.8J	4.2						3.1
Chloroform	3.4			1.7				9.1	1.8		3.1		5.2J	3.4	14	6.9	2.6			3.1
1,1,1-Trichloroethane											1.8	1.5J	4.7J	1.9						2
Carbon tetrachloride													1.0J							
1,2-Dichloroethane																				
2-Chloroethylvinyl ether																				
Trichloroethene				1.2							6.9	4.0J	3.8J	10.0		1.7	1.7			8.7
1,2-Dichloropropane																				
Bromodichloromethane								1.1							1.6					
cis-1,3-Dichloropropene																				
trans-1,3-Dichloropropene																				
1,1,2-Trichloroethane																				
Tetrachloroethene				1							2.8	3.45		2.3		1.3	6.2			2.6
Dibromochloromethane																				
Chlorobenzene																				
Bromoform																				
1,2,2,2-Tetrachloroethane																				
1,3-Dichlorobenzene																				
1,4-Dichlorobenzene																				
1,2-Dichlorobenzene																				

Blank Spaces - Analysis performed but have no detection.

D - Duplicate Sample.

DIWI - Deionized Water.

GF - Great Falls.

GW1 & GW2 - 1st and 2nd Round Groundwater.

J - Estimated Values.

mg/L - milligrams per liter.

MS/MSD - Matrix Spike/Matrix Spike Duplicate.

MW - Monitoring Well.

Result Presentation - 0.05/0.03 means Total/Dissolved Results.

NA - Not Applicable.

PWI - Potable Water.

P&DWI - Purge and Development Water.

TB - Trip Blank.

TPH - Total Petroleum Hydrocarbons.

TVAH - Total Volatile Aromatic Hydrocarbons.

ug/L - micrograms per liter.

VOCs - Volatile Organic Compounds.

Shaded areas indicate results above ARARs.

Table 2.18  
EE/CA 2nd Round (September 25, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW5D	8-MW6D
BTEX (ug/L)																				
Benzene		5.3J	6J		4.1J		130J	1.2J	11J	2.8										
Toluene								1.84J												
Ethylbenzene		10J	78J		3.3J	1.4	310J	17J	290J	1.9									1.3	
Total Xylene		12J	280J		14		980J	29J	700J	1.55										
TVAH		27.3J	464J		21.4J	1.4	1420J	49	1001J	6.75									1.3	
TPH (mg/L)																				
Gasoline Range		.052J	3.0J		1.8J		3.8J	0.91J	4.6J				0.013	0.11						
Diesel Range		0.98J	7.5		5.0J		4.1J	1.2J	2.6J	0.048									0.10J	
Metals (T/D, mg/L)																				
Silver																				
Arsenic																				
Beryllium																				
Cadmium																				
Chromium																				
Copper																				
Mercury																				
Nickel																				
Lead	.003/ND		.002/ND			ND/.004			ND/.013		.006/N	.003/	.004/ND							.004/ND
Antimony		.007/.008													.006/.005					
Selenium		.005/.006													.006/.008					
Thallium																				
Zinc	.04/.10	.06/.05	.05/.13	.06/.12	.10/.21	.36/.10	.06/0.0	.12/.45	.05/.32	.03/.20	.05/.23	.03/.33	.06/.34	.03/.49	.05/.55	.04/.33	ND/.10		0.08/.55	0.02/0.16

Blank Spaces - Analysis performed, but have no detection.  
D - Duplicate Sample.  
DIWI - Deionized Water.  
GF - Great Falls.  
GW1 & GW2 - 1st and 2nd Round Groundwater.  
J - Estimated Values.  
mg/L - milligrams per liter.  
MS/MSD - Matrix Spike/Matrix Spike Duplicate.  
MW - Monitoring Well.  
Result Presentation - 0.05/0.03 means Total/Dissolved results.

NA - Not Applicable.  
PWI - Potable Water.  
P&DWI - Purge and Development Water.  
TB - Trip Blank.  
TPH - Total Petroleum Hydrocarbons.  
TVAH - Total Volatile Aromatic Hydrocarbons.  
ug/L - micrograms per liter.  
VOCs - Volatile Organic Compounds.  
Shaded areas indicate results above ARARs.

Table B7-7 (Con't)  
Source: OTC, 1998a

Table 2.18 (Concluded)  
EE/CA 2nd Round (September 25, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW5	8-MW6D
VOCs (ug/L)																				
Dichlorodifluoromethane																				
Chloromethane						1.1	1.5							1.1						
Vinyl chloride																				
Bromomethane																				
Chloroethane																				
Tichlorofluoromethane																				
1,1-Dichloroethene												1.1	5.1	1						
Methylene chloride																				
Trans-1,2-Dichloroethene																				
1,1-Dichloroethane											1.3		13	6.7						
Chloroform	3.2			2.6				2.2	2.2		6.2	1.1	12	8.5	1.6	7.1	2.7			5.9
1,1,1-Trichloroethane											1.4	1.3	5.4	2.2						
Carbon tetrachloride																				
1,2-Dichloroethane																				
2-Chloroethylvinyl ether																				
Trichloroethene				1.4							4.1	4.1	53	20		1.7	1.6			3
1,2-Dichloropropane																				
Bromodichloromethane																				
cis-1,3-Dichloropropene																				
trans-1,3-Dichloropropene																				
1,1,2-Trichloroethane																				
Tetrachloroethene				1.1							3	6.9		2.1		1.4	4.1			1.3
Dibromochloromethane																				
Chlorobenzene																				
Bromoform																				
1,2,2,2-Tetrachloroethane																				
1,3-Dichlorobenzene																				
1,4-Dichlorobenzene																				
1,2-Dichlorobenzene																				

Blank Spaces - Analysis performed, but have no detection.

D - Duplicate Sample.

DIWI - Deionized Water.

GF - Great Falls.

GW1 & GW2 - 1st and 2nd Round Groundwater.

J - Estimated Values.

mg/L - milligrams per liter.

MS/MSD - Matrix Spike/Matrix Spike Duplicate.

MW - Monitoring Well.

Result presentation - 0.05/0.03 means Total/Dissolved results.

NA - Not Applicable.

PWI - Potable Water.

P&DWI - Purge and Development Water.

TB - Trip Blank.

TPH - Total Petroleum Hydrocarbons.

TVAH - Total Volatile Aromatic Hydrocarbons.

ug/L - micrograms per liter.

VOCs - Volatile Organic Compounds.

Shaded areas indicate results above ARARs.

**Table 3.43 Organic Constituents Detected in Soil Gas Survey**  
**Site 7: Dry Well Off Corrosion Control Building**  
 (ppb by volume, GC)

Sample ID	Grid Coordinates		1,2-DCE	TCE	Toluene	o-Xylene
A0	0	0	58	130	135	147
A1	0	-25	ND	ND	ND	ND
A2	0	-50	ND	ND	16	ND
A3	0	-75	ND	ND	ND	ND
A4	0	-100	ND	ND	ND	ND
B0	15	0	ND	ND	ND	ND
B1	15	-25	ND	1,100	318	ND
B2	15	-50	ND	ND	ND	290
B3	15	-75	ND	ND	ND	ND
B4	15	-100	ND	ND	ND	ND
C0	30	0	ND	ND	88	207
C1	30	-25	ND	ND	ND	ND
C2	30	-50	ND	ND	19	37
C3	30	-75	ND	13	ND	ND
C4	30	-100	ND	6	15	ND

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ND = not detected

Figure B8-1  
Source: ES, 1992a

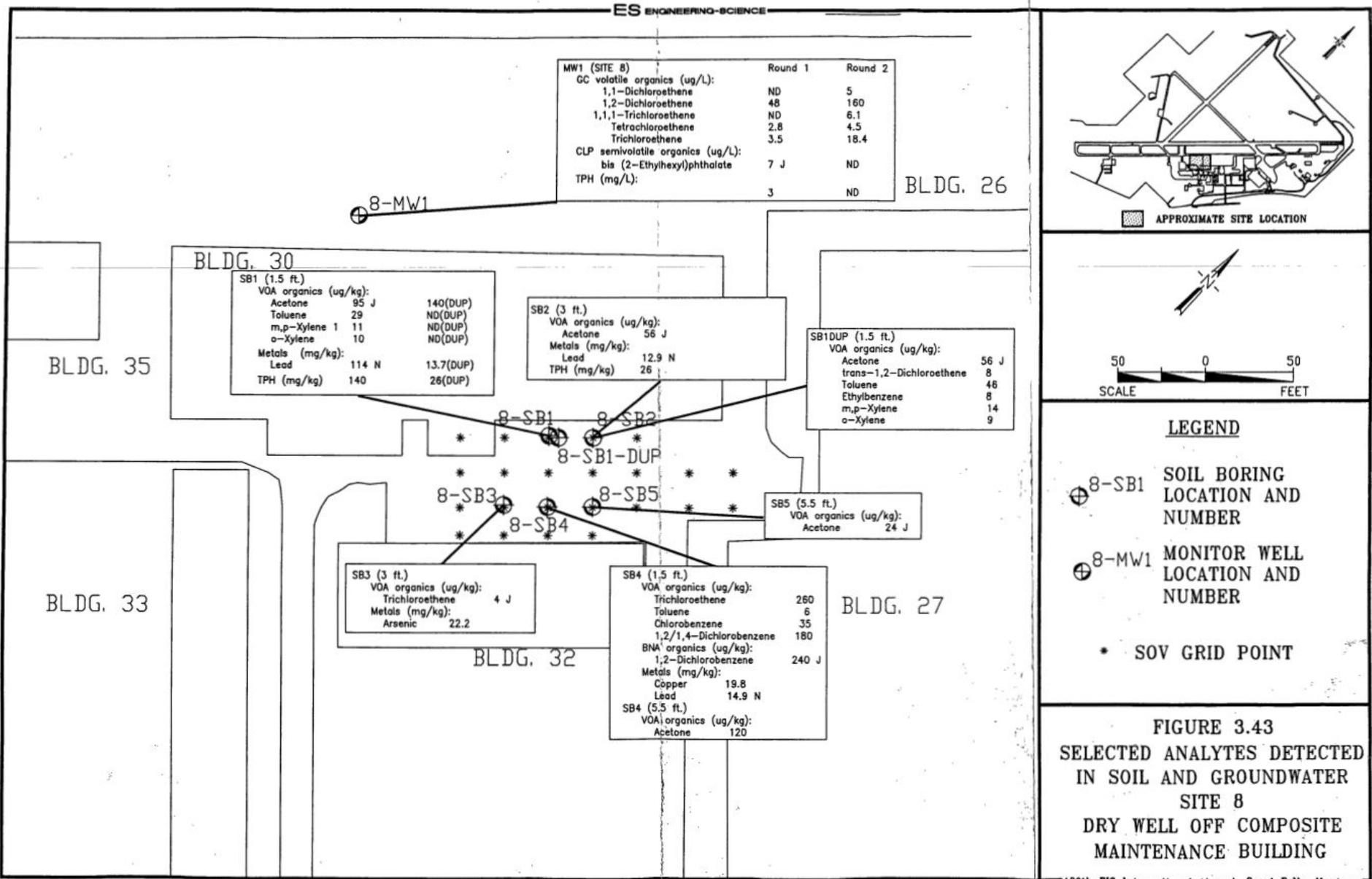


Table B8-1  
Source: ES, 1992a

Table 3.49 Chemical Constituents Detected in Soil  
Site 8: Dry Well Off Composite Maintenance Building (Bldg. 32)  
(CLP Laboratory Analysis)

Chemical	Background (1)	MANG-8 SB1-1.5	MANG-8 SB2-3	MANG-8 SB3-3	MANG-8 SB4-1.5	MANG-8 SB4-5.5	MANG-8 SB5-1	MANG-8 SB5-5.5	MANG-8 SB6-1.5	Health (2) Criteria
<b>Volatile organics (µg/kg):</b>										
Acetone	ND-157	95 J	140	ND	ND	120	ND	24 J	56 J	8E06
trans-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	8	1.6E06
Trichloroethene	ND	ND	ND	4 J	260	ND	ND	ND	ND	6.4E04
Toluene	ND-9	29	ND	ND	6	ND	ND	ND	46	1.6E07
Chlorobenzene	ND	ND	ND	ND	35	ND	ND	ND	ND	1.6E06
Ethyl benzene	ND	ND	ND	ND	ND	ND	ND	ND	8	8E06
m/p-Xylene (3)	ND	11	ND	ND	ND	ND	ND	ND	14	1.6E08
o-Xylene	ND	10	ND	ND	ND	ND	ND	ND	9	1.6E08
1,2/1,4-Dichlorobenzene	ND	ND	ND	ND	180	ND	ND	ND	ND	2.4E04
<b>BNA organics (µg/kg):</b>										
1,2-Dichlorobenzene	ND	ND	ND	ND	240 J	ND	ND	ND	ND	7.2E06
<b>Metals (mg/kg):</b>										
Arsenic	1.9-9.9	6.3	7.1	22.2	7.4	3.2	3.2	3.5	7.3	80
Barium	ND-1,231	182	302	119	223	151	73.4	88.5	187	5,600
Chromium	8.7-22.7	9.4	12.5	10.5	14	15.6	8.9	12.6	14.6	8E04
Copper	3.3-19.7	12.6	17.2	6	19.8	7.4	5.2	6.3	14.2	--
Lead	3.4-13.0	11.4 N	13.7 N	12.3 N	14.9 N	7.5 N	7.4 N	8.9 N	12.9 N	500
Nickel	3.6-17.6	7.5 B	8.5	ND	ND	7.8	ND	ND	7.6 B	1,600
Selenium	ND-0.66	ND	ND	0.32 B	ND	0.35 B	ND	ND	ND	240
Zinc	21.6-61.3	39.2 *	46.3 *	20.2 *	48.3 *	37.7 *	26 *	42.9 *	45.4 *	1.6E04
Total petroleum hydrocarbons (mg/kg)	ND	140	26	ND	ND	ND	ND	ND	22	--

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- (1) Background range is the average +/- two standard deviations.
- (2) Based upon soil ingestion, see section 4.
- (3) Meta- and para-xylene coelute and are not distinguishable by this method.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**VOA and BNA organics:**

**J** The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

**Metals:**

**B** Reported value is less than reporting limit but greater than the instrument detection limit.

**N** Spiked sample recovery not within control limits set by lab QA/QC.

**\*** Duplicate analysis not within control limits set by lab QA/QC.

Figure B8-2  
 Source: HAZWRAP, 1997

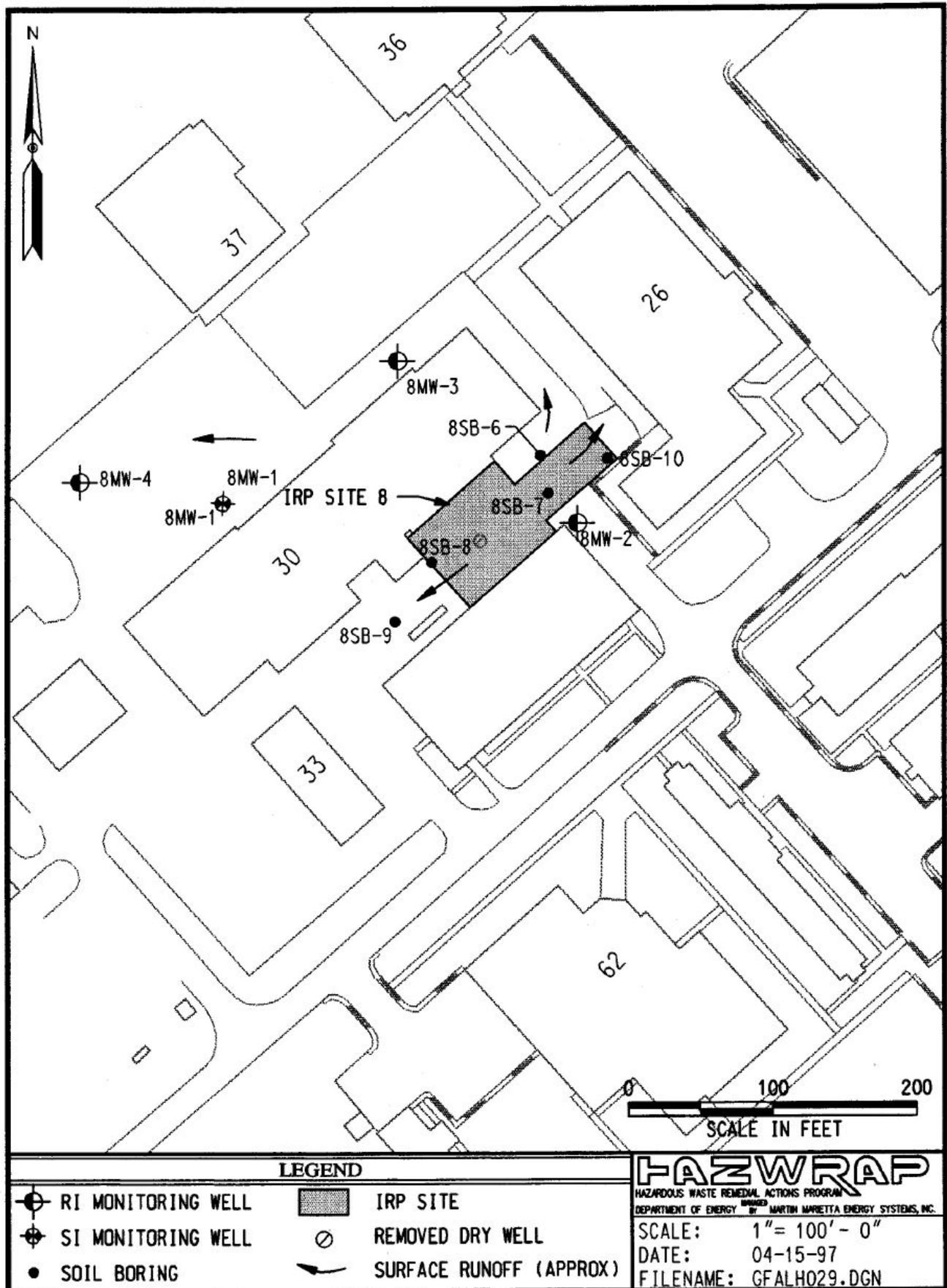


Fig. 5.13. Site 8, Soil Boring Location Map.  
 120 FW Montana Air National Guard, Great Falls, Montana.

Table B8-2

Source: HAZWRAP, 1997 Table 5.16. Soils Organic Analytical Data - Site 8 - 120th FW MANG, Great Falls, Montana

SAMPLE INFORMATION						Diluted Sample						
Location		SB6	SB6	SB6	SB7	SB7	SB7	SB7	SB8	SB8	Diluted Sample	SB8
Depth		0.5-2.4 ft	4.5-5.7 ft	9.5-10.3 ft	0.5-2.5 ft	0.5-2.5 ft	4.5-5.8 ft	8.9-10.3 ft	0.5-2.5 ft	4.5-5.5 ft	4.5-5.5 ft	9.5-10.5 ft
Sample Number		8-SB6-0.5-2.5	8-SB6-4.5-5.7	8-SB6-8.9.5-10.3	8-SB70.5-2.5	8-SB70.5-2.6DL	8-SB7-4.5-5.8	8-SB7-8.9-10.3	8-SB8-0.5-2.5	8-SB-4.5-5.5	8-SB8-4.5-5.5DL	8SB8-9.5-10.5
Matrix		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date Sampled		4/25/96	4/25/96	4/25/96	4/25/96	4/25/96	4/25/96	4/25/96	4/25/96	4/25/96	4/25/96	4/25/96
<b>ANALYTICAL INFORMATION</b>												
<b>VOCs</b>												
Date Analyzed		5/3/96	4/30/96	5/3/96	4/30/96	5/3/96	5/3/96	5/3/96	4/30/96	4/30/96	5/7/96	5/2/96
Analyte	CRQL	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Acetone	10	610J	ND	130J	390	950J	200J	130J	140J	540J	910J	820J
Carbon Disulfide	10	ND	1J	ND	1J	ND	1J	ND	1J	1J	ND	ND
Methylene Chloride	10	ND	2BJ	ND	ND	ND	ND	ND	ND	ND	90J	77J
2-Butanone	10	33	2J	6J	12	93	ND	11J	23	10J	ND	ND
4-Methyl-2-Pentanone	10	ND	ND	ND	25	14J	ND	ND	22	ND	ND	ND
Toluene	10	ND	ND	ND	ND	ND	1J	ND	1J	1J	ND	420J
1,1,2-Trichloroethane	10	ND	1J	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	10	2J	ND	4J	5J	18J	ND	5J	11J	11	ND	ND
Ethylbenzene	10	ND	ND	ND	ND	ND	1J	ND	ND	ND	ND	250J
1,2-Dichloroethene	10	ND	ND	ND	ND	ND	ND	ND	5J	9J	ND	86J
Xylene	10	2J	ND	1J	1J	4J	4J	1J	1J	1J	ND	1900
Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
<b>SVOCS</b>												
Date Analyzed		5/14/96	5/13/96	5/13/96	5/21/96		5/14/96	5/14/96	5/13/96	5/13/96		5/13/96
Analyte	CRQL	Result	Result	Result	Result		Result	Result	Result	Result		Result
Napthalene	330	ND	ND	ND	ND		ND	ND	ND	ND		380J
2-Methylnapthalene	330	ND	ND	ND	ND		ND	ND	ND	ND		220J
Di-n-butylphthalate	330	ND	ND	ND	ND		ND	ND	17J	ND		26J
bis(2-Ethylhexyl)phthalate	330	55J	ND	140J	96J		ND	190J	980	ND		100J
Di-n-octylphthalate	330	ND	ND	12J	ND		ND	14J	ND	ND		ND
Units		ug/kg	ug/kg	ug/kg	ug/kg		ug/kg	ug/kg	ug/kg	ug/kg		ug/kg
<b>Petroleum Hydrocarbons</b>												
Date Analyzed		5/9/96	5/9/96	5/9/96	5/9/96		5/9/96	5/8/96	5/9/96	6/9/96		5/9/96
Petroleum Hydrocarbons	RL	Result	Result	Result	Result		Result	Result	Result	Result		Result
JP-4	10	ND	ND	ND	ND		ND	ND	ND	ND		240
Disel Range, as diesel	10	ND	ND	ND	55NJ		ND	ND	ND	ND		340
Oil Range, as oil	100	15	ND	ND	1700		ND	ND	ND	ND		260NJ
Gasoline Range	5	180	ND	ND	ND		ND	ND	ND	ND		1200
Units		mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg		mg/kg
<b>Legend</b>												
MCLs	Federal Drinking Water Standard Maximum Contaminant Level											
MDEQ	Montana Department of Environmental Quality Human Health Standards											
NE	ARAs Not Established											
DW	Dry Well											
SB	Soil Boring											
SS	Sediment/Surface Soil											
(DISS)	Dissolved Sample (total metals)											
	Concentration > or = MCLs OR MEDQ, ARARs, or Avge + 2 Standard Dev.											
CRQL	Contract Required Quantitation Limit											
RL	Reporting Limit											
ND	Compound Not Detected											
J	Concentration Estimated											
R	Results Rejected on Basis of Laboratory QA/QC											
N	Presumptive Evidence of Compound											

Table B8-2 (Con't)

Source: HAZWRAP, 1997

Table 5.16. Soils Organic Analytical Data - Site 8 - 120th FW MANG, Great Falls, Montana (cont)

SAMPLE INFORMATION								
Location		SB9	SB9	SB9	SB10	SB10	SB10	SB10
Depth		1-3 ft	4.5-5.5 ft	8.5-9.4 ft	1-3 ft	4.5-6.5 ft	4.5-6.5 ft	9-9.9 ft
Sample Number		8-SB9-1-3	8-SB9-4.5-5.5	8-SB9-8.5-9.4	8-SB10-1-3	8-SB10-4.5-6.5	8-SB10-4.5-6.5DL	8-SB10-9-9.9
Matrix		Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date Sampled		4/30/96	4/30/96	4/30/96	4/30/96	4/30/96	4/30/96	4/30/96
ANALYTICAL INFORMATION								
VOCs								
Date Analyzed		5/3/96	5/6/96	5/6/96	5/6/96	5/6/96	5/7/96	5/6/96
Analyte	CRQL	Result	Result	Result	Result	Result	Result	Result
Acetone	10	28	82	93	210	490J	900J	160
Carbon Disulfide	10	ND	ND	1J	1J	ND	ND	ND
2-Butanone	10	4J	ND	8J	2J	2J	ND	10J
4-Methyl-2-Pentanone	10	6J	ND	ND	ND	ND	ND	ND
Toluene	10	ND	1J	1J	1J	1J	ND	1J
2-Hexanone	10	4J	ND	2J	ND	ND	ND	ND
Xylene	10	ND	1J	ND	ND	1J	ND	1J
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SVOCs								
Date Analyzed		5/15/96	5/15/96	5/15/96	5/16/96	5/16/96		5/16/96
Analyte	CRQL	Result	Result	Result	Result	Result		Result
Bis(2-Ethylhexyl)phthalate	330	200J	190J	ND	ND	ND		ND
Di-n-Octylphthalate	330	6J	14J	ND	ND	ND		ND
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg		ug/kg
Date Analyzed		5/17/96	5/17/96	5/17/96	5/17/96	5/18/96		5/17/96
Petroleum Hydrocarbons	CRQL	Result	Result	Result	Result	Result		Result
JP-4, Diesel-Oil-Gasoline Range: ND	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg
RL 10, 10, 100, 5 mg/kg, respectively								
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg
<b>Legend</b>								
MCLs	Federal Drinking Water Standard Maximum Contaminant Level							
MDEQ	Montana Department of Environmental Quality Human Health Standards							
NE	ARAs Not Established							
DW	Dry Well							
SB	Soil Boring							
SS	Sediment/Surface Soil							
(DISS)	Dissolved Sample (total metals)							
	Concentration > or = MCLs OR MEDQ, ARARs, or Avge + 2 Standard Dev.							
CRQL	Contract Required Quantitation Limit							
RL	Reporting Limit							
ND	Compound Not Detected							
J	Concentration Estimated							
R	Results Rejected on Basis of Laboratory QA/QC							
N	Presumptive Evidence of Compound							

Table B8-2 (Con't)  
Source: HAZWRAP, 1997

Table 5.17. Soil Inorganic Analytical Data - Site 8 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION		AVG. +/- TWO							
Site	STD. DEV.	8	8	8	8	8	8	8	8
Location		SB6	SB6	SB6	SB7	SB7	SB7	SB8	SB8
Sample Number		8-SB6-0.5-2.4	8-SB6-4.5-5.7	8-SB6-9.5-10.3	8-SB7-0.5-2.5	8-SB7-4.5-5.8	8-SB7-8.9-10.3	8-SB8-0.5-2.5	8-SB8-4.5-5.5
Matrix		soil	soil	soil	soil	soil	soil	soil	soil
Date Sampled		4/25/96	4/25/96	4/25/96	4/25/96	4/25/96	4/25/96	4/25/96	4/25/96
Date Analyzed		5/7-14/96	5/7-14/96	5/7-14/96	5/7-14/96	5/7-14/96	5/7-14/96	5/7-14/96	5/7-14/96
ANALYTICAL INFORMATION									
INORGANICS									
Analyte		RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT
Arsenic	1.9 - 9.9	8.6	2.5	3.3	7.6	2.5	3.3	10.5	4
Barium	ND - 1231	358	78.3	128	436	96.1	141	186	89.5
Beryllium	NE	0.52J	0.26J	0.3J	0.45J	0.29J	0.43J	0.62J	0.29J
Cadmium	NE	ND	ND	ND	ND	ND	ND	0.48J	ND
Chromium	8.7 - 22.7	15.3	7.8	12.7	12.1	8.3	13.2	13.2	7.4
Copper	8.7 - 19.7	37.4	11	11.1	26.7	10	13.3	34	11.4
Lead	3.4 - 13	8.1	5.9	7.9	18.6	6.2	7.7	15	6.5
Mercury	NE	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	3.6 - 17.6	11.9	8.6	11	10.6	8.8	9.1	12.5	9
Selenium	ND - 0.66	ND	ND	0.28J	ND	ND	0.37J	ND	ND
Thallium	NE	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	21.6 - 61.3	52.7	47.5	44.8	137	41.7	55.3	68.3	42.3
Units (mg/kg) Soil, (ug/L) Water									

SAMPLE INFORMATION		AVG. +/- TWO							
Site	STD. DEV.	8	8	8	8	8	8	8	8
Location		SB8	SB9	SB9	SB9	SB10	SB10	SB10	SB10
Sample Number		8-SB8-9.5-10.5	8-SB9-1-3	8-SB9-4.5-5.5	8-SB9-8.5-9.4	8-SB10-1-3	8-SB10-4.5-6.5	8-SB10-9-9.9	
Matrix		soil	soil	soil	soil	soil	soil	soil	
Date Sampled		4/30/96	4/30/96	4/30/96	4/30/96	4/30/96	4/30/96	4/30/96	
Date Analyzed		5/7-14/96	5/9/96 - 6/14/96	5/9/96 - 6/14/96	5/9/96 - 6/14/96	5/9/96 - 6/14/96	5/9/96 - 6/14/96	5/9/96 - 6/14/96	
ANALYTICAL INFORMATION									
INORGANICS									
Analyte		RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	
Arsenic	1.9 - 9.9	3.5	22.4	3.1	5	3.8	2.3	6.7	
Barium	ND - 1231	160	168	130	209	229	100	93.9	
Beryllium	NE	0.45J	0.53J	0.3J	0.42J	0.36J	0.37J	0.34J	
Cadmium	NE	ND	ND	ND	ND	ND	ND	ND	
Chromium	8.7 - 22.7	10.7	11.1	7.3	14.5	9.1	9	6.1	
Copper	8.7 - 19.7	12.7	36.6	24.9	10.9	15.9	11.5	22.1	
Lead	3.4 - 13	7.4	17.2	6.1	6.5	6.7	5.1	8	
Mercury	NE	ND	ND	ND	ND	ND	ND	0.14	
Nickel	3.6 - 17.6	8.5	9.2	7.9	10.9	9.1	8.8	11.2	
Selenium	ND - 0.66	ND	ND	ND	ND	ND	ND	ND	
Thallium	NE	0.42	ND	ND	ND	ND	ND	ND	
Zinc	21.6 - 61.3	53.9	67.8	56.4	56	43.8	38	54.4	
Units (mg/kg) Soil, (ug/L) Water									

Legend

- MCLs Federal Drinking Water Standard Maximum Contaminant Level
- MDEQ Montana Department of Environmental Quality Human Health Standards
- NE ARAs Not Established
- DW Dry Well
- SB Soil Boring
- SS Sediment/Surface Soil
- (DISS) Dissolved Sample (total metals)
- Concentration > or = MCLs OR MDEQ, ARARs, or Avge + 2 Standard Dev.
- CRQL Contract Required Quantitation Limit
- RL Reporting Limit
- ND Compound Not Detected
- J Concentration Estimated
- R Results Rejected on Basis of Laboratory QA/QC
- N Presumptive Evidence of Compound

Figure B8-3  
 Source: HAZWRAP, 1997

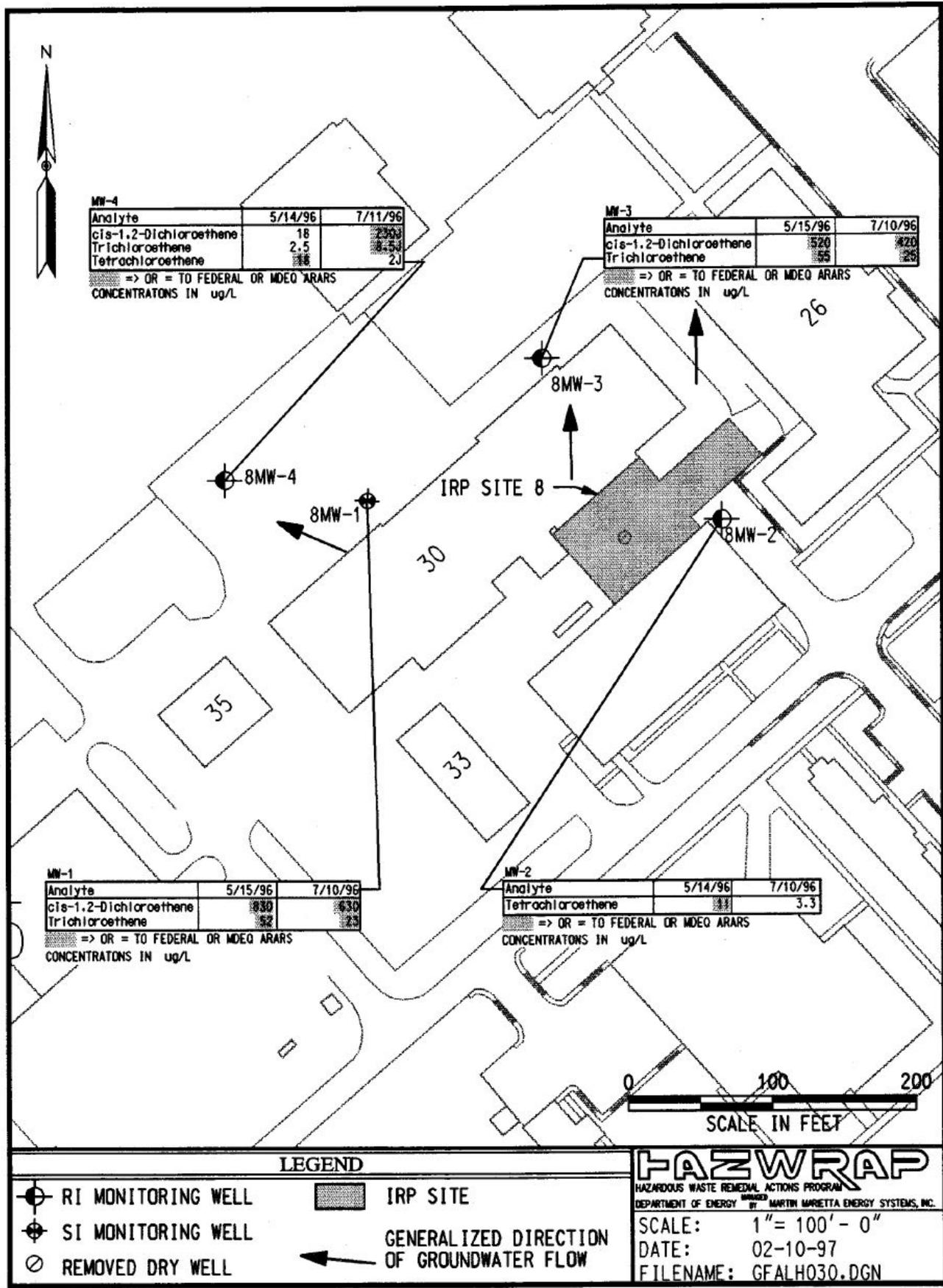


Fig. 5.14. Site 8, Groundwater Monitoring Well Location and Analytical Data Map.  
 120 FW Montana Air National Guard, Great Falls, Montana.

Table 3.50 Chemical Constituents Detected in Groundwater  
Site 8: Dry Well Off Composite Maintenance Building (Bldg. 32)  
(CLP Laboratory Analysis)

Chemical	Round 1 MANG-8 MW1	Round 2 MANG-8 MW1	Background		ARARs (1)
			Round 1 MANG-BG MW1	Round 2 MANG-BG MW1	
GC volatile organics ( $\mu\text{g/L}$ ):					
Chloroform	ND	2.3 J	ND	ND	100
1,1-Dichloroethane	ND	5	ND	ND	
1,2-Dichloroethane	48.0	160	ND	ND	70
1,1,1-Trichloroethane	ND	6.1	ND	ND	
Tetrachloroethene	2.8	4.5	ND	ND	5
Trichloroethene	3.5	18.4	ND	ND	5
CLP semivolatile organics ( $\mu\text{g/L}$ ):					
bis(2-Ethylhexyl)phthalate	7 J	ND	ND	ND	4
Metals ( $\mu\text{g/L}$ ):					
Arsenic	ND	ND	1.1 JB	ND	50
Barium	70 JB	51.2 B	56 JB	62.2 B	1,000
Lead	5.8 J	4.3 JN	4.9 J	4.3 JN	50
Zinc	11 JB*	9.4 JB	15 JB*	9.8 JB	5,000
Total petroleum hydrocarbons (mg/L)	3	ND	1	ND	NA

3205A/AU/23-409/T3-50.WK1

(1) ARARs are proposed only. These are MCLs where available, otherwise WQC.

NA = not applicable.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

**Organics:**

J The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit. For chloroform on sample MANG-8-MW1 (round 2) the compound was detected at less than 5 times the amount detected in an associated blank.

**Metals:**

B Reported value is less than reporting limit but greater than the instrument detection limit.

N Spiked sample recovery not within control limits set by lab QA/QC.

\* Duplicate analysis not within control limits set by lab QA/QC.

J The value reported is an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

Table B8-4

Source: HAZWRAP, 1997

Table 5.18. Groundwater Organic Analyses - Site 8 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION				Diluted Sample		Diluted Sample		Field Duplicate		
Site				8	8	8	8	8	8	8
Monitoring Well				MW-1	MW-1	MW-1	MW-1	MW-2	MW2	MW2A
Sample Number				8-MW1-GW1	8MW1-GW1DL	8MW1-GW2	8MW1-GW2DL	8-MW2-GW1	8-MW2-GW2	8MW2A-GW2
Matrix				Water	Water	Water	Water	Water	Water	Water
Date Sampled				5/15/96	5/15/96	7/10/96	7/10/96	5/14/96	7/10/96	7/10/96
Date Analyzed				5/16/96	5/17/96	7/17/96	7/23/96	5/24/96	7/18/96	7/17/96
ANALYTICAL INFORMATION										
VOCs										
Analyte	CRQL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result
Chloromethane	1	NE	NE	ND	ND	ND	ND	ND	ND	0.16J
1,1-Dichloroethene	1	7	5.7	2.1	ND	1.5	ND	0.54J	0.43J	0.41J
Acetone	1	NE	NE	R	R	R	R	R	R	R
trans-1,2-Dichloroethene	1	100	100	0.63J	ND	0.15J	ND	ND	ND	ND
1,1-Dichloroethane	1	NE	NE	16	14J	9.6	12J	0.3J	0.24J	0.23J
cis-1,2-Dichloroethene	1	70	70	230J	830	340J	630	4.9	2.6	2.3
2-Butanone	5	NE	NE	R	R	R	R	R	R	R
Chloroform	1	100	57	0.9J	ND	0.95J	ND	1.3	0.87J	0.79J
1,2-Dichloroethane	1	5	3.8	0.86J	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	1	200	200	4.6	ND	2.9	ND	0.74J	0.68J	0.58J
Carbon Tetrachloride	1	5	2.5	0.49J	ND	0.33J	ND	ND	ND	ND
Trichloroethene	1	5	5	55J	52	23	ND	3	1.2	1
Toluene	1	1000	1000	ND	ND	1.6	ND	ND	2.2	1.8
1,1,2-Trichloroethane	1	5	5	0.42J	ND	0.13J	ND	ND	ND	ND
Tetrachloroethene	1	5	5	1.8	ND	2.4	ND	11	3.3	3
2-Hexanone	5	NE	NE	ND	ND	R	R	ND	R	R
Chlorobenzene	1	100	20	ND	ND	0.1J	ND	ND	ND	ND
1,4-Dichlorobenzene	1	75	75	ND	ND	0.96J	ND	ND	0.85J	0.77J
1,2-Dibromo-3-chloropropane	1	0.2	0.2	R	R	ND	ND	R	ND	ND
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Sample Number				8-MW1-GW1		8-MW1-GW2		8-MW2-GW1	8-MW2-GW2	8-MW2A-GW2
Date Sampled				5/15/96		7/10/96		5/14/96	7/10/96	7/10/96
Date Analyzed				5/24/96		7/23/96		5/24/96	7/23/96	7/23/96
SVOCs										
Analyte	CRQL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Date Sampled				5/15/96		7/10/96		5/14/96	7/10/96	7/10/96
Date Analyzed				5/17/96		7/17/96		5/17/96	7/17-24/1996	7/18-24/1996
Petroleum Hydrocarbons	RL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result
Diesel range, as diesel	0.25	NE	NE	0.28NJ		ND		ND	ND	ND
Units	mg/l	mg/l	mg/l	mg/l		mg/l		mg/l	mg/l	mg/l
<b>Legend</b> MCLs Federal Drinking Water Standard Maximum Contaminant Level MDEQ Montana Department of Environmental Quality Human Health Standards NE ARAs Not Established DW Dry Well SB Soil Boring SS Sediment/Surface Soil (DIS) Dissolved Sample (total metals) Concentration > or = MCLs OR MEDQ, ARARs, or Avge + 2 Standard Dev. CRQL Contract Required Quantitation Limit RL Reporting Limit ND Compound Not Detected J Concentration Estimated R Results Rejected on Basis of Laboratory QA/QC N Presumptive Evidence of Compound										

Table B8-4 (Con't)  
Source: HAZWRAP, 1997

Table 5.18. Groundwater Organic Analyses - Site 8 - 120th FW, MANG, Great Falls, Montana (cont)

SAMPLE INFORMATION				Diluted Sample		Diluted Sample		Diluted Sample		Diluted Sample	
Site				8	8	8	8	8	8	8	8
Monitoring Well				MW-3	MW-3	MW-3	MW-3	MW-4	MW-4	MW-4	MW-4
Sample Number				8-MW3-GW1	8-MW3-GW1DL	8-MW3-GW2	8-MW3-GW2DL	8-MW4-GW1	8-MW4-GW1DL	8-MW4-GW2	8-MW4-GW2DL
Matrix				Water	Water	Water	Water	Water	Water	Water	Water
Date Sampled				5/15/96	5/15/96	7/10/96	7/10/96	5/14/96	5/14/96	7/11/96	7/11/96
Date Analyzed				5/16/96	5/17/96	7/17/96	7/18/96	5/15/96	5/16/96	7/23/96	7/23/96
ANALYTICAL INFORMATION											
VOCs											
Analyte	CRQL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result
Chloromethane	1	NE	NE	ND	ND	ND	ND	ND	ND	0.17J	ND
Vinyl Chloride	1	2	2	0.22J	ND	0.26J	ND	ND	ND	ND	ND
1,1-Dichloroethene	1	7	5.7	3.8	ND	3.1	2.2J	0.67J	0.54J	0.59J	ND
Acetone	1	NE	NE	R	R	R	R	R	R	R	R
trans-1,2-Dichloroethene	1	100	100	0.38J	ND	0.31J	ND	ND	ND	0.1J	ND
1,1-Dichloroethane	1	NE	NE	10	ND	12	9.4J	0.85J	0.62J	5.3J	4.2J
cis-1,2-Dichloroethene	1	70	70	380J	520	360J	420	26J	18	230J	220J
2-Butanone	5	NE	NE	R	R	R	R	R	R	R	R
Chloroform	1	100	57	4.3	ND	3.4	3J	2.7	1.9J	1.8J	ND
1,2-Dichloroethane	1	5	3.8	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	1	200	200	6.1	5.5J	3.9	3.4J	0.97J	0.84J	1.2J	ND
Carbon Tetrachloride	1	5	2.5	0.77J	ND	0.33J	ND	ND	ND	0.16J	ND
Benzene	1	5	5	0.12J	ND	ND	ND	ND	ND	NDJ	ND
Trichloroethene	1	5	5	86J	58	31J	26	2.5	2J	8.6J	7.4J
Bromodichloromethane	1	100	5.8	0.28J	ND	0.16J	ND	0.32J	0.2J	0.15J	ND
Toluene	1	1,000	1,000	ND	ND	1.3	ND	ND	ND	2.3J	ND
1,1,2-Trichloroethane	1	5	5	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1	5	5	ND	ND	ND	ND	ND	ND	2J	ND
2-Hexanone	5	NE	NE	ND	ND	R	R	ND	ND	R	R
1,4-Dichlorobenzene	1	75	75	ND	ND	0.79J	2.2J	ND	ND	1.2J	ND
1,2-Dibromo-3-chloropropane	1	0.2	0.2	R	R	ND	ND	R	R	ND	ND
Units	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Sample Number				8-MW3-GW1		8-MW3-GW2		8-MW4-GW1		8-MW4-GW2	
Date Sampled				5/15/96		7/10/96		5/14/96		7/11/96	
Date Analyzed				5/24/96		7/23/96		5/23/96		7/23/96	
SVOCs											
Analyte	CRQL	MCLs	MDEQ	Result		Result		Result		Result	
Diethylphthalate	10	NE	23,000	1J		ND		ND		ND	
Di-n-butylphthalate	10	NE	2,700	ND		ND		ND		1J	
Units	ug/l	ug/l	ug/l	ug/l		ug/l		ug/l		ug/l	
Date Sampled				5/15/96		7/10/96		5/14/96		7/11/96	
Date Analyzed				5/17/96		7/17-24/96		5/17/96		7/18/96	
Petroleum Hydrocarbons											
	RL	MCLs	MDEQ	Result		Result		Result		Result	
JP-4	0.25	NE	NE	ND		ND		ND		ND	
Diesel range, as diesel	0.25	NE	NE	ND		0.28NJ		0.28NJ		ND	
Gasoline range	0.25	NE	NE	ND		ND		ND		ND	
Units	mg/l	mg/l	mg/l	mg/l		mg/l		mg/l		mg/l	
Legend											
MCLs	Federal Drinking Water Standard Maximum Contaminant Level										
MDEQ	Montana Department of Environmental Quality Human Health Standards										
NE	ARAs Not Established										
DW	Dry Well										
SB	Soil Boring										
SS	Sediment/Surface Soil										
(DISS)	Dissolved Sample (total metals)										
	Concentration > or = MCLs OR MEDQ, ARARs, or Avge + 2 Standard Dev.										
CRQL	Contract Required Quantitation Limit										
RL	Reporting Limit										
ND	Compound Not Detected										
J	Concentration Estimated										
R	Results Rejected on Basis of Laboratory QA/QC										
N	Presumptive Evidence of Compound										

Table B8-4 (Con't)  
Source: HAZWRAP, 1997

Table 5.19. Groundwater Inorganic Analytical Data - Site 8 - 120th FW, MANG, Great Falls, Montana

SAMPLE INFORMATION												
Site	8		8		8		8		8		8	
Monitoring Well	MW1		MW1		MW1		MW2		MW2		MW2A	
Sample Number	8-MW1-GW1 (Diss.)		8-MW1-GW1		8-MW1-GW2 (Diss.)		8-MW2-GW1 (Diss.)		8-MW2-GW1		8-MW2A-GW2 (Diss.)	
Matrix	water		water		water		water		water		water	
Date Sampled	5/15/98		5/15/98		7/10/98		5/14/98		5/14/98		7/10/98	
Date Analyzed	5/24/98 - 6/4/98		5/24/98 - 6/4/98		7/17-24/98		5/24/98 - 6/4/98		5/24/98 - 6/4/98		7/17-24/98	
ANALYTICAL INFORMATION												
INORGANICS												
Analyte	CRDL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result
Antimony	* 6	6	6	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	10	50	18	ND	ND	ND	ND	ND	ND	ND	ND	1.1J
Barium	200	2000	1000	37.8J	96.7J	36.9J	149J	50.2J	74.8J	62.9J	134J	64.2J
Beryllium	* 4	4	40	ND	ND	ND	0.3J	ND	ND	0.3J	0.8J	0.7J
Chromium	10	100	100	ND	ND	ND	7.8J	ND	ND	ND	12.7	ND
Copper	25	1300**	1000	ND	ND	ND	6.5J	ND	ND	6.3J	5.2J	ND
Lead	3	15**	15	ND	6.3	ND	9.1	ND	ND	ND	3.2	ND
Mercury	0.2	2	0.14	ND	ND	ND	ND	0.46	ND	ND	ND	ND
Nickel	40	100	100	ND	ND	ND	10.9J	ND	ND	ND	ND	ND
Selenium	6	50	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	20	NE	5000	ND	31.5	4.1J	49.8	ND	14.3J	3.8J	27.6	7.2J
Units (mg/kg) Soil, (ug/L) Water				ug/L								

SAMPLE INFORMATION												
Site	8		8		8		8		8		8	
Monitoring Well	MW3		MW3		MW3		MW4		MW4		MW4	
Sample Number	8-MW3-GW1 (Diss.)		8-MW3-GW1		8-MW3-GW2 (Diss.)		8-MW4-GW1 (Diss.)		8-MW4-GW1		8-MW4-GW2 (Diss.)	
Matrix	water		water		water		water		water		water	
Date Sampled	5/15/98		5/15/98		7/10/98		5/14/98		5/14/98		7/11/98	
Date Analyzed	5/24/98 - 6/4/98		5/24/98 - 6/4/98		7/17-24/98		5/24/98 - 6/4/98		5/24/98 - 6/4/98		7/23/98 - 8/2/98	
ANALYTICAL INFORMATION												
INORGANICS												
Analyte	CRDL	MCLs	MDEQ	Result	Result	Result	Result	Result	Result	Result	Result	Result
Antimony	* 6	6	6	ND	ND	ND	ND	ND	ND	3.7J	ND	8J
Arsenic	10	50	18	ND	ND	1J	ND	ND	ND	ND	ND	ND
Barium	200	2000	1000	187J	207	123J	137J	102J	212	87.9J	ND	135J
Beryllium	* 4	4	40	ND	ND	0.3J	ND	ND	ND	ND	ND	ND
Chromium	10	100	100	ND	ND	ND	7.4J	ND	ND	ND	ND	13.6
Copper	25	1300**	1000	4.8J	11.8J	ND	ND	ND	8.7J	ND	ND	ND
Lead	3	15**	15	ND	2.4J	ND	ND	ND	2.5J	ND	ND	1.4J
Mercury	0.2	2	0.14	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	40	100	100	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	6	50	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	20	NE	5000	458	250	25.1	ND	13.7J	68.2	ND	ND	31.4
Units (mg/kg) Soil, (ug/L) Water				ug/L								

- Legend**
- MCLs Federal Drinking Water Standard Maximum Contaminant Level
  - MDEQ Montana Department of Environmental Quality Human Health Standards
  - NE ARAs Not Established
  - DW Dry Well
  - SB Soil Boring
  - SS Sediment/Surface Soil
  - (DISS) Dissolved Sample (total metals)
  - Concentration > or = MCLs OR MDEQ, ARAs, or Avg + 2 Standard Dev.
  - CRDL Contract Required Quantitation Limit
  - RL Reporting Limit
  - ND Compound Not Detected
  - J Concentration Estimated
  - R Results Rejected on Basis of Laboratory QA/QC
  - N Presumptive Evidence of Compound

Figure B8-4  
 Source: ES, 1992a

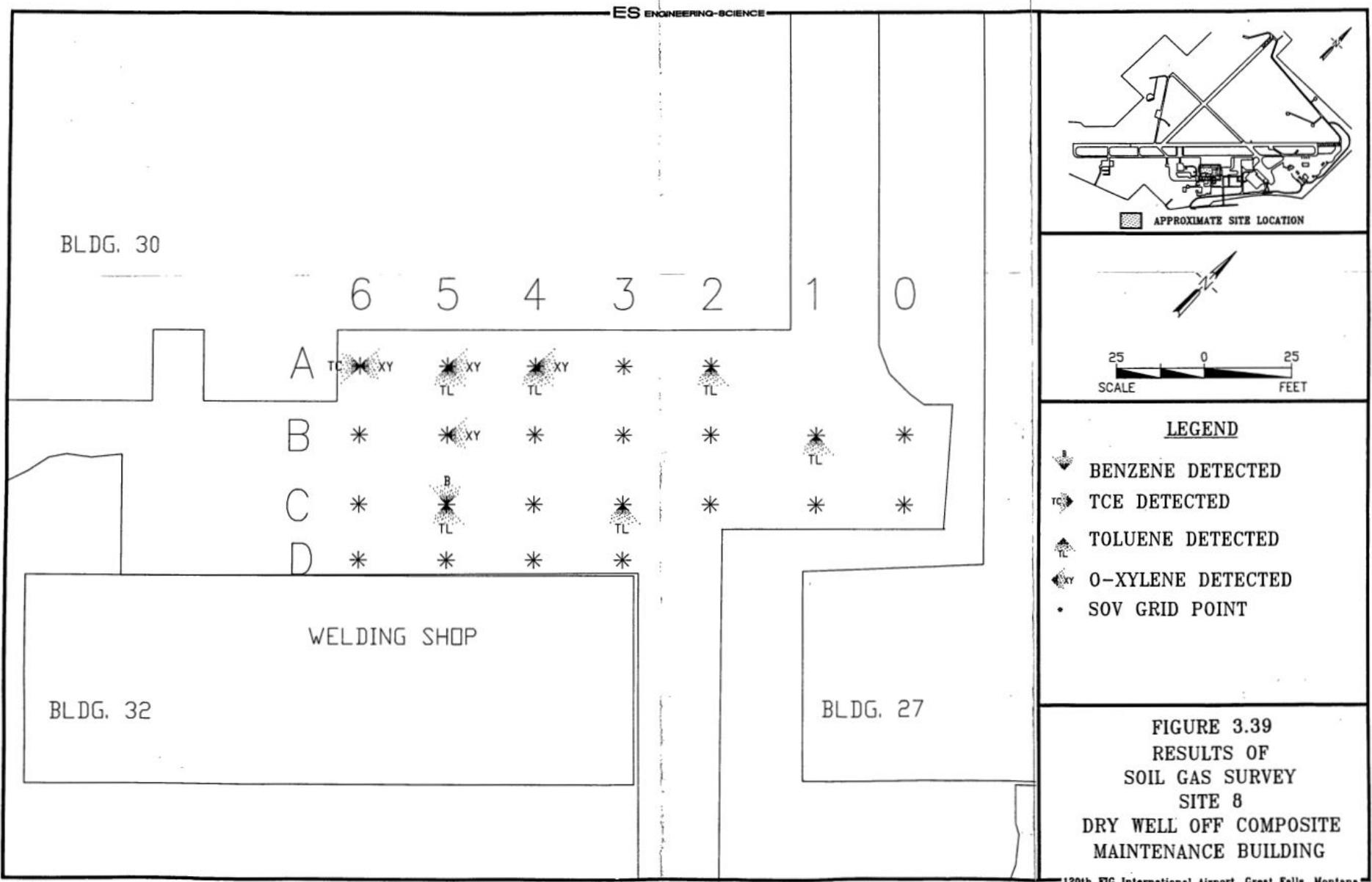


Table 2.16  
EE/CA 1st Round (September 9, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW9D	8-MW1D
BTEX (ug/L)																				
Benzene		7.25	14		2.3J		230J		9.0J	7.6									8.7	
Toluene					5.8J		1.4J													
Ethylbenzene		9.45	170		12J		716J	16	150J	8.4									11	
Total Xylene		16J	430		4.1J		1200J	26	300J	2.6									2.9	
TVAH		32.65	614		24.2		2147.4J	42	459J	18.6									22.6	
TPH (mg/L)																				
Gasoline Range		0.85J	4	0.25	1.2		1.70J	0.76	2.5		0.34J		0.16	0.48J					0.11	0.425
Diesel Range		0.59J	12		2.4	0.15	3.1J	0.74	1.9	0.69J									0.81J	
Metals (T/D, mg/L)																				
Silver																				
Arsenic																				ND
Beryllium																				
Cadmium																				
Chromium																				
Copper					0.01/ND															
Mercury																				
Nickel			0.02/ND	0.003/ND	0.004/ND	0.004/ND					0.003/ND	0.002/ND							0.003/ND	
Lead					0.004/ND														0.007/ND	
Antimony																			0.006	
Selenium																				
Thallium																				
Zinc	0.05/ND	ND/0.33	0.005/0.11	0.06/0.02	0.03/ND	0.06/0.23		ND/1.50	0.04/ND		0.02/0.04	0.02ND	0.03/ND	0.04	0.03/0.05	.05/0.2	0.02/0.94	0.09/ND	0.11	0.02/0.03

Blank Spaces - Analysis performed but have no detection.  
D - Duplicate Sample.  
DIWI - Deionized Water.  
GF - Great Falls.  
GW1 & GW2 - 1st and 2nd Round Groundwater.  
J - Estimated Values.  
mg/L - milligrams per liter.  
MS/MSD - Matrix Spike/Matrix Spike Duplicate.  
MW - Monitoring Well.  
Result Presentation - 0.05/0.03 means Total/Dissolved Results.

ND - Not Detected.  
NA - Not Applicable.  
PWI - Potable Water  
P&DWI - Purge and Development Water.  
TB - Trip Blank.  
TPH - Total Petroleum Hydrocarbons.  
TVAH - Total Volatile Aromatic Hydrocarbons.  
ug/L - micrograms per liter.  
VOCs - Volatile Organic Compounds.  
Shaded areas indicate results above ARARs.

Table B8-5 (Con't)  
Source: OTC, 1998a

Table 2.16 (Concluded)  
EE/CA 1st Round (September 9, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW9D	8-MW1D
VOCs (ug/L)																				
Dichlorodifluoromethane																				
Chloromethane																1.2				
Vinyl chloride																				
Bromomethane																				
Chloroethane																				
Tichlorofluoromethane																				
1,1-Dichloroethene												1.1J	3.4J							
Methylene chloride				2.2							2.45			1.9J						1.6J
Trans-1,2-Dichloroethene																				
1,1-Dichloroethene											2.5		8.8J	4.2						3.1
Chloroform	3.4			1.7				9.1	1.8		3.1		5.2J	3.4	14	6.9	2.8			3.1
1,1,1-Trichloroethane											1.8	1.5J	4.7J	1.9						2
Carbon tetrachloride													1.0J							
1,2-Dichloroethane																				
2-Chloroethylvinyl ether																				
Trichloroethene				1.2							6.9	4.0J	3.8J	10		1.7	1.7			8.7
1,2-Dichloropropane																				
Bromodichloromethane								1.1							1.6					
cis-1,3-Dichloropropene																				
trans-1,3-Dichloropropene																				
1,1,2-Trichloroethane																				
Tetrachloroethene				1							2.8	3.45		2.3		1.3	8.2			2.6
Dibromochloromethane																				
Chlorobenzene																				
Bromoform																				
1,2,2,2-Tetrachloroethane																				
1,3-Dichlorobenzene																				
1,4-Dichlorobenzene																				
1,2-Dichlorobenzene																				

Blank Spaces - Analysis performed but have no detection.

D - Duplicate Sample.

DIWI - Deionized Water.

GF - Great Falls.

GW1 & GW2 - 1st and 2nd Round Groundwater.

J - Estimated Values.

mg/L - milligrams per liter.

MS/MSD - Matrix Spike/Matrix Spike Duplicate.

MW - Monitoring Well.

Result Presentation - 0.05/0.03 means Total/Dissolved Results.

NA - Not Applicable.

PWI - Potable Water.

P&DWI - Purge and Development Water.

TB - Trip Blank.

TPH - Total Petroleum Hydrocarbons.

TVAH - Total Volatile Aromatic Hydrocarbons.

ug/L - micrograms per liter.

VOCs - Volatile Organic Compounds.

Shaded areas indicate results above ARARs.

Table 2.18  
EE/CA 2nd Round (September 25, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW5D	8-MW6D
BTEX (ug/L)																				
Benzene		5.3J	6J		4.1J		130J	1.2J	11J	2.8										
Toluene								1.84J												
Ethylbenzene		10J	78J		3.3J	1.4	310J	17J	290J	1.9										1.3
Total Xylene		12J	280J		14		980J	29J	700J	1.55										
TVAH		27.3J	464J		21.4J	1.4	1420J	49	1001J	6.75										1.3
TPH (mg/L)																				
Gasoline Range		.052J	3.0J		1.8J		3.8J	0.91J	4.6J				0.013	0.11						
Diesel Range		0.98J	7.5		5.0J		4.1J	1.2J	2.6J	0.048										0.10J
Metals (T/D, mg/L)																				
Silver																				
Arsenic																				
Beryllium																				
Cadmium																				
Chromium																				
Copper																				
Mercury																				
Nickel																				
Lead	.003/ND		.002/ND			ND/.004			ND/.013		.006/N	.003/	.004/ND							.004/ND
Antimony		.007/.008													.006/.005					
Selenium		.005/.006													.006/.008					
Thallium																				
Zinc	.04/.10	.06/.05	.05/.13	.06/.12	.10/.21	.36/.10	.06/0.0	.12/.45	.05/.32	.03/.20	.05/.23	.03/.33	.06/.34	.03/.49	.05/.55	.04/.33	ND/.10		0.08/.55	0.02/0.16

Blank Spaces - Analysis performed, but have no detection.

D - Duplicate Sample.

DIWI - Deionized Water.

GF - Great Falls.

GW1 & GW2 - 1st and 2nd Round Groundwater.

J - Estimated Values.

mg/L - milligrams per liter.

MS/MSD - Matrix Spike/Matrix Spike Duplicate.

MW - Monitoring Well.

Result Presentation - 0.05/0.03 means Total/Dissolved results.

NA - Not Applicable.

PWI - Potable Water.

P&DWI - Purge and Development Water.

TB - Trip Blank.

TPH - Total Petroleum Hydrocarbons.

TVAH - Total Volatile Aromatic Hydrocarbons.

ug/L - micrograms per liter.

VOCs - Volatile Organic Compounds.

Shaded areas indicate results above ARARs.

Table B8-5 (Con't)  
Source: OTC, 1998a

Table 2.18 (Concluded)  
EE/CA 2nd Round (September 25, 1997) Groundwater Analytical Results  
120th FW, Montana ANG, Great Falls, Montana

Analytical Information	6-MW4	6-MW5	7-MW2	7-MW3	7-MW4	7-MW5	7-MW6	7-MW7	7-MW8	7-MW9	8-MW1	8-MW2	8-MW3	8-MW4	8-MW5	8-MW6	8-MW7	8-MW8	7-MW5	8-MW6D
VOCs (ug/L)																				
Dichlorodifluoromethane																				
Chloromethane						1.1	1.5							1.1						
Vinyl chloride																				
Bromomethane																				
Chloroethane																				
Tichlorofluoromethane																				
1,1-Dichloroethene												1.1	5.1	1						
Methylene chloride																				
Trans-1,2-Dichloroethene																				
1,1-Dichloroethane											1.3	13	6.7							
Chloroform	3.2			2.6				2.2	2.2		6.2	1.1	12	8.5	1.6	7.1	2.7			5.9
1,1,1-Trichloroethane											1.4	1.3	5.4	2.2						
Carbon tetrachloride																				
1,2-Dichloroethane																				
2-Chloroethylvinyl ether																				
Trichloroethene				1.4							4.1	4.1	53	20		1.7	1.6			3
1,2-Dichloropropane																				
Bromodichloromethane																				
cis-1,3-Dichloropropene																				
trans-1,3-Dichloropropene																				
1,1,2-Trichloroethane																				
Tetrachloroethene				1.1							3	6.9		2.1		1.4	4.1			1.3
Dibromochloromethane																				
Chlorobenzene																				
Bromoform																				
1,2,2,2-Tetrachloroethane																				
1,3-Dichlorobenzene																				
1,4-Dichlorobenzene																				
1,2-Dichlorobenzene																				

Blank Spaces - Analysis performed, but have no detection.  
D - Duplicate Sample.  
DIWI - Deionized Water.  
GF - Great Falls.  
GW1 & GW2 - 1st and 2nd Round Groundwater.  
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mg/L - milligrams per liter.  
MS/MSD - Matrix Spike/Matrix Spike Duplicate.  
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Result presentation - 0.05/0.03 means Total/Dissolved results.

NA - Not Applicable.  
PWI - Potable Water.  
P&DWI - Purge and Development Water.  
TB - Trip Blank.  
TPH - Total Petroleum Hydrocarbons.  
TVAH - Total Volatile Aromatic Hydrocarbons.  
ug/L - micrograms per liter.  
VOCs - Volatile Organic Compounds.  
Shaded areas indicate results above ARARs.

Table 3.47 Organic Constituents Detected in Soil Gas Survey  
Site 8: Dry Well Off Composite Maintenance Building (Bldg. 32)  
(ppb by volume)

Sample ID	Grid Coordinates		1,1-DCE	1,2-DCE	Benzene	TCE	Toluene	o-Xylene
A2	0	-50	0	0	0	0	8	0
A3	0	-75	0	0	0	0	0	0
A4	0	-100	23	140	0	0	240	620
A5	0	-125	12,000	160,000	0	0	***	680,000
A6	0	-150	0	23	0	21	0	71
B0	20	0	0	0	0	0	0	0
B1	20	-25	0	0	0	0	44	0
B2	20	-50	0	0	0	0	0	0
B3	20	-75	0	0	0	0	0	0
B5	20	-125	0	0	0	0	0	2,000
C0	40	0	0	0	0	0	0	0
C1	40	-25	0	0	0	0	0	0
C2	40	-50	0	0	0	0	0	0
C3	40	-75	0	0	0	0	9	0
C4	40	-100	0	0	0	0	0	0
C5	40	-125	0	0	130	0	***	0
C6	40	-150	0	0	0	0	0	0
D3	60	-75	0	0	0	0	0	0
D4	60	-100	0	0	0	0	0	0
D5	60	-125	0	0	0	0	0	0
D6	60	-150	0	0	0	0	0	0

3205A\AU23409\T3-47.WRI

ND= not detected

\*\*\*Too high to quantify



## A.1 Introduction

Presented herein is a screening level risk assessment for the 120<sup>th</sup> Airlift Wing of the Montana Air National Guard (MANG) located at the Great Falls International Airport in Great Falls, Montana (MT) (the 'Base'). This risk assessment is presented as an appendix to the Supplemental Remedial Investigation (SRI)/ Focused Feasibility Study (FFS). The objective of the risk assessment is to provide a screening level evaluation of historical soil and sediment data and more current (2020-2022) groundwater monitoring data to evaluate whether there is a potentially unacceptable risk/hazard to current and potential future human and/or ecological receptors.

A Preliminary Assessment was conducted in 1988 (Hazardous Materials Technical Center [HMTTC] 1988) which identified eight areas of concern at the installation where sufficient justification existed to collect environmental data to evaluate potential soil and groundwater contamination from Base activities (Environmental Restoration Program [ERP] Sites). Background information on the Base and the status of the ERP Sites are discussed in the SRI.

ERP Sites 1, 2, and 3 are currently inactive and are not included in the risk assessment. An assessment of the inactive sites to current regulatory standards was performed and is presented in the Supplemental RI. The active sites addressed in the risk assessment include:

- ERP Site 4, former fire training area 1
- ERP Site 5, former fire training area 2 and Schedule oil/water separator
- ERP Site 6, aerospace ground equipment (age) area (building 22) and drainage ditch
- ERP Site 7, dry well near corrosion control building (building 23)
- ERP Site 8, dry well near composite maintenance building (building 32)

The risk assessment includes a screening level human health risk assessment (HHRA), conducted in accordance with U.S. Environmental Protection Agency (USEPA) and Montana Department of Environmental Quality (MDEQ) risk assessment guidance including *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part A* (USEPA 1989), MDEQ Risk-Based Corrective Action Guidance for Petroleum Releases (MDEQ 2018), and Montana Numeric Water Quality Standards (MDEQ 2019). This assessment considers potential exposures for current and future receptors that may come into contact with Base soil and sediment. Groundwater is not currently used as a potable source which will continue into the foreseeable future. Information regarding groundwater risks to two downgradient receptors will be fully evaluated following collection of additional groundwater data in 2023 to support the evaluation of potential off-base contaminant migration from Site 1 and included in the cumulative risk assessment as part of ongoing PFAS RI. Currently, a POET system is installed and monitored at the inhabited property and provisions are in place to install a POET system at the vacant property should it become inhabited. This assessment also includes a qualitative pathway evaluation of current and potential future ecological receptors.

This report includes the sections listed below. The tables, figure, and attachments follow the text sections.

- **A.2 Conceptual Site Model:** Identifies sources, exposure pathways, and receptors.
- **A.3 Data Evaluation and Selection of Chemicals of Potential Concern:** Summarizes the available analytical data and how it was prepared for use in the risk assessment. Describes how the chemicals of potential concern (COPCs) were selected for the HHRA.
- **A.4 Cumulative Risk-Screening Evaluation:** Presents the estimated potential cumulative risk/hazard for each receptor.
- **A.5 Uncertainties:** Describes the factors that introduce key uncertainties to the risk calculations and how they qualify the results.
- **A.6 Conclusions**
- **A.7 References**

## **A.2 Conceptual Site Model**

The conceptual site model (CSM) is a key tool in developing an understanding of contamination in relation to site conditions. The exposure pathway illustrates the movements of a chemical from its source to a potentially exposed population or individual, referred to as a receptor. Receptors are identified based on their locations relative to the site and source, their activity patterns, and the presence of potential sensitive subpopulations. An exposure pathway must be complete or exposure by receptors to site chemicals cannot occur.

A complete exposure pathway must have the following elements:

- A source (e.g., chemical releases and leaks/spills onto soil);
- A mechanism for release and migration of chemical (e.g., infiltration into soil);
- An exposure point or site of potential contact; and
- A receptor and route of intake (e.g., direct contact by future Hypothetical Future Residents).

If one or more elements are not present, the pathway is incomplete and there is no exposure. In some cases, the exposure pathway may be complete, but may be deemed insignificant due to site-specific factors and is therefore not a candidate for further quantitative evaluation.

The CSM for the Site is provided in Figure A.1 and detailed in the sections below.

### *A.2.1 Potential Human Receptors and Exposure Routes*

The Base currently provides support for the operation and maintenance of the 120<sup>th</sup> Airlift Wing and houses aircraft, support personnel, vehicles, and equipment. The base's facilities consist of over 50 buildings occupying approximately 125 acres of mostly paved land leased from the airport authority on the southeast corner of the airport. A drainage ditch is present along the east side of ERP Site 6 that periodically receives runoff during heavy precipitation events. Sediment is present in this ditch and periodically dries out during periods of low precipitation.

Current commercial/industrial use is anticipated to continue into the foreseeable future. Therefore, commercial/industrial workers are present under current and future use of the Base. The facility is within a secured zone; therefore, trespassers are unlikely to intrude. Construction workers may be present under a current/future use scenario. The Base receives water (potable) from the city which is supplied by the Missouri River. Information regarding groundwater risks to the two downgradient receptors will be fully evaluated following collection of additional groundwater data in 2023 to support the evaluation of potential off-base contaminant migration from Site 1 and included in the cumulative risk assessment as part of ongoing PFAS RI. Currently, a POET system is installed and monitored at the inhabited property and provisions are in place to install a POET system at the vacant property should it become inhabited. Residential use is not a current or likely future use of the site.

A hypothetical future on-site residential (unrestricted use) scenario, including use of groundwater as a source of drinking water or other potable use, was evaluated in this screening level HHRA to inform risk

management decisions. Depth to groundwater is approximately 57 feet below ground surface (ft bgs); thus, direct contact with potential receptors (construction worker in an excavation trench) is an incomplete exposure pathway. A shallow perched groundwater bearing zone of limited extent is present at Site 4. Wells completed in the shallow perched groundwater are at depths ranging from 28.8 to 30.5 ft bgs.

The human receptors and potentially complete exposure pathways considered in this screening level HHRA are as follows:

Current/future commercial/industrial worker

- Exposure to site soil via direct contact (incidental ingestion, dermal contact, and inhalation of particulates/volatiles). Under a current scenario, exposure is considered potentially complete for surface soil (0 to 2 ft bgs) only. However, the potential for future redevelopment of the Base may result in deeper soils being brought to the surface. Thus, under a future scenario, commercial/industrial workers may be exposed to subsurface soil (greater than [ $>$ ] 2 ft bgs); and
- Exposure to sediment in the concrete-lined drainage ditch via direct contact (incidental ingestion, and dermal contact). Sediments present in the drainage ditch periodically dry out; thus, inhalation of particulates/volatiles is a potentially complete exposure pathway.

Hypothetical future on-Site resident

- Exposure to soil via direct contact (incidental ingestion, dermal contact, and inhalation of particulates/volatiles) with surface (0 to 2 ft bgs) and subsurface soils ( $>$  2 ft bgs);
- Exposure to sediment in the concrete-lined drainage ditch via direct contact (incidental ingestion and dermal contact). Sediments in the drainage ditch may periodically dry out; thus, inhalation of particulates is a potentially complete exposure pathway; and,
- Exposure to site groundwater via direct contact (ingestion, dermal contact, and inhalation of vapors) if the Base is redeveloped.

Current/future construction worker

- Exposure to site soil via direct contact (incidental ingestion, dermal contact, and inhalation of particulates/volatiles) with surface (0 to 2 ft bgs) and subsurface soils ( $>$  2 ft bgs); and,
- Exposure to site sediment in the concrete-lined drainage ditch via direct contact (incidental ingestion and dermal contact). Sediments present in the drainage ditch periodically dry out; thus, inhalation of particulates/volatiles is a potentially complete exposure pathway.

A vapor intrusion evaluation was conducted in 2017 and found no potential unacceptable human health risks associated with subsurface vapors migrating into indoor air for current commercial/industrial workers (EA Engineering, Science, and Technology, In. [EA] 2017). Thus, further evaluation of the vapor intrusion pathway was not considered herein.

*A.2.2 Ecological Receptors*

The Base is located within the Great Falls International Airport and is completely developed with buildings

and asphalt parking lots. Given the long-term commercial/industrial nature of the adjacent properties there are no quality ecological habitats within the facility or the immediate vicinity. Even if the asphalt is removed or not maintained, quality habitat would not exist on the sites, and it is unlikely that ecologically sensitive terrestrial receptors would inhabit the Site. Some ornamental trees in the area may be used by migrating birds, but they would likely be transient given the conditions are unattractive for long-term nesting. Therefore, there are no sensitive ecological receptors identified for soil. Although soil-related pathways may be potentially complete for ecological receptors in the future, these pathways are considered insignificant given the very limited foraging and nesting/breeding habitat offered by the artificial landscaping features, manicured lawns, and high level of human activity.

Drainage ditches are present at the Site that are shallow concrete-lined ditches which collect runoff during heavy precipitation events. Sediments were observed in ditches approximately 4 to 6 inches in depth. No sediment dwelling ecological receptors are assumed to be present within the concrete lined drainage ditches as the sediments periodically dry out leaving unsuitable ecological habitat. When the drainage ditches hold standing water, wildlife may be attracted to the area for drinking, bathing, and feeding; however, this is most likely an infrequent occurrence resulting in insignificant exposures.

Groundwater is generally inaccessible to ecological receptors and considered as an exposure medium only if it discharges into surface water. No permanent surface water bodies are located at the Site. Thus, no ecological receptors were identified for groundwater discharging into surface water.

### **A.3 HHRA Data Evaluation and Selection of Chemicals of Potential Concern**

This section describes the analytical soil, sediment, and groundwater datasets provided for the HHRA, describes the HHRA approaches for data evaluation and chemical screening, and presents the COPCs selected for further evaluation in the screening level HHRA.

#### *A.3.1 Analytical Data*

The HHRA utilized soil, sediment, and groundwater data from past investigations at the Site. Soil analytical data were available for the eight Sites at the base, as originally identified in the preliminary assessment (1992). Sediment was collected and analyzed (1992 and 1996) from concrete lined drainage ditches at Site 6. Groundwater samples from October 2020 through April 2022 were selected for use in the assessment as representing current conditions to which receptors may be exposed. Groundwater was treated as one exposure unit.

Analytical data used in this assessment are presented in the Table 1 series. General statistics (e.g., detection frequency, minimum and maximum detections and locations) are presented in the Table 2 series. A discussion of all available soil, sediment, and groundwater data is presented below along with tables of both soil and groundwater data used in the HHRA.

##### **A.3.1.1 Soil**

Soil analytical data used herein were obtained from the following sources: Site Investigation Report (Engineering-Science, Inc. [ES] 1992), Remedial Investigation Report (Hazardous Waste Remedial Action Program [HWRAP] 1997), and the Preliminary Assessment/Site Investigation (PA/SI) for Two Areas of Concern at Montana Air National Guard, Great Falls Montana (Science Applications International Corporation [SAIC] 2013). Samples were analyzed for inorganics, polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), and petroleum hydrocarbons.

Duplicate results (field duplicates) were treated as discrete samples in this HHRA. Uncertainty associated with the use of historical soil data is detailed in the uncertainty section.

##### Site 4 – Former Fire Training Area 1

Soils were collected at Site 4 from five locations ranging from 1 to 7 ft bgs in 1990. Four sample locations were collected for surface soil (0 to 2 ft bgs) and five locations were collected for subsurface soil (> 2 ft bgs). Field duplicates were collected from location SB2 at 1 ft bgs and 3.5 ft bgs.

##### Site 5 – Former Fire Training Area 2 and OWS-009 (Deactivated Oil-Water Separator)

Surface soils were collected at Site 5 from two locations in 1990 (SB2 and SB3) and one location in 2012 (OWS-009). Subsurface soil was collected from three locations (SB1, SB3, and SB4) in 1990. No field duplicates were collected from Site 5.

##### Site 6 – Aerospace Ground Equipment Area (Building 22)

Surface soils were collected from 11 locations in 1990 and 1996. One field duplicate was collected from location SB7. Subsurface soils were collected from seven locations in 1990 and 1996. No field duplicates

were collected from Site 6.

#### Site 7 – Dry Well Near Corrosion Control Building (Building 23)

Surface soils were collected at Site 6 from six locations in 1990 and 1996. Subsurface soils were collected from seven locations in 1990 and 1996. No field duplicates were collected from Site 7.

#### Site 8 – Dry Well Near Composite Maintenance Building (Building 32)

Surface soils were collected at Site 6 from six locations in 1990 and 1996. Subsurface soils were collected from seven locations in 1990 and 1996. No field duplicates were collected from Site 8.

### A.3.1.2 Sediment

#### Site 6

Sediments were collected from a drainage ditch at Site 6 along the southeast edge of the site in 1992 and 1996. The drainage ditch is a shallow concrete-lined ditch with approximately 4 to 6 inches of sediment present. Samples were collected from three locations in the drainage ditch.

### A.3.1.3 Groundwater

Two groundwater bearing zones are present at the Site. A regional groundwater bearing zone is present beneath the entire Site and is encountered at depths greater than (>) 57 ft bgs. A shallow perched groundwater bearing zone of limited extent is present at Site 4. Wells 4-MW2A, 4-MW3, and 4-MW5 are completed in the shallow perched groundwater bearing zone to depths ranging from 28.8 to 30.5 ft bgs.

### A.3.2 HHRA Screening Process

Consistent with MT DEQ and USEPA's approach for selecting chemicals for further quantitative evaluation in the HHRA, maximum detected concentrations of chemicals were compared to conservative screening levels to identify chemicals of potential concern (COPCs). If the maximum detected chemical concentration was less than the associated screening level, the chemical was eliminated as a COPC because the chemical would not contribute significantly to overall risk (USEPA 1993). Exceedances of screening levels do not in themselves indicate that an unacceptable risk exists. Rather, the exceedance of a screening level indicates the need for further evaluation in the HHRA. The screening levels used in this HHRA are summarized below:

Soil and sediment screening levels considered protective of human health were obtained from the sources below using the following hierarchy:

- MT DEQ Tier 1 Risk-Based Screening Levels (RBSLs) for petroleum compounds in soil based on an excess lifetime cancer risk (ELCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.125.
- USEPA Regional Screening Levels (RSLs) for soil based on an ELCR of 1E-6 or a noncancer HQ of 0.1 to account for potential additive effects to the same target organ(s) (USEPA 2022a).
- Concentrations of inorganic chemicals were compared to Montana soil background concentrations (MT DEQ 2013). Where background concentrations were greater than risk-based screening levels, the background concentration was used to identify

Groundwater screening levels considered protective of human health were obtained from the following sources in order of preference:

- MT DEQ Tier 1 RBSLs for petroleum compounds in groundwater (> 20 ft bgs) based on an excess lifetime cancer risk (ELCR) of 1E-6 or a noncancer hazard quotient (HQ) of 0.125.
- Montana Numeric Water Quality Standards, Circular DEQ-7 (MT DEQ 2019).
- USEPA RSLs for tapwater based on an ELCR of 1E-6 or a noncancer hazard of 0.1 to account for potential additive effects to the same target organ (USEPA 2022a).

Chemicals considered to be essential nutrients (calcium, magnesium, potassium, and sodium) were included in screening; however, were not selected as COPCs (USEPA 1989).

In the absence of published sediment screening levels protective of human health, soil screening levels, as detailed above, were used. Humans are not expected to come into contact with sediments in the drainage ditch at the same frequency and for the same duration as for soil. The use of soil screening levels to select sediment COPCs is very conservative but appropriate for a screening level assessment.

Uncertainty associated with the use of soil screening levels in the evaluation of chemicals in sediment is discussed in the uncertainty section.

The potential migration of chemicals in soil to groundwater is acknowledged. However, because recent groundwater data are available and because the chemicals have been present at the Site for long time periods, it is not necessary to predict concentrations in groundwater on the basis of soil concentrations.

Furthermore, the potential for chemicals to leach from soil to groundwater is not indicative of a potential health effect and is not an appropriate criterion for evaluating direct exposure. Thus, soils were evaluated in comparison to leaching screening levels for informational purposes; however, leaching screening levels were not used for selecting COPCs.

- Primary screening levels were not available for a limited number of chemicals detected at the Site. For these chemicals, surrogate screening levels were selected and documented based on structural similarities, potential toxicity, and health endpoints. The use of surrogates is documented in the appropriate screening tables.
- For petroleum compounds, screening was performed in agreement with MT DEQ guidance (2018) assuming fractionation of fuel compounds.

COPCs are identified as the chemicals suspected of being site related which are present in concentrations greater than the conservative screening levels and/or background concentrations (inorganics only, as available). The Table 2 series provides a comparison of the maximum detected COPC concentrations to the screening levels and background concentrations. Chemicals detected at concentrations above both the screening levels and background concentrations were identified as COPCs for further evaluation in the HHRA. Chemicals that were not detected in a particular medium or were detected at concentrations below the screening levels or background concentration were eliminated from consideration as a COPC and were

The MT DEQ Tier 1 RBSLs do not differentiate between residential and construction worker exposure scenarios. Default USEPA RSLs for a construction worker exposure scenario are not published. Thus, potential risks and hazards for a construction worker were not evaluated herein. COPC screening and cumulative risk-screening evaluation was performed for hypothetical future residents and current/future commercial/industrial workers. These evaluations are considered protective of a potential current/future construction worker exposure scenario.

#### A.3.2.1 Additional Screening Considerations

##### Chromium

Chromium is a naturally occurring metal typically present in the trivalent or hexavalent forms. Trivalent chromium species dominate in nature, whereas high levels of hexavalent chromium species are generally only found as a result of man-made pollution.

Past operations at the site included the use and disposal of materials and wastes that were subsequently categorized as hazardous. Major operations included aircraft maintenance; ground maintenance; and petroleum, oil, and lubricant management and distribution. No evidence of industrial applications that result in the use and/or production of hexavalent chromium (e.g., production of stainless and heat-resistant steels, refractory production, metal finishing, leather tanning, or wood preservation) have been reported at the site.

Chromium was primarily analyzed for as “total chromium”. Because site history does not suggest the use or storage of hexavalent chromium at the Site, it is not anticipated that hexavalent chromium is present in site media, and total chromium results were evaluated in the HHRA as trivalent chromium.

##### Lead

The evaluation of lead is conducted differently from other constituents because of lead’s unique toxicological properties. The most sensitive receptors to lead exposures are children and pregnant women (developing fetus). In accordance with USEPA (2007) and MT DEQ (2021) guidance, potential exposure to lead in soil was evaluated through a comparison of the arithmetic mean lead concentrations in soil and sediment to USEPA soil screening levels protective of the residential and commercial/industrial worker exposure scenarios. The soil screening level corresponds to the lead concentration at which the probability of a child’s blood lead (PbB) concentration exceeding 5 micrograms per deciliter ( $\mu\text{g}/\text{dL}$ ) does not exceed five percent (%). In this screening-level HHRA, lead was first evaluated in the preliminary screening/COPC selection using the maximum detected concentration (as presented in the Table 2 series). For scenarios in which lead was identified as a COPC, it was further evaluated by a comparison of the lead exposure point concentration (EPC) to the associated screening level, as further discussed per receptor and media in Section A.4.

## Total Petroleum Hydrocarbons

Total Petroleum Hydrocarbons (TPH) is often used to refer to a broad range of chemicals comprising petroleum hydrocarbons and is a gross quantification of petroleum mixtures without identification of individual constituents. Industry-defined whole products (e.g., gasoline or diesel fuel) are not specific chemical formulations; thus, composition of petroleum products released into the environment are complex and variable (MADEP 2002). Once released, chemistry is further altered by fate and transport processes (leaching, volatilization, and biodegradation) (MADEP 2002).

TPH data available for the site includes bulk fraction analyses without distinction of aliphatic and aromatic hydrocarbon ranges (gasoline range, diesel range, Jet Propellant 4 [JP-4], and oil range) and individual chemicals (benzene, ethylbenzene, toluene, xylenes, and polycyclic aromatic hydrocarbons). The screening evaluation herein was performed in agreement with MT DEQ Risk-Based Corrective Action for Petroleum Release Sites (MT DEQ 2018) for aged bulk petroleum mixtures as follows:

- Bulk TPH data were evaluated assuming C11-C22 aromatic
- Gasoline range organics were evaluated using C9-C10 aromatic
- Diesel range organics assumed C9-C18 aliphatic (minimum of C9-18 aliphatic and C11-C22 aromatic)
- Jet Propellant 4 (JP-4) assumed C9-C18 aliphatic (minimum of C9-18 aliphatic and C11-C22 aromatic)
- Oil range organics assumed C9-C18 aliphatic (minimum of C9-18 aliphatic and C11-C22 aromatic)

The whole product (gasoline, diesel, JP-4, oil) approach used herein assigns a single toxicity factor to each product. However, the composition and toxicity of the product will change as weathering occurs. In some instances, individual constituent analytical data were available though not subtracted from the bulk product group it may be associated with. This has the potential to overestimate risks to receptors as chemicals are double counted for cumulative risks and hazards. Though conservative, this approach allows a screening level evaluation of whole product data and the associated uncertainty with health risk estimates using this approach is detailed in the uncertainty section.

### *A.3.3 HHRA Screening/COPC Selection Results*

A summary of the results of the HHRA screening and the COPCs identified are provided for each site, medium, and receptor below. Summary statistics for detected chemicals, screening levels, and the results and basis for COPC selection or exclusion are presented in the Table 2 series.

### *A.3.4 Surface Soil Screening Results*

#### Site 4

Results of surface soil screening for Site 4 are presented in Table 2.1.1a (hypothetical future resident) and Table 2.1.1b (commercial/industrial worker) and discussed below.

In surface soil, detections below background were reported for inorganics (arsenic, barium, chromium,

copper, lead, nickel, and zinc). No detections were reported for acetone, toluene, diethylphthalate, butyl benzyl phthalate, or bis(2-ethylhexyl)phthalate. TPH was detected, with the maximum detected concentration reported at SB2 in the field duplicate (the parent sample was not analyzed for TPH)..

#### *Hypothetical Future Resident*

The maximum detected concentration of TPH in surface soil was greater than the screening level (C11-C22 aromatics). Arsenic and chromium were detected greater than the screening level but less than background. No other chemicals were detected in concentrations greater than the screening levels.

Therefore, TPH (as C11-C22 aromatics) was the only surface soil COPC identified for a hypothetical future residential scenario within Site 4.

#### *Current/Future Commercial/Industrial Worker*

Arsenic and chromium were identified in surface soil less than background and screening levels. No chemicals were detected in concentrations greater than the screening levels. Therefore, no surface soil COPCs were identified for this receptor.

#### Site 5

Results of surface soil screening for Site 5 are presented in Table 2.2.1a (hypothetical future resident) and 2.2.1b (commercial/industrial worker) and discussed below.

In surface soil, detections were reported for inorganics (aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, vanadium, and zinc), VOCs (methylene chloride), SVOCs (2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, and pyrene), and TPH. Antimony and zinc were reported in surface soil at Site 5 with maximum detected concentrations greater than background.

#### *Hypothetical Future Resident*

The maximum detected concentrations of arsenic, chromium, cobalt, and iron were greater than screening values; however, less than background. No other chemicals were detected in concentrations greater than the screening levels. Therefore, no surface soil COPCs were identified for this receptor.

#### *Current/Future Commercial/Industrial Worker*

No chemicals were detected in concentrations greater than the screening levels. Therefore, no surface soil COPCs were identified for this receptor.

#### Site 6

Results of surface soil screening for Site 6 are presented in Table 2.3.1a (hypothetical future resident) and 2.3.1b (commercial/industrial worker) and discussed below.

In surface soil, detections were reported for inorganics (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc), VOCs (1,2-dichloroethene,

2-hexanone, 4-methyl-2-pentanone, acetone, carbon disulfide, chloroform, ethylbenzene, methyl ethyl ketone, methylene chloride, toluene, and xylenes), SVOCs (2-methylnaphthalene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, bis(2-ethylhexyl)phthalate, chrysene, di-n-butyl phthalate, di-n-octyl phthalate, fluoranthene, indeno(1,2,3-c,d)pyrene, naphthalene, and pyrene), and TPH (TPH, JP-4, diesel range, oil range, and gasoline range). Concentrations of antimony, barium, cadmium, chromium, lead, silver, thallium, and zinc were reported greater than background.

#### *Hypothetical Future Resident*

Arsenic was detected in surface soil greater than the screening level but less than background. Benzo(a)pyrene, TPH (evaluated as C11-C22 aromatics), JP-4 (evaluated as C9-C18 aliphatics), diesel range (evaluated as C9-C18 aliphatics), oil range (evaluated as C9-C18 aliphatics), gasoline range (evaluated as C9-C10 aromatics), cadmium, chromium, lead, and thallium were greater than the screening levels and retained as surface soil COPCs. No other chemicals reported maximum detected concentrations greater than screening levels.

#### *Current/Future Commercial/Industrial Worker*

Arsenic was detected in surface soil greater than the screening level but less than background. TPH (evaluated as C11-C22 aromatics), JP-4 (evaluated as C9-C18 aliphatics), diesel range (evaluated as C9-C18 aliphatics), oil range (evaluated as C9-C18 aliphatics), gasoline range (evaluated as C9-C10 aromatics), cadmium, and chromium were greater than the screening levels and retained as surface soil COPCs. No other chemicals reported maximum detected concentrations greater than screening levels.

#### Site 7

Results of surface soil screening for Site 7 are presented in Table 2.4.1a (hypothetical future resident) and 2.4.1b (commercial/industrial worker) and discussed below.

In surface soil, detections were reported for inorganics (arsenic, barium, beryllium, chromium, copper, lead, nickel, and zinc), VOCs (2-hexanone, acetone, benzene, carbon disulfide, ethylbenzene, methyl ethyl ketone, methylene chloride, toluene, xylenes, and trichloroethylene [TCE]), SVOCs (2-methylnaphthalene, bis(2-ethylhexyl)phthalate, naphthalene, and pyrene), and TPH. No chemicals in surface soil at Site 7 were detected in concentrations greater than background.

#### *Hypothetical Future Resident*

Barium and chromium were detected in surface soil greater than the screening level but less than background. No other chemicals reported maximum detected concentrations greater than screening levels. Therefore, no surface soil COPCs were identified for this receptor.

#### *Current/Future Commercial/Industrial Worker*

Arsenic and chromium were detected in surface soil greater than the screening level but less than background. No other chemicals reported maximum detected concentrations greater than screening levels. Therefore, no surface soil COPCs were identified for this receptor.

## Site 8

Results of surface soil screening for Site 8 are presented in Table 2.5.1a (hypothetical future resident) and 2.5.1b (commercial/industrial worker) and discussed below.

In surface soil, detections were reported for inorganics (arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, and zinc), VOCs (1,2-dichloroethene, 2-hexanone, 4-methyl-2-pentanone, acetone, carbon disulfide, ethylbenzene, m, p-xylene, methyl ethyl ketone, o-xylene, toluene, xylenes, and trans-1,2-dichloroethene), SVOCs (bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, and di-n-octyl phthalate), and TPH (TPH, diesel range, oil range, and gasoline range). Barium and zinc were detected in surface soil greater than background.

### *Hypothetical Future Resident*

Barium and zinc were detected in surface soil greater than the screening level but less than background. Oil range and gasoline range reported maximum detected concentrations greater than screening levels and were retained as surface soil COPCs. No other chemicals reported maximum detected concentrations greater than screening levels.

### *Current/Future Commercial/Industrial Worker*

Barium and zinc were detected in surface soil greater than the screening level but less than background. Oil range reported a maximum detected concentration greater than the screening level and was retained as a surface soil COPC. No other chemicals reported maximum detected concentrations greater than screening levels.

## *A.3.5 Subsurface Soil Screening Results*

### Site 4

Results of subsurface soil screening for Site 4 are presented in Table 2.1.2a (hypothetical future resident) and Table 2.1.2b (commercial/industrial worker) and discussed below.

In subsurface soil, detections were reported for inorganics (arsenic, barium, chromium, copper, lead, nickel, and zinc), TPH, VOCs (acetone and toluene), and SVOCs (diethylphthalate, butyl benzyl phthalate, and bis(2-ethylhexyl)phthalate). Barium was the only chemical detected in subsurface soil at Site 4 greater than background.

### *Hypothetical Future Resident*

Arsenic was detected in subsurface soil greater than the screening level but less than background. No chemicals were detected in concentrations greater than the screening levels. Therefore, no subsurface soil COPCs were identified for this receptor.

### *Future Commercial/Industrial Worker*

Arsenic was detected in subsurface soil greater than the screening level but less than background. No chemicals were detected in concentrations greater than the screening levels. Therefore, no subsurface soil COPCs were identified for this receptor.

### Site 5

Results of the subsurface soil screening for Site 5 are presented in Table 2.2.2a (hypothetical future resident) and Table 2.2.2b (commercial/industrial worker) and discussed below.

In subsurface soil, detections were reported for inorganics (arsenic, barium, chromium, copper, lead, nickel, and zinc) and VOCs (acetone and toluene). Barium was detected in subsurface soil greater than background.

#### *Hypothetical Future Resident*

Arsenic was detected in surface soil greater than the screening level; however, less than background. No other chemicals were detected in concentrations greater than the screening levels. Therefore, no subsurface soil COPCs were identified for this receptor.

#### *Future Commercial/Industrial Worker*

Arsenic was detected in subsurface soil greater than the screening level; however, less than background. No other chemicals were detected in concentrations greater than the screening levels. Therefore, no subsurface soil COPCs were identified for this receptor.

### Site 6

Results of subsurface soil screening for Site 6 are presented in Table 2.3.2a (hypothetical future resident) and 2.3.2b (commercial/industrial worker) and discussed below.

In subsurface soil, detections were reported for inorganics (arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, selenium, thallium, and zinc), VOCs (1,2-dichloroethene, 2-hexanone, acetone, carbon disulfide, ethylbenzene, m,p-xylene, methyl ethyl ketone, methylene chloride, o-xylene, toluene, xylenes, and TCE), SVOCs (2-methylnaphthalene, bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, di-n-octyl phthalate, fluorene, and naphthalene), and TPH (TPH, JP-4, diesel range, oil range, and gasoline range). Lead was detected in subsurface soil greater than background.

#### *Hypothetical Future Resident*

Arsenic and thallium were reported in subsurface soil greater than the screening level but less than background. TCE, TPH (evaluated as C11-C22 aromatics), JP-4 (evaluated as C9-C18 aliphatics), diesel range (evaluated as C9-C18 aliphatics), oil range (evaluated as C9-C18 aliphatics), and gasoline range (evaluated as C9-C10 aromatics) were greater than screening levels and retained as subsurface soil COPCs. No other chemicals reported maximum detected concentrations greater than screening levels.

#### *Future Commercial/Industrial Worker*

Arsenic was detected in subsurface soil greater than the screening level but less than background. TCE, TPH (evaluated as C11-C22 aromatics), JP-4 (evaluated as C9-C18 aliphatics), diesel range (evaluated as C9-C18 aliphatics), oil range (evaluated as C9-C18 aliphatics), and gasoline range (evaluated as C9-C10 aromatics) were greater than screening levels and retained as subsurface soil COPCs. No other chemicals reported maximum detected concentrations greater than screening levels.

Site 7

Results of subsurface soil screening for Site 7 are presented in Table 2.4.2a (hypothetical future resident) and 2.4.2b (commercial/industrial worker) and discussed below.

In subsurface soil, detections were reported for inorganics (arsenic, barium, beryllium, chromium, copper, lead, mercury, nickel, selenium, and zinc), VOCs (2-hexanone, 4-methyl-2-pentanone, acetone, benzene, carbon disulfide, chloroform, ethylbenzene, m,p-xylene, methyl ethyl ketone, o-xylene, toluene, and xylenes), SVOCs (2-methylnaphthalene, bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, di-n-octylphthalate, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene), and TPH (TPH, JP-4, diesel range, oil range, and gasoline range). Barium, lead, and zinc were detected in subsurface soil greater than background.

*Hypothetical Future Resident*

Arsenic reported a maximum detected concentration in subsurface soil greater than the screening level but less than background. Benzene, chloroform, toluene, 2-methylnaphthalene, TPH, JP-4, diesel range, oil range, gasoline range, and lead reported maximum detected concentrations greater than screening levels and were retained as subsurface soil COPCs. No other chemicals reported maximum detected concentrations greater than screening levels.

*Future Commercial/Industrial Worker*

Arsenic reported a maximum detected concentration greater than the screening level but less than background. Benzene, toluene, 2-methylnaphthalene, TPH, JP-4, diesel range, oil range, and gasoline range reported maximum detected concentrations greater than screening levels and were retained as subsurface soil COPCs. No other chemicals reported maximum detected concentrations greater than screening levels.

Site 8

Results of subsurface soil screening for Site 8 are presented in Table 2.5.2a (hypothetical future resident) and 2.5.2b (commercial/industrial worker) and discussed below.

In subsurface soil, detections were reported for inorganics (arsenic, barium, beryllium, chromium, copper, lead, mercury, nickel, selenium, thallium, and zinc), VOCs (1,1,2-trichloroethane, 1,2/1,4-dichlorobenzene, 1,2-dichlorobenzene, 1,2-dichloroethene, 2-hexanone, acetone, carbon disulfide, chlorobenzene, ethylbenzene, methyl ethyl ketone, methylene chloride, toluene, xylenes, and TCE), SVOCs (2-methylnaphthalene, bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, di-n-octyl phthalate, and naphthalene), and TPH (TPH, JP-4, diesel range, oil range, and gasoline range). Thallium was detected in subsurface soil greater than background.

*Hypothetical Future Resident*

Arsenic and thallium were detected in subsurface soil greater than the screening level but less than background. Gasoline range and thallium reported maximum detected concentrations greater than screening levels and were retained as subsurface soil COPCs. No other chemicals reported maximum

detected concentrations greater than screening levels.

#### *Future Commercial/Industrial Worker*

Arsenic was detected in subsurface soil greater than the screening level but less than background. Gasoline range reported a maximum detected concentration greater than the screening level and was retained as a subsurface soil COPC. No other chemicals reported maximum detected concentrations greater than screening levels.

#### *A.3.6 Sediment Screening Results*

Sediments were conservatively screened using soil screening levels as presented in Tables 2.6.1a (hypothetical future resident) and 2.6.1b (commercial/industrial worker). TPH and inorganics (arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc) were detected in sediments at Site 6. Cadmium, chromium, lead, and zinc were detected in sediment greater than background.

#### *Hypothetical Future Resident*

Arsenic was detected in sediment greater than the screening level but less than background. TPH, cadmium, and lead reported maximum detected concentrations greater than screening levels and were retained as sediment COPCs. No other chemicals reported maximum detected concentrations greater than screening levels.

#### *Current/Future Commercial/Industrial Worker*

Arsenic was detected in sediment greater than the screening level but less than background.. TPH reported a maximum detected concentration greater than the screening level and retained as a sediment COPC. No other chemicals reported maximum detected concentrations greater than screening levels.

#### *A.3.7 Groundwater Screening Results*

Groundwater was screened using tapwater screening levels as presented in Table 2.7.1. Detections were reported for extractable petroleum hydrocarbons (C9-C18 aliphatic, C19-C-36 aliphatic, and C11-C22 aromatic), volatile petroleum hydrocarbons (benzene, C5-C8 aliphatic, C9-C10 aromatic, C9-C12 aliphatic, ethylbenzene, naphthalene, tert-butyl methyl ether, toluene, total volatile petroleum hydrocarbons, and xylenes), and VOCs (acetone, n-propylbenzene, chloroform, 1,1,2-trichloroethane, 1,1-dichloroethane, 1,2,3-trichloropropane, 1,2,4-trimethylbenzene, 1,2-dichloroethane, 1,3,5-trimethylbenzene, benzene, carbon tetrachloride, cis-1,2-dichloroethylene, ethylbenzene, isopropylbenzene, m,p-xylene, methyl ethyl ketone, methyl isobutyl ketone, naphthalene, n-butylbenzene, o-xylene, p-cymene sec-butylbenzene, t-butylbenzene, tetrachloroethylene, toluene, total 1,2-dichloroethene, trans-1,2-dichloroethene, TCE, and vinyl chloride).

Maximum detected concentrations of C9-C18 aliphatic, total extractable petroleum hydrocarbons, benzene, C5-C8 aliphatic, C9-C10 aromatic, C9-C12 aliphatic, total volatile petroleum hydrocarbons, n-propylbenzene, 1,1,2-trichloroethane, 1,1-dichloroethane, 1,2,3-trichloropropane, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, benzene, carbon tetrachloride, cis-1,2-dichloroethylene, isopropylbenzene, total

1,2-dichloroethene, TCE, and vinyl chloride were greater than screening levels protective of groundwater used as tapwater and retained as COPCs.

The chemicals identified above are retained as drinking water COPCs under a hypothetical future use scenario. Under current and anticipated future site use conditions, ingestion and dermal contact with groundwater (as drinking water) are incomplete exposure pathways. Thus, further quantitative evaluation of groundwater as drinking water was not conducted herein. However, additional evaluation of groundwater risks will be conducted following collection of additional groundwater samples near the Site 1 property boundary in 2023.

## A.4 Cumulative Risk-Screening Evaluation

Chemicals identified as COPCs based on the comparison to risk-based screening levels discussed in the previous section were further evaluated in a cumulative risk screening evaluation, in which the potential cancer risk and noncancer hazard are estimated based on the relationship between the risk-based screening levels and the target risk and target hazard levels upon which the screening levels are based. This approach represents a conservative screening-level evaluation of the potential risk/hazard associated with human exposure to COPCs in site soil and sediment.

The USEPA RSLs are a comprehensive set of screening levels for multiple receptors and media. RSLs are protective of human health and correspond to an excess lifetime cancer risk (ELCR) of 1E-6 (i.e., probability of one in one million) or noncancer hazard quotient (HQ) of 1 (the threshold or “safe dose”), based on USEPA recommended default input variables (e.g., exposure parameters, toxicity values) (USEPA 2022b). MT DEQ risk-based screening levels (RBSLs) and DEQ 7 levels provide initial screening levels in some instances but do not provide endpoint-specific (cancer or noncancer) levels for this comparison. TPH are only assessed in HHRAs for noncancer effects. Thus, potential cumulative risks and hazards are estimated herein primarily using the USEPA RSLs; however, potential cumulative noncancer hazards are estimated for TPHs using MT DEQ screening levels only for noncancer effects. If bulk TPH data were available at a site along with fuel mixtures, the bulk TPH data was excluded to avoid double counting. The TPH risk calculations use fractional assumptions applied to EPCs as detailed in the MT DEQ guidance and summarized below:

- Bulk TPH data were evaluated assuming 100% as C11-C22 aromatic
- Gasoline range organics were evaluated assuming 100% as C9-C10 aromatic
- Diesel range organics assumed 40% as C9-C18 aliphatic and 60% as C11-C22 aromatic
- Jet Propellant 4 (JP-4) assumed 70% as C9-C18 aliphatic and 30% as C11-C22 aromatic
- Oil range organics assumed 30% as C9-C18 aliphatic and 70% as C11-C22 aromatic

The cumulative risk screening evaluation was performed using the sum of ratios approach described in the RSL User’s Guide (USEPA 2022b). Using this approach, the potential cancer risk and noncancer HQ were estimated for each COPC using the following equations:

$$\text{Chemical-Specific ELCR} = \text{EPC} / \text{Cancer Endpoint screening level (SL)} \times (1\text{E-}6)$$

$$\text{Chemical-Specific Noncancer HQ} = \text{EPC} / \text{Noncancer Endpoint SL} \times \text{Target Hazard}^1$$

The cumulative ELCR for each receptor was estimated by summing the individual potential ELCRs for all of the carcinogenic COPCs. The hazard index (HI) for each receptor was estimated by summing the individual HQs for the noncarcinogenic COPCs. As a first approximation, all noncarcinogenic COPCs were assumed to have additive effects.

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<sup>1</sup> USEPA RSLs used in this assessment are based on a target noncancer hazard of 0.1; MT DEQ screening levels are based on a target noncancer hazard of 0.125.

USEPA (1991) states that where the cumulative incremental current or future potential ELCR to an individual is less than  $1E-4$ , action generally is not warranted unless there are adverse environmental impacts. Per USEPA (1991), a cancer risk of  $1E-6$  or less is considered *de minimis* risk (i.e., the probability of an individual developing cancer from this exposure is one in a million and may be interpreted as negligible or essentially cannot be differentiated from the background level of risk). A comparison of the one in a million ( $1E-6$ ) cancer risk threshold to the current background risk for all types of cancer in the United States population of 1 in 2 ( $4.1E-1$ ) for men and 1 in 3 ( $3.9E-1$ ) for women (American Cancer Society 2023) demonstrates the levels of protectiveness and conservatism of this threshold. USEPA (1991) uses the cancer risk range of  $1E-4$  to  $1E-6$  as a “target risk management range” and uses a target noncancer HI of 1 per target organ.

The estimated potential risks and hazards are only estimates and are based on intentionally conservative exposure scenarios and toxicity values. This HHRA utilizes standard (intentionally conservative) exposure scenarios. Exceedance of any particular risk or hazard level does not imply that adverse health effects have already occurred or will occur but indicate that further evaluation may be recommended.

Exposure point concentrations (EPCs) for surface and subsurface soil and sediment were equal to the 95% upper confidence limit (UCL) on the arithmetic mean concentration, calculated using USEPA’s ProUCL Version 5.1.002 statistical software package (USEPA 2016), as recommended by USEPA. In instances where the 95% UCL was greater than the maximum detected concentration, the maximum detected concentration was selected as the EPC. ProUCL statistical output tables are provided as Attachment A-1.

EPCs for lead were calculated as the arithmetic mean or average concentration, in accordance with USEPA guidance (USEPA 2007). For the purposes of this evaluation the EPC was compared to the receptor-specific screening level. Lead was not included in the cumulative risk and hazard calculations.

For the purposes of this screening level HHRA, default parameters used in the RSL (2022b) and MT DEQ (2018) equations to calculate site-specific screening levels were not modified. The RSLs are based on default exposure parameters and factors that represent a Reasonable Maximum Exposure (RME) scenario for long-term chronic exposures associated with a hypothetical future resident (adult and child) and commercial/industrial workers (USEPA 2022b) as follows:

- Exposure duration: 20 (adult resident), 6 (child resident), 25 (worker) - years
- Exposure frequency: 350 (resident), 250 (commercial/industrial worker) - days per year
- Exposure time: 24 (adult and child), 8 (worker) - hours per day
- Body weight: 15 (child), 80 (adult) - kilograms
- Averaging time (noncancer): 2,190 (child), 7,300 (adult), 9,125 (worker) – days
- Averaging time (cancer): 25,550 - days
- Ingestion rate (soil/sediment): 200 (child), 100 (adult and worker) - milligram per day

- Skin surface area: 2,373 (child), 6,032 (adult), 3,527 (worker) - square centimeters
- Adherence factor: 0.2 (child), 0.07 (adult), 0.12 (worker) - milligrams

#### *A.4.1 Cumulative Risk Screening Evaluation Results*

The Table 4 series presents the cumulative risk screening evaluation performed for exposure to surface and subsurface soil and sediment COPCs for the hypothetical future resident and commercial/industrial worker scenarios. Cumulative risk screening was not performed for groundwater as additional data are required to determine if drinking water is an complete exposure pathway. Results are detailed in the sections below.

##### *A.4.1.1 Hypothetical Future Resident*

This screening level HHRA evaluated a hypothetical future residential use scenario to represent an unrestricted use and unlimited exposure scenario to inform risk management decisions. However, the site is currently used for commercial/industrial purposes which is anticipated to continue into the foreseeable future. Hypothetical future residents were assumed to potentially be exposed to surface soil, subsurface soil, and sediment.

##### Site 4

The estimated potential ELCR and HI for a hypothetical future residential scenario at Site 4 are presented in Table 4.1a.

No carcinogenic COPCs were identified for surface soil at Site 4.

The potential noncancer HI for a hypothetical future resident potentially exposed to surface soil at Site 4 was less than the USEPA target level of 1; the HI was 0.4.

##### Site 6

Estimated potential ELCRs and HIs for hypothetical future residents in surface and subsurface soils are presented in Tables 4.3a and 4.3b, respectively. Cumulative potential ELCRs and HIs for hypothetical future residents exposed to chemicals in sediment are presented in Table 4.3c.

The estimated potential ELCR for hypothetical future residents exposed to surface soil was within the USEPA acceptable risk range; the ELCR was 3E-6.

The estimated potential noncancer HI for hypothetical future residents exposed to surface soil was greater than the USEPA target level of 1; the HI was 5. Hazards were driven by the presence of gasoline range (2), oil range (0.8), JP-4 (0.9), cadmium (0.5), thallium (0.5), and diesel range (0.4).

The evaluation of lead is conducted differently from other constituents because of lead's unique toxicological properties and is not accounted for in the estimated potential ELCR and HI. To evaluate the potential risks from exposure to lead, the arithmetic mean concentration (EPC) was compared to the residential screening level. The EPC for lead in surface soil at Site 6 (91 mg/kg) was less than the residential screening level (200 mg/kg). Thus, lead was not considered a COPC for surface soil at Site 6.

The estimated potential ELCR for hypothetical future residents exposed to subsurface soil was equal to the lower end of the USEPA acceptable risk range; the ELCR was 1E-6.

The estimated potential noncancer HI for hypothetical future residents exposed to subsurface soil was greater than the USEPA target level of 1; the HI was 18. Hazards were driven by the presence of oil range (7), gasoline range (6), JP-4 (3), diesel range (1.5), and TCE (0.2).

No carcinogenic COPCs were identified for hypothetical future residents exposed to sediment at Site 6.

The estimated potential noncancer HI for hypothetical future residents exposed to sediment was less than the USEPA target level of 1; the HI was 0.6.

The EPC (arithmetic mean) for lead (315 mg/kg) was greater than the residential screening level (200 mg/kg). This evaluation uses soil screening levels as a conservative estimate of potential risks and hazards. Exposures to sediment are likely to be much less frequent in intensity and duration than residential contact with soils. Though the EPC is greater than the screening level, lead was not retained as a sediment COPC. Uncertainty associated with this assumption is detailed in the uncertainty section.

#### Site 7

No COPCs were identified for hypothetical future residents exposed to surface soil. Estimated potential ELCRs and HIs for hypothetical future residents in subsurface soils are presented in Table 4.4b.

The estimated potential ELCR for hypothetical future residents exposed to subsurface soil was within the USEPA acceptable risk range; the ELCR was 3E-6.

The estimated potential noncancer HI for hypothetical future residents exposed to subsurface soil was greater than the USEPA target level of 1; the HI was 4. Hazards were driven by the presence of oil range (2), JP-4 (7), diesel range (0.3) gasoline range (0.9), JP-4 (0.5), and 2-methylnaphthalene (0.2).

The evaluation of lead is conducted differently from other constituents because of lead's unique toxicological properties and is not accounted for in the estimated potential ELCR and HI. To evaluate the potential risks from exposure to lead, the arithmetic mean concentration (EPC) was compared to the residential screening level. The EPC for lead in subsurface soil at Site 7 (63 mg/kg) was less than the residential screening level (200 mg/kg). Thus, lead was not considered a COPC for subsurface soil at Site 7.

#### Site 8

Estimated potential ELCRs and HIs for hypothetical future residents in surface and subsurface soils are presented in Tables 4.5a and 4.5b, respectively.

No carcinogenic COPCs were identified for surface soil for hypothetical future residents at Site 8.

The estimated potential noncancer HI for hypothetical future residents exposed to surface soil was equal to the USEPA target level of 1.

No carcinogenic COPCs were identified for subsurface soil for hypothetical future residents at Site 8.

The estimated potential noncancer HI for hypothetical future residents exposed to subsurface soil was equal

#### A.4.1.2 Current/Future Commercial/Industrial Workers

The site is currently used for commercial/industrial purposes which is anticipated to continue into the foreseeable future. Commercial/industrial workers were assumed to potentially be exposed to surface soil (current/future), subsurface soil (future), and sediment (current/future).

##### Site 6

Estimated potential ELCRs and HIs for current/future commercial/industrial workers in surface soil, subsurface soil, and sediment are presented in Tables 4.3a, 4.3b, and 4.3c, respectively.

No carcinogenic COPCs were identified for commercial/industrial workers in surface soils.

The estimated potential noncancer HI for commercial/industrial workers exposed to surface soil was greater than the USEPA target level of 1; the HI was 39. Hazards were driven by the presence of TPH (23), gasoline range (6), oil range (4), JP-4 (3), and diesel range (2).

The estimated potential ELCR for commercial/industrial workers exposed to subsurface soil was less than the USEPA acceptable risk range; the ELCR was 2E-7.

The estimated potential noncancer HI for commercial/industrial workers exposed to subsurface soil was greater than the USEPA target level of 1; the HI was 4. Hazards were driven by the presence of oil range (1.6), gasoline range (1), JP-4 (0.6), and diesel range (0.3).

No carcinogenic COPCs were identified for commercial/industrial workers exposed to sediment at Site 6.

The estimated potential noncancer HI for commercial/industrial workers exposed to sediment was less than the USEPA target level of 1; the HI was 0.2.

##### Site 7

Estimated potential ELCRs and HIs for current/future commercial workers from exposure to subsurface soils are presented in Table 4.4b.

No COPCs were identified for current/future commercial/industrial workers in surface soil at Site 7.

The estimated potential ELCR for commercial/industrial workers exposed to subsurface soil is less than the USEPA acceptable risk range; the ELCR was 4E-7.

The estimated potential noncancer HI for commercial/industrial workers exposed to subsurface soil is equal to the USEPA target level of 1.

##### Site 8

Estimated potential ELCRs and HIs for current/future commercial workers from exposure to surface and subsurface soils are presented in Tables 4.5a and 4.5b, respectively.

No carcinogenic COPCs were identified for surface soil for current/future commercial/industrial workers at Site 8.

The estimated potential noncancer HI for current/future commercial/industrial workers exposed to surface soil was less than the USEPA target level of 1; the HI was 0.2.

No carcinogenic COPCs were identified for subsurface soil for current/future commercial/industrial workers at Site 8.

The estimated potential noncancer HI for current/future commercial/industrial workers exposed to subsurface soil was less than the USEPA target level of 1; the HI was 0.2.

## **A.5 Uncertainties**

This screening level HHRA involves the consideration of multiple data sources, conservative exposure scenarios, current science in the form of toxicity data and site characteristics to quantify receptor risk/hazard within the CSM. Each component brings with it inherent uncertainties that may over- or underestimate risk/hazard, which should be weighed with the overall risk/hazard results. The following are key site-specific topics that may contribute uncertainty within the risk assessment process of this HHRA.

### *A.5.1 Limitations of the Dataset*

The characterization of a site is reliant on the quality of the data used. In this uncertainty assessment, the approach required sufficient data from each individual site. The following subsections describe the data limitations of the risk assessment.

#### A.5.1.1 Soil Data Limitations

The ideal soil dataset should provide representative samples both laterally and vertically to meet the receptor exposures evaluated (i.e., a systematic grid sampling). Often times soil sampling is targeted based on site information and past uses; this creates a dataset biased high since sample locations are selected based on known or suspected areas of contamination.

The majority of soil data was collected from a limited number of locations at each site ( $n < 10$ ) in areas of suspected contamination. In some instances, only two samples per analyte (surface soil for Site 5) were available. The limited data available introduces uncertainty into the risk assessment direct contact pathways and may over- or underestimate risks.

#### A.5.1.2 Exposure Point Concentrations

The risk assessment relies on the estimation of EPCs (95% UCL or maximum detected concentration) to estimate risks and hazards. There is some bias in using the EPC to represent a potential receptors exposure. The statistical process used to calculate the EPC is intended to minimize the chance that the average concentration is underestimated; therefore, it is likely that the result of the EPC estimation process results in an overestimate of risks and hazards.

In this assessment, if sufficient data were unavailable to calculate a reliable 95% UCL or if the calculated UCL was greater than the maximum detected concentration, the maximum detected concentration was used as an EPC. This has the potential to overestimate risks as it assumes a receptor spends the entire exposure frequency and duration at the most contaminated area of the site. This conservative assumption is reasonable for this screening level assessment; however, suggests further evaluation may be warranted to accurately estimate potential risks and hazards.

#### A.5.1.3 Use of Old Data

Soil data from as early as 1990 were included in the HHRA dataset (see Section A.3.1). Although a soil sample being “old” is not a sufficient reason for omission, the data points also lacked some location and depth information. Aged soil samples may not accurately reflect current site conditions as chemicals may undergo weathering over time. Weathering may result in the volatilization of volatile chemicals,

biodegradation, and physical changes that affect a chemicals movement in the environment (density/viscosity). Since a statistical average was used in the EPC calculation, soil data with the above listed uncertainty were included as a conservative measure. There is also a low possibility of under-estimating risk for cases of diluting the dataset with low detect values. Utilizing the 95% UCL generally mitigates some of the uncertainty. Risks are likely overestimated as a result.

#### *A.5.2 Exposure Assumptions*

Estimated potential risk and hazard were evaluated for default exposure scenarios that do not take into account modification based on site-specific information. These default assumptions might result in overestimating the intakes calculated for specific receptors, depending on the accuracy of the assumptions relative to actual site conditions and land uses. The default assumptions were selected to produce a reasonable upper-bound estimate of potential risks and hazards in accordance with USEPA guidelines.

#### *A.5.3 Lead Evaluation*

The soil screening level used in this screening level HHRA is equal to the MT DEQ residential screening level for lead, which corresponds to the lead concentration at which the probability of a child's PbB concentration exceeding 5 µg/dL does not exceed 5% (MT DEQ 2021). The USEPA RSLs are still based on the PbB level of concern of 10 µg/dL which corresponds to a RSL of 400 mg/kg. The CDC has adopted a "reference value" for lead based on the >97.5th percentile of the PbB level distribution in U.S. children aged 1-5 years, which currently has most recently been referenced as 3.5 µg/dL. The reference value is intended to identify children potentially at risk from exposure to lead from many sources and is not a toxicological value for environmental cleanup. If the target PbB level decreases in the future, further evaluation may be warranted to determine potential health effects associated with exposures to lead.

The EPC for lead in sediment at Site 6 (315 mg/kg) was greater than the residential soil screening level (200 mg/kg). The use of residential soil screening levels for sediment exposures is highly conservative as the site is not likely to be redeveloped for residential use. In addition, residential soil screening levels are overly conservative for a sediment exposure scenario which would likely include much lower exposure frequency and duration. As such, lead is not considered a COPC for sediment. Should redevelopment of the site be considered, additional evaluation of sediment may be warranted.

#### *A.5.4 Total Petroleum Hydrocarbon Approach*

Whole product TPH analytical results (gasoline, diesel, JP-4, oil, and total TPH) are a significant portion of results available for evaluation herein. The composition and toxicity of each product will change over time during weathering. In addition, a high degree of variability is present in final product materials which introduces uncertainty in extrapolating toxicity results from one tested product to other (ITRC 2019).

In some instances, individual constituent analytical data were available though not subtracted from the bulk product group it may be associated with. This has the potential to overestimate risks to receptors as chemicals are double counted for cumulative risks and hazards.

As discussed in Section A.5.1.2, in some instances, a sufficient number of samples or detected concentrations were not available to calculate a UCL. Therefore, estimated potential risks are based on the

maximum detected concentration of a chemical. The use of maximum detected concentrations as the EPC in this screening level risk assessment has the potential to overestimate risks for receptors.

## **A.6 Conclusions**

The screening level HHRA results indicate the estimated potential risks/hazards associated with exposure to COPCs in site media exceeds USEPA's target risk range and/or target HI level, respectively, for a hypothetical future residential scenario at Site 6 (surface and subsurface soil), Site 7 (subsurface soil), and Site 8 (subsurface soil). Potential risk/hazard did not exceed USEPA's target risk range or HI level for a hypothetical future residential scenario at Site 4 (surface and subsurface soil), Site 5 (surface and subsurface soil), Site 6 (sediment), Site 7 (surface soil), or Site 8 (surface soil). An evaluation of lead found that arithmetic mean concentrations at Site 6 (surface soil) and Site 7 (subsurface soil) were below the residential screening level (200 mg/kg). The arithmetic mean lead concentration in sediment at Site 6 (315 mg/kg) was greater than the residential soil screening level (200 mg/kg). Though the mean concentration of lead in sediment exceeds the screening level, the screening level was developed for residential exposure to soil which would occur with a much greater frequency than exposure to sediment. Should the Base be considered for redevelopment, additional evaluation may be warranted.

Estimated potential risks/hazards associated with exposure to COPCs in site media exceeds USEPA's target risk range and/or target HI level, respectively, for a current/future commercial worker scenario at Site 6 (subsurface soil). No potential unacceptable risks/hazards were identified for Site 4 (surface and subsurface soil), Site 5 (surface and subsurface soil), Site 6 (surface soil and sediment), Site 7 (surface and subsurface soil), and Site 8 (surface and subsurface soil).

It is assumed that estimated potential risks and hazards for residents and commercial/industrial workers are also protective of construction workers. It is anticipated that all maintenance work conducted at the Site are guided by appropriate site and contractor Health and Safety Plans (HASP) which limits exposure to Site media using personal protective equipment.

The results of the screening level HHRA identified TPH as the primary risk driver in surface and subsurface soils and sediments. TPH data were available as whole product (gasoline, diesel, etc.) and bulk TPH. Screening and potential cumulative risks and hazards were evaluated using surrogates for aged petroleum mixtures in agreement with MT DEQ guidance (MT DEQ 2018). This evaluation does not take into account potential weathering processes that alter the chemical composition and toxicity of petroleum products. This approach is appropriate for a screening level evaluation; however, may overestimate potential human health risks. Thus, additional evaluation may be warranted in the future should redevelopment occur. Currently, the Site is mostly paved with manicured lawns/landscaping which limits the potential for human receptors to come into direct contact with soil.

There are no current ecological receptors for the Base soils. Although soil-related pathways may be potentially complete for ecological receptors in the future, these pathways are considered insignificant given the very limited foraging and nesting/breeding habitat offered by the artificial landscaping features, manicured lawns, paved surfaces, and high level of human activity.

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Appendix A  
Table 2.1.1a  
Site 4 - Surface Soil Screening (0 to 2 feet below ground surface) - Hypothetical Future Resident  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum Hydrocarbons (1)	TPH	83	1500	mg/kg	SB2-1(D)	4 / 4	NA	--	NA	490	Yes	Yes	2000	No
<b>Inorganics</b>														
Arsenic	7440-38-2	5	7.4	mg/kg	SB2-1	5 / 5	NA	22.5	No	0.68	Yes	No	1308	No
Barium	7440-39-3	170	260	mg/kg	SB5-1.5	5 / 5	NA	429	No	1500	No	No	39474	No
Chromium (1)	7440-47-3	9.3	17	mg/kg	SB2-1	5 / 5	NA	41.7	No	0.3	Yes	No	5455	No
Copper	7440-50-8	7.4	18.5	mg/kg	SB5-1.5	5 / 5	NA	165	No	310	No	No	50375	No
Lead	7439-92-1	9.3	16.7	mg/kg	SB2-1	5 / 5	NA	29.8	No	200 (a)	No	No	4000	No
Nickel	7440-02-0	7.1 B	13.8	mg/kg	SB2-1	3 / 5	6.5 - 7.6	31.4	No	150	No	No	3846	No
Zinc	7440-66-6	34.3	48.4	mg/kg	SB2-1	5 / 5	NA	118	No	2300	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Total petroleum hydrocarbons used C11-C22 aromatics

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels were selected from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

**Appendix A**  
**Table 2.1.1b**  
**Site 4 - Surface Soil Screening (0 to 2 feet below ground surface) - Commercial/Industrial Worker**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum Hydrocarbons (1)	TPH	83	1500	mg/kg	SB2-1(D)	4 / 4	NA	--	NA	3900	No	No	2000	No
<b>Inorganics</b>														
Arsenic	7440-38-2	5	7.4	mg/kg	SB2-1	5 / 5	NA	22.5	No	3	Yes	No	1308	No
Barium	7440-39-3	170	260	mg/kg	SB5-1.5	5 / 5	NA	429	No	22000	No	No	39474	No
Chromium	7440-47-3	9.3	17	mg/kg	SB2-1	5 / 5	NA	41.7	No	6	Yes	No	5455	No
Copper	7440-50-8	7.4	18.5	mg/kg	SB5-1.5	5 / 5	NA	165	No	4700	No	No	50375	No
Lead	7439-92-1	9.3	16.7	mg/kg	SB2-1	5 / 5	NA	29.8	No	923 (a)	No	No	4000	No
Nickel	7440-02-0	7.1	13.8	mg/kg	SB2-1	3 / 5	6.5 - 7.6	31.4	No	2200	No	No	3846	No
Zinc	7440-66-6	34.3	48.4	mg/kg	SB2-1	5 / 5	NA	118	No	35000	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Total petroleum hydrocarbons used C11-C22 aromatics

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels were selected from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a commercial/industrial exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

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Appendix A  
Table 2.1.2a  
Site 4 - Subsurface Soil Screening (> 2 feet below ground surface) - Hypothetical Future Resident  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background ?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Volatile Organic Compounds</b>														
Acetone	67-64-1	0.052 J	0.16 J	mg/kg	SB3-3	3 / 7	0.11 - 0.54	--	NA	7000	No	No	70000	No
Toluene	108-88-3	0.006	0.006	mg/kg	SB1-5.5	1 / 7	0.006 - 0.027	--	NA	100	No	No	100	No
<b>Semivolatile Organic Compounds</b>														
Diethylphthalate	84-66-2	1.7	1.7	mg/kg	SB4-7	1 / 7	0.35 - 3.6	--	NA	5100	No	No	20400	No
Butylbenzylphthalate	85-68-7	0.41	1.4	mg/kg	SB3-3	2 / 7	0.36 - 3.6	--	NA	290	No	No	181	No
bis(2-Ethylhexyl)phthalate	117-81-7	0.12 J	0.24 J	mg/kg	SB1-5.5	2 / 7	0.36 - 3.6	--	NA	39	No	No	418	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum Hydrocarbons (1)	TPH	230	600	mg/kg	SB2-3.5	2 / 7	NA	--	NA	2000	No	No	2000	No
<b>Inorganics</b>														
Arsenic	7440-38-2	3.6	7.9	mg/kg	SB3-3	7 / 7	NA	22.5	No	1	Yes	No	1308	No
Barium	7440-39-3	138	1190	mg/kg	SB4-7	7 / 7	NA	429	Yes	1500	No	No	39474	No
Chromium (1)	7440-47-3	6.4	20.6	mg/kg	SB5-3.5	7 / 7	NA	41.7	No	12000	No	No	5455	No
Copper	7440-50-8	7	34.9	mg/kg	SB4-7	7 / 7	NA	165	No	310	No	No	50375	No
Lead	7439-92-1	7.5 N	15.4 N	mg/kg	SB5-3.5	7 / 7	NA	29.8	No	200 (a)	No	No	4000	No
Nickel	7440-02-0	7.5 B	12.1	mg/kg	SB5-3.5	4 / 7	6.7 - 7.3	31.4	No	150	No	No	3846	No
Zinc	7440-66-6	36	48.8	mg/kg	SB3-7	7 / 7	NA	118	No	2300	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

N = Spiked sample recovery not within control limits

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Total petroleum hydrocarbons used medium aromatics

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels were selected from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

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Appendix A  
Table 2.1.2b  
Site 4 - Subsurface Soil Screening (> 2 feet below ground surface) - Commercial/Industrial Worker  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Volatile Organic Compounds</b>														
Acetone	67-64-1	0.052 J	0.16 J	mg/kg	SB3-3	3 / 7	0.11 - 0.54	--	NA	110000	No	No	70000	No
Toluene	108-88-3	0.006	0.006	mg/kg	SB1-5.5	1 / 7	0.006 - 0.027	--	NA	100	No	No	100	No
<b>Semivolatile Organic Compounds</b>														
Diethylphthalate	84-66-2	1.7	1.7	mg/kg	SB4-7	1 / 7	0.35 - 3.6	--	NA	66000	No	No	20400	No
Butylbenzylphthalate	85-68-7	0.41	1.4	mg/kg	SB3-3	2 / 7	0.36 - 3.6	--	NA	1200	No	No	181	No
bis(2-Ethylhexyl)phthalate	117-81-7	0.12 J	0.24 J	mg/kg	SB1-5.5	2 / 7	0.36 - 3.6	--	NA	160	No	No	418	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum Hydrocarbons	(1) TPH	230	600	mg/kg	SB2-3.5	2 / 7	NA	--	NA	2000	No	No	2000	No
<b>Inorganics</b>														
Arsenic	7440-38-2	3.6	7.9	mg/kg	SB3-3	7 / 7	NA	22.5	No	3	Yes	No	1308	No
Barium	7440-39-3	138	1190	mg/kg	SB4-7	7 / 7	NA	429	Yes	22000	No	No	39474	No
Chromium	7440-47-3	6.4	20.6	mg/kg	SB5-3.5	7 / 7	NA	41.7	No	180000	No	No	5455	No
Copper	7440-50-8	7	34.9	mg/kg	SB4-7	7 / 7	NA	165	No	4700	No	No	50375	No
Lead	7439-92-1	7.5	15.4	mg/kg	SB5-3.5	7 / 7	NA	29.8	No	923 (a)	No	No	4000	No
Nickel	7440-02-0	7.5 B	12.1	mg/kg	SB5-3.5	4 / 7	6.7 - 7.3	31.4	No	2200	No	No	3846	No
Zinc	7440-66-6	36	48.8	mg/kg	SB3-7	7 / 7	NA	118	No	35000	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

N = Spiked sample recovery not within control limits

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Total petroleum hydrocarbons used medium aromatics

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels were selected from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a commercial/industrial exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

**Appendix A**  
**Table 2.2.1a**  
**Site 5 - Surface Soil Screening (0 to 2 feet below ground surface) - Hypothetical Future Resident**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background ?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Volatile Organic Compounds</b>														
Methylene Chloride	75-09-2	0.0055	J 0.01	J mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	35	No	No	159	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.0034	0.0034	mg/kg	GRE-010-SS-SB2-01	1 / 2	0.0033 - 0.0033	--	NA	30	No	No	35	No
Benzo(a)anthracene	56-55-3	0.0046	0.0046	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0032 - 0.0032	--	NA	1.3	No	No	35	No
Benzo(a)pyrene	50-32-8	0.0046	0.0046	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	0.13	No	No	12	No
Benzo(b)fluoranthene	205-99-2	0.0084	0.0084	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0032 - 0.0032	--	NA	1.3	No	No	120	No
Benzo(g,h,i)perylene	191-24-2	0.0031	J 0.0031	J mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0032 - 0.0032	--	NA	220	No	No	430	No
Chrysene	218-01-9	0.0055	0.0055	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	130	No	No	3500	No
Dibenz(a,h)anthracene	53-70-3	0.00064	J 0.0012	J mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	0.13	No	No	38	No
Fluoranthene	206-44-0	0.0097	0.0097	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	300	No	No	440	No
Indeno(1,2,3-c,d)pyrene	193-39-5	0.0053	0.0053	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	1.3	No	No	380	No
Phenanthrene	85-01-8	0.0014	J 0.0014	J mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0032 - 0.0032	--	NA	220	No	No	430	No
Pyrene	129-00-0	0.0086	0.0086	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	220	No	No	430	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum Hydrocarbons	(1) TPH	160	160	mg/kg	SB3-1.5	1 / 2	NA	--	NA	490	No	No	2000	No
<b>Inorganics</b>														
Aluminum	7429-90-5	2420	2790	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	25941	No	7700	No	No	77000	No
Antimony	7440-36-0	0.5	J 0.53	J mg/kg	GRE-010-SS-SB2-01	2 / 2	NA	0.4	Yes	3.1	No	No	238	No
Arsenic	7440-38-2	3.7	7	S mg/kg	SB3-1.5	4 / 4	NA	22.5	No	0.7	Yes	No	1308	No
Barium	7440-39-3	182	258	mg/kg	SB3-1.5	4 / 4	NA	429	No	1500	No	No	39474	No
Beryllium	7440-41-7	0.19	0.21	mg/kg	GRE-010-SS-SB2-01	2 / 2	NA	1.1	No	16	No	No	256	No
Cadmium	7440-43-9	0.1	0.6	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	0.7	No	0.7	No	No	--	NSL
Calcium	7440-70-2	2700	12200	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	EN	No	No	--	NSL
Chromium, Total	(1) 7440-47-3	6.2	12.7	mg/kg	SB2-1	4 / 4	NA	41.7	No	0.3	Yes	No	5455	No
Cobalt	7440-48-4	3.3	3.4	mg/kg	GRE-010-SS-SB2-01	2 / 2	NA	10	No	2.3	Yes	No	23	No
Copper	7440-50-8	5.4	31	mg/kg	SB3-1.5	4 / 4	NA	165	No	310	No	No	50375	No
Iron	7439-89-6	8180	8840	mg/kg	GRE-010-SS-SB2-01	2 / 2	NA	24400	No	5500	Yes	No	55000	No
Lead	7439-92-1	3.3	9.5	mg/kg	SB2-1	4 / 4	NA	29.8	No	200	(a) No	No	4000	No
Magnesium	7439-95-4	265	990	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	EN	No	No	--	NSL
Manganese	7439-96-5	112	115	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	880	No	180	No	No	1800	No
Mercury	7439-97-6	0.016	0.017	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	1.1	No	No	349	No
Nickel	7440-02-0	5.4	9.7	mg/kg	SB3-1.5	4 / 4	NA	31.4	No	150	No	No	3846	No
Potassium	7440-09-7	307	350	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	EN	No	No	--	NSL
Selenium	7782-49-2	0.22	0.29	mg/kg	SB3-1.5	2 / 4	0.3 - 0.42	0.7	No	39	No	No	1950	No
Sodium	7440-23-5	21.2	30.1	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	EN	No	No	--	NSL
Vanadium	7440-62-2	14.6	17.1	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	52.6	No	39	No	No	390	No
Zinc	7440-66-6	31.2	276	mg/kg	GRE-010-SS-SB1-01	4 / 4	NA	118	Yes	2300	No	No	76667	No

**Appendix A**  
**Table 2.2.1a**  
**Site 5 - Surface Soil Screening (0 to 2 feet below ground surface) - Hypothetical Future Resident**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background ?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
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Notes:

-- = not available

> = greater than

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

EN = essential nutrient

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

NSL = no screening level

S = reported value was determined by the method of standard additions

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Benzo(g,h,i)perylene used pyrene

Phenanthrene used pyrene

Total petroleum hydrocarbons used C11-C22 aromatics

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/tbca\\_guide](https://deq.mt.gov/Land/statesuperfund/tbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

**Appendix A**  
**Table 2.2.1b**  
**Site 5 - Surface Soil Screening (0 to 2 feet below ground surface) - Commercial/Industrial Worker**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background ?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Volatile Organic Compounds</b>														
Methylene Chloride	75-09-2	0.0055	J 0.01	J mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	320	No	No	159	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.0034	0.0034	mg/kg	GRE-010-SS-SB2-01	1 / 2	0.0033 - 0.0033	--	NA	250	No	No	35	No
Benzo(a)anthracene	56-55-3	0.0046	0.0046	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0032 - 0.0032	--	NA	24	No	No	35	No
Benzo(a)pyrene	50-32-8	0.0046	0.0046	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	2.4	No	No	12	No
Benzo(b)fluoranthene	205-99-2	0.0084	0.0084	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0032 - 0.0032	--	NA	24	No	No	120	No
Benzo(g,h,i)perylene	(1) 191-24-2	0.0031	J 0.0031	J mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0032 - 0.0032	--	NA	1900	No	No	430	No
Chrysene	218-01-9	0.0055	0.0055	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	2400	No	No	3500	No
Dibenz(a,h)anthracene	53-70-3	0.00064	J 0.0012	J mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	2.4	No	No	38	No
Fluoranthene	206-44-0	0.0097	0.0097	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	2500	No	No	440	No
Indeno(1,2,3-c,d)pyrene	193-39-5	0.0053	0.0053	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	24	No	No	380	No
Phenanthrene	(1) 85-01-8	0.0014	J 0.0014	J mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0032 - 0.0032	--	NA	1900	No	No	430	No
Pyrene	129-00-0	0.0086	0.0086	mg/kg	GRE-010-SS-SB1-01	1 / 2	0.0016 - 0.0016	--	NA	1900	No	No	430	No
<b>Total Petroleum Hydrocarbons</b>	(1) TPH	160	160	mg/kg	SB3-1.5	1 / 2	NA	--	NA	3900	No	No	2000	No
<b>Inorganics</b>														
Aluminum	7429-90-5	2420	2790	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	25941	No	110000	No	No	77000	No
Antimony	7440-36-0	0.5	J 0.53	J mg/kg	GRE-010-SS-SB2-01	2 / 2	NA	0.4	Yes	47	No	No	238	No
Arsenic	7440-38-2	3.7	7	S mg/kg	SB3-1.5	4 / 4	NA	22.5	No	3.0	Yes	No	1308	No
Barium	7440-39-3	182	258	mg/kg	SB3-1.5	4 / 4	NA	429	No	22000	No	No	39474	No
Beryllium	7440-41-7	0.19	0.21	mg/kg	GRE-010-SS-SB2-01	2 / 2	NA	1.1	No	230	No	No	256	No
Cadmium	7440-43-9	0.1	0.6	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	0.7	No	10	No	No	--	NA
Calcium	7440-70-2	2700	12200	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	EN	No	No	--	NA
Chromium, Total	(1) 7440-47-3	6.2	12.7	mg/kg	SB2-1	4 / 4	NA	41.7	No	6.3	Yes	No	5455	No
Cobalt	7440-48-4	3.3	3.4	mg/kg	GRE-010-SS-SB2-01	2 / 2	NA	10	No	35	No	No	23	No
Copper	7440-50-8	5.4	31	mg/kg	SB3-1.5	4 / 4	NA	165	No	4700	No	No	50375	No
Iron	7439-89-6	8180	8840	mg/kg	GRE-010-SS-SB2-01	2 / 2	NA	24400	No	82000	No	No	55000	No
Lead	7439-92-1	3.3	9.5	mg/kg	SB2-1	4 / 4	NA	29.8	No	923	(a) No	No	4000	No
Magnesium	7439-95-4	265	990	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	EN	No	No	--	NA
Manganese	7439-96-5	112	115	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	880	No	2600	No	No	1800	No
Mercury	7439-97-6	0.016	0.017	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	5	No	No	349	No
Nickel	7440-02-0	5.4	9.7	mg/kg	SB3-1.5	4 / 4	NA	31.4	No	2200	No	No	3846	No
Potassium	7440-09-7	307	350	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	EN	No	No	--	NA
Selenium	7782-49-2	0.22	0.29	mg/kg	SB3-1.5	2 / 4	0.3 - 0.42	0.7	No	580	No	No	1950	No
Sodium	7440-23-5	21.2	30.1	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	--	NA	EN	No	No	--	NA
Vanadium	7440-62-2	14.6	17.1	mg/kg	GRE-010-SS-SB1-01	2 / 2	NA	52.6	No	580	No	No	390	No
Zinc	7440-66-6	31.2	276	mg/kg	GRE-010-SS-SB1-01	4 / 4	NA	118	Yes	35000	No	No	76667	No

**Appendix A**  
**Table 2.2.1b**  
**Site 5 - Surface Soil Screening (0 to 2 feet below ground surface) - Commercial/Industrial Worker**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background ?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
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Notes:

- = not available
- > = greater than
- B = analyte detected in method blank
- CAS = Chemical Abstracts Service
- COPC = chemical of potential concern
- EN = essential nutrient
- J = estimated concentration
- mg/kg = milligram per kilogram
- MT DEQ = Montana Department of Environmental Quality
- NA = not applicable
- NSL = no screening level
- S = reported value was determined by the method of standard additions
- USEPA = United States Environmental Protection Agency
- (1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:
  - Total petroleum hydrocarbons used C11-C22 aromatics
  - Chromium used trivalent chromium
- (2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4
- (3) Screening levels was obtained from the following sources (in order of preference):
  - Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)
  - United States Environmental Protection Agency Regional Screening Level for a commercial/industrial exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)
  - (a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)
- (4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level
- (5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):
  - Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)
  - United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)
  - United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

- MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>
- MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)
- MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.
- USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.2.2a  
Site 5 - Subsurface Soil Screening (> 2 feet below ground surface) - Hypothetical Future Resident  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Volatile Organic Compounds</b>														
Acetone	67-64-1	0.017	J 0.14	mg/kg	SB3-5	3 / 4	0.11 - 0.11	--	NA	7000	No	No	70000	No
Toluene	108-88-3	0.006	J 0.01	mg/kg	SB1-3.5	2 / 4	0.006 - 0.006	--	NA	100	No	No	100	No
<b>Inorganics</b>														
Arsenic	7440-38-2	3.1	22.5	mg/kg	SB1-3.5	4 / 4	NA	22.5	No	0.68	Yes	No	1308	No
Barium	7440-39-3	155	437	mg/kg	SB4-5.5	4 / 4	NA	429	Yes	1500	No	No	39474	No
Chromium	(1) 7440-47-3	9.5	22.8	mg/kg	SB3-5	4 / 4	NA	41.7	No	12000	No	No	5455	No
Copper	7440-50-8	5.7	31.6	mg/kg	SB1-3.5	4 / 4	NA	165	No	310	No	No	50375	No
Lead	7439-92-1	5.2	B 12.7	mg/kg	SB1-3.5	4 / 4	NA	29.8	No	200	(a) No	No	4000	No
Nickel	7440-02-0	16.1	16.1	mg/kg	SB3-5	1 / 4	6.5 - 7.2	31.4	No	150	No	No	3846	No
Zinc	7440-66-6	26.4	61.2	mg/kg	SB1-3.5	4 / 4	NA	118	No	2300	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.2.2b  
Site 5 - Subsurface Soil Screening (> 2 feet below ground surface) - Commercial/Industrial Worker  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Volatile Organic Compounds</b>														
Acetone	67-64-1	0.017 J	0.14	mg/kg	SB3-5	3 / 4	0.11 - 0.11	--	NA	110000	No	No	70000	No
Toluene	108-88-3	0.006 J	0.01	mg/kg	SB1-3.5	2 / 4	0.006 - 0.006	--	NA	100	No	No	100	No
<b>Inorganics</b>														
Arsenic	7440-38-2	3.1	22.5	mg/kg	SB1-3.5	4 / 4	NA	22.5	No	3	Yes	No	1308	No
Barium	7440-39-3	155	437	mg/kg	SB4-5.5	4 / 4	NA	429	Yes	22000	No	No	39474	No
Chromium	(1) 7440-47-3	9.5	22.8	mg/kg	SB3-5	4 / 4	NA	41.7	No	180000	No	No	5455	No
Copper	7440-50-8	5.7	31.6	mg/kg	SB1-3.5	4 / 4	NA	165	No	4700	No	No	50375	No
Lead	7439-92-1	5.2 B	12.7	mg/kg	SB1-3.5	4 / 4	NA	29.8	No	923 (a)	No	No	4000	No
Nickel	7440-02-0	16.1	16.1	mg/kg	SB3-5	1 / 4	6.5 - 7.2	31.4	No	2200	No	No	3846	No
Zinc	7440-66-6	26.4	61.2	mg/kg	SB1-3.5	4 / 4	NA	118	No	35000	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a commercial/industrial exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.3.1b  
Site 6 - Surface Soil Screening (0 to 2 feet below ground surface) - Commercial/Industrial Worker  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Volatile Organic Compounds</b>														
1,2-Dichloroethene	(1) 540-59-0	0.44 J	0.44 J	mg/kg	6-SB17-0.5-2.5	1 / 5	0.011 - 1.4	--	NA	37	No	No	1764	No
2-Hexanone	591-78-6	0.002 J	0.008 J	mg/kg	MANG-SS3-0-1	5 / 8	0.056 - 1.4	--	NA	130	No	No	200	No
4-Methyl-2-Pentanone	108-10-1	0.005 J	0.011 J	mg/kg	6-SB16-0.9-3.9	2 / 6	0.011 - 1.4	--	NA	14000	No	No	33000	No
Acetone	67-64-1	0.1 J	1.6 J	mg/kg	6-SB15-0.5-2.5	6 / 14	0.011 - 1.4	--	NA	110000	No	No	70000	No
Carbon Disulfide	75-15-0	0.001 J	0.001 J	mg/kg	6-SB18-0.5-2.5	2 / 8	0.011 - 1.4	--	NA	350	No	No	770	No
Chloroform	67-66-3	0.001 J	0.001 J	mg/kg	6-SB16-0.9-3.9	1 / 3	0.056 - 1.4	--	NA	1.40	No	No	1018	No
Ethylbenzene	100-41-4	0.002 J	3.6 J	mg/kg	6-SB17-0.5-2.5	2 / 7	0.006 - 1.4	--	NA	28.0	No	No	130	No
Methyl Ethyl Ketone	78-93-3	0.008 J	0.043 J	mg/kg	6-SB15-0.5-2.5	3 / 5	1.3 - 1.4	--	NA	19000	No	No	27000	No
Methylene Chloride	75-09-2	0.003 J	0.003 J	mg/kg	MANG-SS1-0-1	3 / 8	0.011 - 1.4	--	NA	320	No	No	159	No
Toluene	108-88-3	0.004 J	19 J	mg/kg	6-SB17-0.5-2.5	3 / 14	0.005 - 1.4	--	NA	5500	No	No	100	No
Total Xylenes	1330-20-7	0.005 J	26 J	mg/kg	6-SB17-0.5-2.5	2 / 5	0.011 - 1.4	--	NA	310	No	No	1600	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.11 J	0.11 J	mg/kg	6-SB17-0.5-2.5	1 / 6	0.37 - 3.8	--	NA	250	No	No	35	No
Benzo(a)pyrene	50-32-8	0.38 J	0.38 J	mg/kg	MANG-SS2-0-1	1 / 3	11 - 11	--	NA	2.40	No	No	12	No
Benzo(b)fluoranthene	205-99-2	0.17 J	0.66 J	mg/kg	MANG-SS2-0-1	3 / 3	NA	--	NA	24.0	No	No	120	No
Benzo(g,h,i)perylene	(1) 191-24-2	0.34 J	0.62 J	mg/kg	MANG-SS2-0-1	2 / 3	11 - 11	--	NA	1900	No	No	430	No
bis(2-Ethylhexyl)phthalate	117-81-7	0.059 J	0.28 J	mg/kg	6-SB16-0.9-3.9	2 / 6	0.35 - 3.8	--	NA	160	No	No	418	No
Chrysene	218-01-9	0.24 J	0.49 J	mg/kg	MANG-SS1-0-1	2 / 3	11 - 11	--	NA	2400	No	No	3500	No
Di-n-Butyl Phthalate	84-74-2	0.13 J	0.13 J	mg/kg	MANG-SS1-0-1	1 / 7	0.011 - 0.74	--	NA	8200	No	No	1400	No
Di-n-Octylphthalate	117-84-0	0.019 J	0.019 J	mg/kg	6-SB16-0.9-3.9	1 / 2	0.37 - 0.37	--	NA	820	No	No	630	No
Fluoranthene	206-44-0	0.19 J	0.22 J	mg/kg	MANG-SS2-0-1	2 / 3	11 - 11	--	NA	2500	No	No	440	No
Indeno(1,2,3-c,d)pyrene	193-39-5	0.11 J	0.11 J	mg/kg	MANG-SS1-0-1	1 / 3	11 - 11	--	NA	24.0	No	No	380	No
Naphthalene	91-20-3	0.42 J	0.42 J	mg/kg	6-SB17-0.5-2.5	1 / 6	0.37 - 3.8	--	NA	9.5	No	No	62	No
Pyrene	129-00-0	0.13 J	0.49 J	mg/kg	MANG-SS1-0-1	3 / 3	NA	--	NA	1900	No	No	430	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum Hydrocarbons	(1) TPH	12	13000	mg/kg	SB11-1.3	8 / 9	NA	--	NA	3900	Yes	Yes	2000	Yes
JP-4	(1) JP-4	1300	1300	mg/kg	6-SB17-0.5-2.5	1 / 4	10 - 10	--	NA	540	Yes	Yes	270000	No
Diesel Range, as diesel	(1) TPHd	18	1100	mg/kg	MANG-SS2-0-1	4 / 7	10 - 10	--	NA	540	Yes	Yes	270000	No
Oil Range, as oil	(1) TPHo	500	3700	mg/kg	MANG-SS1-0-1	3 / 7	100 - 100	--	NA	540	Yes	Yes	270000	No
Gasoline Range	(1) TPHg	2600	2600	mg/kg	6-SB17-0.5-2.5	1 / 4	5 - 5	--	NA	1000	Yes	Yes	720	Yes
<b>Inorganics</b>														
Antimony	7440-36-0	0.83 J	1.1 J	mg/kg	MANG-SS2-0-1	2 / 3	0.87 - 0.87	0.4	Yes	47.0	No	No	238	No
Arsenic	7440-38-2	3 J	7.6 J	mg/kg	MANG-SS2-0-1	14 / 15	4.1 - 4.1	22.5	No	3.00	Yes	No	1308	No
Barium	7440-39-3	132 J	468 J	mg/kg	6-SB15-0.5-2.5	15 / 15	NA	429	Yes	22000	No	No	39474	No
Beryllium	7440-41-7	0.28 J	0.66 J	mg/kg	MANG-SS2-0-1	5 / 6	0.28 - 0.28	1.1	No	230	No	No	256	No
Cadmium	7440-43-9	0.35 B	11.9 J	mg/kg	MANG-SS2-0-1	4 / 12	0.38 - 0.44	0.7	Yes	10.0	Yes	Yes	--	NA
Chromium	7440-47-3	7.2 J	83.1 J	mg/kg	MANG-SS1-0-1	15 / 15	NA	41.7	Yes	6.3	Yes	Yes	5455	No
Copper	7440-50-8	5.6 J	63.4 J	mg/kg	MANG-SS2-0-1	15 / 15	NA	165	No	4700	No	No	50375	No
Lead	7439-92-1	2.5 B	758 J	mg/kg	MANG-SS2-0-1	15 / 15	NA	29.8	Yes	923 (a)	No	No	4000	No
Mercury	7439-97-6	0.1 J	0.11 J	mg/kg	6-SB15-0.5-2.5	2 / 6	0.08 - 0.11	--	NA	4.6	No	No	349	No
Nickel	7440-02-0	7.3 B	24.5 J	mg/kg	MANG-SS2-0-1	10 / 15	6.6 - 7.3	31.4	No	2200	No	No	3846	No
Selenium	7782-49-2	0.37 J	0.37 J	mg/kg	SB11-1.3	1 / 12	0.17 - 0.38	0.7	No	580	No	No	1950	No
Silver	7440-22-4	1.6 J	1.6 J	mg/kg	MANG-SS2-0-1	1 / 3	0.49 - 0.56	0.3	Yes	580	No	No	4149	No
Thallium	7440-28-0	0.42 J	0.42 J	mg/kg	6-SB18-0.5-2.5	1 / 6	0.32 - 0.38	0.41	Yes	1.2	No	No	78	No
Zinc	7440-66-6	27.7 J	368 J	mg/kg	MANG-SS2-0-1	15 / 15	NA	118	Yes	35000	No	No	76667	No

**Appendix A**  
**Table 2.3.1b**  
**Site 6 - Surface Soil Screening (0 to 2 feet below ground surface) - Commercial/Industrial Worker**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
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Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

1,2-Dichloroethene used cis-1,2-dichloroethene

Benzo(g,h,i)perylene used pyrene

Total petroleum hydrocarbons used C11-C22 aromatics

JP-4 used C9-C18 aliphatics

Diesel Range, as diesel used C9-C18 aliphatics

Oil Range, as oil used C9-C18 aliphatics

Gasoline Range used C9-C10 aromatics

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a commercial/industrial exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.3.2a  
Site 6 - Subsurface Soil Screening (> 2 feet below ground surface) - Hypothetical Future Resident  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Volatile Organic Compounds</b>														
1,2-Dichloroethene	540-59-0	0.13 J	0.35 J	mg/kg	6-DW1-4.1-4.6	3 / 14	0.011 - 1.4	--	NA	6	No	No	1764	No
2-Hexanone	591-78-6	0.005	0.005	mg/kg	6-SB16-3.9-4.5	1 / 14	0.011 - 2.7	--	NA	20	No	No	200	No
Acetone	67-64-1	0.066	2.6	mg/kg	6-SB18-6.4-7.3DL	14 / 22	0.11 - 14	--	NA	7000	No	No	70000	No
Carbon Disulfide	75-15-0	0.002	0.002	mg/kg	6-SB15-7.7-8.1	3 / 14	0.011 - 2.7	--	NA	77	No	No	770	No
Ethylbenzene	100-41-4	0.004	5.9	mg/kg	6-DW1-4.1-4.6DL	9 / 20	0.006 - 1.4	--	NA	130	No	No	130	No
Methyl Ethyl Ketone	78-93-3	0.005	0.025	mg/kg	6-SB18-8-8.3	5 / 14	1.3 - 2.7	--	NA	2700	No	No	27000	No
Methylene Chloride	75-09-2	0.25	0.25	mg/kg	6-DW1-4.1-4.6DL	1 / 14	0.011 - 1.4	--	NA	35	No	No	159	No
Toluene	108-88-3	0.005	60	mg/kg	6-DW1-4.1-4.6	8 / 22	0.006 - 1.4	--	NA	100	No	No	100	No
Total Xylenes	1330-20-7	0.51	37	mg/kg	6-DW1-4.1-4.6DL	6 / 14	0.011 - 1.4	--	NA	610	No	No	1600	No
Trichloroethylene (TCE)	79-01-6	0.23	4	mg/kg	SB3-5.5	3 / 14	0.006 - 1.4	--	NA	0.41	Yes	Yes	73	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.17	12	mg/kg	6-DW1-4.1-4.6	7 / 16	0.36 - 0.73	--	NA	35	No	No	35	No
bis(2-Ethylhexyl)phthalate	117-81-7	0.051	2.9	mg/kg	6-DW1-4.1-4.6	10 / 16	0.36 - 3.7	--	NA	39	No	No	418	No
Di-n-Butyl Phthalate	84-74-2	0.12	0.22	mg/kg	6-DW1-4.1-4.6	3 / 10	0.36 - 3.7	--	NA	630	No	No	1400	No
Di-n-Octylphthalate	117-84-0	0.05	0.05	mg/kg	6-SB16-3.9-4.5	1 / 6	0.36 - 3.7	--	NA	63	No	No	630	No
Fluorene	86-73-7	0.04	0.04	mg/kg	6-DW1-7.3-7.6	1 / 6	0.36 - 3.7	--	NA	180	No	No	180	No
Naphthalene	91-20-3	0.2	13	mg/kg	6-SB17-4.5-5.8	7 / 16	0.36 - 0.73	--	NA	62	No	No	62	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum Hydrocarbons (1)	TPH	12	8100	mg/kg	SB4-5	5 / 8	NA	--	NA	2000	Yes	Yes	2000	Yes
JP-4 (1)	JP-4	50	7800	mg/kg	6-SB17-4.5-5.8	8 / 10	10 - 10	--	NA	900	Yes	Yes	270000	No
Diesel Range, as diesel (1)	TPHd	17	2800	mg/kg	6-SB17-4.5-5.8	9 / 10	10 - 10	--	NA	900	Yes	Yes	270000	No
Oil Range, as oil (1)	TPHo	79	14000	mg/kg	6-SB17-4.5-5.8	7 / 10	100 - 100	--	NA	900	Yes	Yes	270000	No
Gasoline Range (1)	TPHg	110	17000	mg/kg	6-SB17-4.5-5.8	6 / 10	5 - 5	--	NA	720	Yes	Yes	720	Yes
<b>Inorganics</b>														
Arsenic	7440-38-2	2.1	7.2	mg/kg	6-SB15-3.9-4.5	16 / 18	2.2 - 5.9	22.5	No	0.68	Yes	No	1308	No
Barium	7440-39-3	73	333	mg/kg	SB6-3.5	18 / 18	NA	429	No	1500	No	No	39474	No
Beryllium	7440-41-7	0.23	0.37	mg/kg	6-SB15-3.9-4.5	8 / 10	0.28 - 0.3	1.1	No	16	No	No	256	No
Cadmium	7440-43-9	0.41	0.41	mg/kg	SB3-5.5	1 / 8	0.38 - 0.44	0.7	No	0.7	No	No	--	NA
Chromium (1)	7440-47-3	7.1	18.3	mg/kg	SB3-5.5	17 / 18	7 - 7	41.7	No	12000	No	No	5455	NA
Copper	7440-50-8	4.2 B	34.2	mg/kg	6-DW1-7.3-7.6	18 / 18	NA	165	No	310	No	No	50375	No
Lead	7439-92-1	4.3 B	56.6	mg/kg	6-DW1-4.1-4.6	18 / 18	NA	29.8	Yes	200	No	No	4000	No
Nickel	7440-02-0	5.6 J	11.9	mg/kg	6-SB17-9.5-9.9	13 / 18	6.6 - 734	31.4	No	150	No	No	3846	No
Selenium	7782-49-2	0.35	0.35	mg/kg	SB1-3.5	1 / 8	0.29 - 0.35	0.7	No	39	No	No	1950	No
Thallium	7440-28-0	0.34 J	0.34 J	mg/kg	6-SB15-7.7-8.1	1 / 10	0.34 - 0.41	0.41	No	0.08	Yes	No	78	No
Zinc	7440-66-6	10.1	65.3	mg/kg	6-DW1-7.3-7.6	18 / 18	NA	118	No	2300	No	No	76667	No

**Appendix A**  
**Table 2.3.2a**  
**Site 6 - Subsurface Soil Screening (> 2 feet below ground surface) - Hypothetical Future Resident**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
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Notes:

-- = not available  
 > = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

N = Spiked sample recovery not within control limits

RSL = Regional Screening Level

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

m/p-xylene used xylenes

Total petroleum hydrocarbons used C11-C22 aromatics

JP-4 used C9-C18 aliphatics

Diesel Range, as diesel used C9-C18 aliphatics

Oil Range, as oil used C9-C18 aliphatics

Gasoline Range used C9-C10 aromatics

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.3.2b  
Site 6 - Subsurface Soil Screening (> 2 feet below ground surface) - Commercial/Industrial Worker  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Volatile Organic Compounds</b>														
1,2-Dichloroethene	540-59-0	0.13 J	0.35 J	mg/kg	6-DW1-4.1-4.6	3 / 14	0.011 - 1.4	--	NA	37	No	No	1764	No
2-Hexanone	591-78-6	0.005 J	0.005 J	mg/kg	6-SB16-3.9-4.5	1 / 14	0.011 - 2.7	--	NA	130	No	No	200	No
Acetone	67-64-1	0.066 J	2.6 J	mg/kg	6-SB18-6.4-7.3DL	14 / 22	0.11 - 14	--	NA	110000	No	No	70000	No
Carbon Disulfide	75-15-0	0.002 J	0.002 J	mg/kg	6-SB15-7.7-8.1	3 / 14	0.011 - 2.7	--	NA	350	No	No	770	No
Ethylbenzene	100-41-4	0.004 J	5.9 J	mg/kg	6-DW1-4.1-4.6DL	9 / 20	0.006 - 1.4	--	NA	130	No	No	130	No
Methyl Ethyl Ketone	78-93-3	0.005 J	0.025 J	mg/kg	6-SB18-8-8.3	5 / 14	1.3 - 2.7	--	NA	19000	No	No	27000	No
Methylene Chloride	75-09-2	0.25 J	0.25 J	mg/kg	6-DW1-4.1-4.6DL	1 / 14	0.011 - 1.4	--	NA	320	No	No	159	No
Toluene	108-88-3	0.005 J	60 J	mg/kg	6-DW1-4.1-4.6	8 / 22	0.006 - 1.4	--	NA	100	No	No	100	No
Total Xylenes	1330-20-7	0.51 J	37 J	mg/kg	6-DW1-4.1-4.6DL	6 / 14	0.011 - 1.4	--	NA	610	No	No	1600	No
Trichloroethylene (TCE)	79-01-6	0.23 J	4 J	mg/kg	SB3-5.5	3 / 14	0.006 - 1.4	--	NA	1.9	Yes	Yes	73	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.17 J	12 J	mg/kg	6-DW1-4.1-4.6	7 / 16	0.36 - 0.73	--	NA	35	No	No	35	No
bis(2-Ethylhexyl)phthalate	117-81-7	0.051 J	2.9 J	mg/kg	6-DW1-4.1-4.6	10 / 16	0.36 - 3.7	--	NA	160	No	No	418	No
Di-n-Butyl Phthalate	84-74-2	0.12 J	0.22 J	mg/kg	6-DW1-4.1-4.6	3 / 10	0.36 - 3.7	--	NA	8200	No	No	1400	No
Di-n-Octylphthalate	117-84-0	0.05 J	0.05 J	mg/kg	6-SB16-3.9-4.5	1 / 6	0.36 - 3.7	--	NA	820	No	No	630	No
Fluorene	86-73-7	0.04 J	0.04 J	mg/kg	6-DW1-7.3-7.6	1 / 6	0.36 - 3.7	--	NA	180	No	No	180	No
Naphthalene	91-20-3	0.2	13	mg/kg	6-SB17-4.5-5.8	7 / 16	0.36 - 0.73	--	NA	62	No	No	62	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum Hydrocarbons	(1) TPH	12	8100	mg/kg	SB4-5	5 / 8	NA	--	NA	2000	Yes	Yes	2000	Yes
JP-4	JP-4	50	7800	mg/kg	6-SB17-4.5-5.8	8 / 10	10 - 10	--	NA	900	Yes	Yes	270000	No
Diesel Range, as diesel	TPHd	17	2800	mg/kg	6-SB17-4.5-5.8	9 / 10	10 - 10	--	NA	900	Yes	Yes	270000	No
Oil Range, as oil	TPHo	79	14000	mg/kg	6-SB17-4.5-5.8	7 / 10	100 - 100	--	NA	900	Yes	Yes	270000	No
Gasoline Range	TPHg	110	17000	mg/kg	6-SB17-4.5-5.8	6 / 10	5 - 5	--	NA	720	Yes	Yes	720	Yes
<b>Inorganics</b>														
Arsenic	7440-38-2	2.1	7.2	mg/kg	6-SB15-3.9-4.5	16 / 18	2.2 - 5.9	22.5	No	3	Yes	No	1308	No
Barium	7440-39-3	73	333	mg/kg	SB6-3.5	18 / 18	NA	429	No	22000	No	No	39474	No
Beryllium	7440-41-7	0.23 J	0.37 J	mg/kg	6-SB15-3.9-4.5	8 / 10	0.28 - 0.3	1.1	No	230	No	No	256	No
Cadmium	7440-43-9	0.41 B	0.41 B	mg/kg	SB3-5.5	1 / 8	0.38 - 0.44	0.7	No	10	No	No	--	NA
Chromium	7440-47-3	7.1	18.3	mg/kg	SB3-5.5	17 / 18	7 - 7	41.7	No	180000	No	No	5455	No
Copper	7440-50-8	4.2 B	34.2	mg/kg	6-DW1-7.3-7.6	18 / 18	NA	165	No	4700	No	No	50375	No
Lead	7439-92-1	4.3 B	56.6	mg/kg	6-DW1-4.1-4.6	18 / 18	NA	29.8	Yes	923	(a)	No	4000	No
Nickel	7440-02-0	5.6 J	11.9	mg/kg	6-SB17-9.5-9.9	13 / 18	6.6 - 734	31.4	No	2200	No	No	3846	No
Selenium	7782-49-2	0.35	0.35	mg/kg	SB1-3.5	1 / 8	0.29 - 0.35	0.7	No	580	No	No	1950	No
Thallium	7440-28-0	0.34 J	0.34 J	mg/kg	6-SB15-7.7-8.1	1 / 10	0.34 - 0.41	0.41	No	1.2	No	No	78	No
Zinc	7440-66-6	10.1	65.3	mg/kg	6-DW1-7.3-7.6	18 / 18	NA	118	No	35000	No	No	76667	No

Notes:  
-- = not available  
> = greater than  
B = analyte detected in method blank  
CAS = Chemical Abstracts Service  
COPC = chemical of potential concern  
J = estimated concentration  
mg/kg = milligram per kilogram  
MT DEQ = Montana Department of Environmental Quality  
NA = not applicable  
USEPA = United States Environmental Protection Agency  
(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:  
Total petroleum hydrocarbons used C11-C22 aromatics

**Appendix A**  
**Table 2.3.2b**  
**Site 6 - Subsurface Soil Screening (> 2 feet below ground surface) - Commercial/Industrial Worker**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
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- JP-4 used C9-C18 aliphatics  
 Diesel Range, as diesel used C9-C18 aliphatics  
 Oil Range, as oil used C9-C18 aliphatics  
 Gasoline Range used C9-C10 aromatics  
 Chromium used trivalent chromium
- (2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4
- (3) Screening levels was obtained from the following sources (in order of preference):  
 Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)  
 United States Environmental Protection Agency Regional Screening Level for a commercial/industrial exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)  
 (a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)
- (4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level
- (5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):  
 Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)  
 United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)  
 United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>  
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 MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.  
 USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.4.1a  
Site 7 - Surface Soil Screening (0 to 2 feet below ground surface) - Hypothetical Future Resident  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Risk-Based Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Volatile Organic Compounds</b>														
2-Hexanone	591-78-6	0.001	0.001	mg/kg	7-SB6-0-2	1 / 8	0.012 - 1.6	--	NA	20	No	No	200	No
Acetone	67-64-1	0.46 J	1.4 J	mg/kg	7-SB7-1-3 DL	8 / 10	0.1 - 0.11	--	NA	7000	No	No	70000	No
Benzene	71-43-2	0.005 J	0.005 J	mg/kg	7-SB5-1-3DL	1 / 10	0.005 - 1.6	--	NA	1.3	No	No	0.3	No
Carbon Disulfide	75-15-0	0.002 J	0.002 J	mg/kg	7-SB7-1-3	1 / 8	0.011 - 1.6	--	NA	77	No	No	770	No
Ethylbenzene	100-41-4	0.001 J	0.001 J	mg/kg	7-SB5-1-3	1 / 10	0.005 - 1.6	--	NA	6.4	No	No	130	No
Methyl Ethyl Ketone	78-93-3	0.002 J	0.057 J	mg/kg	7-SB5-1-3DL	5 / 8	1.4 - 1.6	--	NA	2700	No	No	27000	No
Methylene Chloride	75-09-2	0.026 J	0.026 J	mg/kg	7-SB5-1-3DL	1 / 8	0.011 - 1.6	--	NA	35	No	No	159	No
Toluene	108-88-3	0.002 J	0.006 J	mg/kg	7-SB5-1-3DL	2 / 10	0.005 - 1.6	--	NA	610	No	No	100	No
Total Xylenes	1330-20-7	0.001	0.004 J	mg/kg	7-SB5-1-3	3 / 8	0.012 - 1.6	--	NA	72	No	No	1600	No
Trichloroethylene (TCE)	79-01-6	0.004 J	0.004 J	mg/kg	7-SB5-1-3DL	1 / 8	0.011 - 1.6	--	NA	0.41	No	No	73	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.004 J	0.004 J	mg/kg	7-SB5-1-3	1 / 6	0.34 - 0.76	--	NA	30	No	No	35	No
bis(2-Ethylhexyl)phthalate	117-81-7	0.13 J	0.13 J	mg/kg	7-SB7-1-3	1 / 6	0.34 - 0.76	--	NA	39	No	No	418	No
Naphthalene	91-20-3	0.007 J	0.007 J	mg/kg	7-SB5-1-3	1 / 6	0.34 - 0.76	--	NA	2.2	No	No	62	No
Pyrene	129-00-0	0.005 J	0.005 J	mg/kg	7-SB5-1-3	1 / 4	0.41 - 0.76	--	NA	220	No	No	430	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum hydrocarbons (1)	TPH	17	34	mg/kg	SB1-1.5	2 / 2	NA	--	NA	490	No	No	2000	No
<b>Inorganics</b>														
Arsenic	7440-38-2	2.7	11.1	mg/kg	7-SB5-1-3	3 / 5	6.8 - 6.9	22.5	No	77	No	No	60000	No
Barium	7440-39-3	158	250	mg/kg	SB1-1.5	5 / 5	NA	429	No	77	Yes	No	60000	No
Beryllium	7440-41-7	0.78	0.78	mg/kg	7-SB5-1-3	1 / 3	0.33 - 0.71	1.1	No	52	No	No	1200	No
Chromium (1)	7440-47-3	9.7	19.3	mg/kg	7-DW1-1.2-3.2	5 / 5	NA	41.7	No	0.3	Yes	No	5455	No
Copper	7440-50-8	15.3	32.1	mg/kg	7-SB5-1-3	5 / 5	NA	165	No	310	No	No	50375	No
Lead	7439-92-1	7.5	13.5	mg/kg	7-SB5-1-3	5 / 5	NA	29.8	No	200 (a)	No	No	4000	No
Nickel	7440-02-0	10.1	16.2	mg/kg	7-DW1-1.2-3.2	4 / 5	5.7 - 5.7	31.4	No	150	No	No	3846	No
Zinc	7440-66-6	30.4	68.6	mg/kg	7-SB5-1-3	5 / 5	NA	118	No	2300	No	No	76667	No

Notes:

-- = not available

> = greater than

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Total petroleum hydrocarbons used C11-C22 aromatics

Chromium(III), Insoluble Salts was used as a surrogate for Chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rls>

**Appendix A**  
**Table 2.4.1b**  
**Site 7 - Surface Soil Screening (0 to 2 feet below ground surface) - Commercial/Industrial Worker**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Volatile Organic Compounds</b>														
2-Hexanone	591-78-6	0.001	0.001	mg/kg	7-SB6-0-2	1 / 8	0.012 - 1.6	--	NA	130	No	No	200	No
Acetone	67-64-1	0.46	1.4	J mg/kg	7-SB7-1-3 DL	8 / 10	0.1 - 0.11	--	NA	110000	No	No	70000	No
Benzene	71-43-2	0.005	0.005	J mg/kg	7-SB5-1-3DL	1 / 10	0.005 - 1.6	--	NA	6	No	No	0.3	No
Carbon Disulfide	75-15-0	0.002	0.002	J mg/kg	7-SB7-1-3	1 / 8	0.011 - 1.6	--	NA	350.0	No	No	770	No
Ethylbenzene	100-41-4	0.001	0.001	J mg/kg	7-SB5-1-3	1 / 10	0.005 - 1.6	--	NA	28	No	No	130	No
Methyl Ethyl Ketone	78-93-3	0.002	0.057	J mg/kg	7-SB5-1-3DL	5 / 8	1.4 - 1.6	--	NA	19000	No	No	27000	No
Methylene Chloride	75-09-2	0.026	0.026	J mg/kg	7-SB5-1-3DL	1 / 8	0.011 - 1.6	--	NA	320.00	No	No	159	No
Toluene	108-88-3	0.002	0.006	J mg/kg	7-SB5-1-3DL	2 / 10	0.005 - 1.6	--	NA	5500	No	No	100	No
Total Xylenes	1330-20-7	0.001	0.004	J mg/kg	7-SB5-1-3	3 / 8	0.012 - 1.6	--	NA	310	No	No	1600	No
Trichloroethylene (TCE)	79-01-6	0.004	0.004	J mg/kg	7-SB5-1-3DL	1 / 8	0.011 - 1.6	--	NA	1.9	No	No	73	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.004	0.004	J mg/kg	7-SB5-1-3	1 / 6	0.34 - 0.76	--	NA	250	No	No	35	No
bis(2-Ethylhexyl)phthalate	117-81-7	0.13	0.13	J mg/kg	7-SB7-1-3	1 / 6	0.34 - 0.76	--	NA	160	No	No	418	No
Naphthalene	91-20-3	0.007	0.007	J mg/kg	7-SB5-1-3	1 / 6	0.34 - 0.76	--	NA	9.5	No	No	62	No
Pyrene	129-00-0	0.005	0.005	J mg/kg	7-SB5-1-3	1 / 4	0.41 - 0.76	--	NA	1900	No	No	430	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum hydrocarbons (1)	TPH	17	34	mg/kg	SB1-1.5	2 / 2	NA	--	NA	3900	No	No	2000	No
<b>Inorganics</b>														
Arsenic	7440-38-2	2.7	11.1	mg/kg	7-SB5-1-3	3 / 5	6.8 - 6.9	22.5	No	3	Yes	No	1308	No
Barium	7440-39-3	158	250	mg/kg	SB1-1.5	5 / 5	NA	429	No	22000	No	No	39474	No
Beryllium	7440-41-7	0.78	0.78	mg/kg	7-SB5-1-3	1 / 3	0.33 - 0.71	1.1	No	230	No	No	256	No
Chromium	7440-47-3 (1)	9.7	19.3	mg/kg	7-DW1-1.2-3.2	5 / 5	NA	41.7	No	6.3	Yes	No	5455	No
Copper	7440-50-8	15.3	32.1	mg/kg	7-SB5-1-3	5 / 5	NA	165	No	4700	No	No	50375	No
Lead	7439-92-1	7.5	13.5	mg/kg	7-SB5-1-3	5 / 5	NA	29.8	No	923 (a)	No	No	4000	No
Nickel	7440-02-0	10.1	16.2	mg/kg	7-DW1-1.2-3.2	4 / 5	5.7 - 5.7	31.4	No	2200	No	No	3846	No
Zinc	7440-66-6	30.4	68.6	mg/kg	7-SB5-1-3	5 / 5	NA	118	No	35000	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Total petroleum hydrocarbons used C11-C22 aromatics

Chromium(III), Insoluble Salts was used as a surrogate for Chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rls>

Appendix A  
Table 2.4.2a  
Site 7 - Subsurface Soil Screening (> 2 feet below ground surface) - Hypothetical Future Resident  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Volatile Organic Compounds</b>														
2-Hexanone	591-78-6	0.007 J	0.007 J	mg/kg	7-DW1-3.2-4.2	1 / 9	0.011 - 1.6	--	NA	20	No	No	200	No
4-Methyl-2-Pentanone	108-10-1	0.019	0.019	mg/kg	7-DW1-3.2-4.2	1 / 9	0.011 - 1.6	--	NA	3300	No	No	33000	No
Acetone	67-64-1	0.1 J	1.8	mg/kg	7-SB7-3.4-5.2 DL	9 / 12	1.4 - 150	--	NA	7000	No	No	70000	No
Benzene	71-43-2	0.83 J	2.6 J	mg/kg	SB3-3.5	2 / 12	0.006 - 7.3	--	NA	0.33	Yes	Yes	0.3	Yes
Carbon Disulfide	75-15-0	0.001 J	0.001 J	mg/kg	7-DW1-3.2-4.2	1 / 9	0.011 - 1.6	--	NA	77	No	No	770	No
Chloroform	67-66-3	0.001 J	0.73 J	mg/kg	7-SB5-8-8.6	3 / 9	0.011 - 1.6	--	NA	0.32	Yes	Yes	1018	No
Ethylbenzene	100-41-4	0.18 J	24	mg/kg	SB3-5.5	6 / 12	0.006 - 1.4	--	NA	130	No	No	130	No
Methyl Ethyl Ketone	78-93-3	0.005 J	0.015	mg/kg	7-DW1-3.2-4.2	3 / 9	1.4 - 1.6	--	NA	2700	No	No	27000	No
Toluene	108-88-3	0.14 J	140	mg/kg	SB3-5.5	5 / 12	0.006 - 1.4	--	NA	100	Yes	Yes	100	Yes
Total Xylenes	1330-20-7	1.5	80	mg/kg	7-SB5-8-8.6	4 / 9	0.011 - 1.4	--	NA	610	No	No	1600	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.019 J	42	mg/kg	SB3-3.5	7 / 10	0.37 - 0.37	--	NA	35	Yes	Yes	35	Yes
bis(2-Ethylhexyl)phthalate	117-81-7	0.14 J	5.4	mg/kg	SB3-3.5	6 / 10	0.37 - 1.4	--	NA	39	No	No	418	No
Di-n-butylphthalate	84-74-2	0.14 J	0.14 J	mg/kg	SB4-5	1 / 3	3.8 - 3.8	--	NA	630	No	No	1400	No
Di-n-Octylphthalate	117-84-0	0.043 J	0.043 J	mg/kg	7-DW1-3.2-4.2	1 / 7	0.37 - 1.4	--	NA	63	No	No	630	No
Fluoranthene	206-44-0	0.017 J	0.017 J	mg/kg	7-DW1-3.2-4.2	1 / 7	0.37 - 1.4	--	NA	440	No	No	440	No
Fluorene	86-73-7	0.039 J	0.063 J	mg/kg	7-SB7-8-8.3	4 / 7	0.37 - 0.77	--	NA	180	No	No	180	No
Naphthalene	91-20-3	0.016 J	22	mg/kg	SB3-3.5	7 / 10	0.37 - 0.37	--	NA	62	No	No	62	No
Phenanthrene	85-01-8	0.012 J	0.17 J	mg/kg	7-SB7-8-8.3	4 / 7	0.37 - 1.4	--	NA	430	No	No	430	No
Pyrene	129-00-0	0.018 J	0.018 J	mg/kg	7-DW1-3.2-4.2	1 / 7	0.37 - 1.4	--	NA	430	No	No	430	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum hydrocarbons	TPH	44	19000	mg/kg	SB3-3.5	3 / 3	NA	--	NA	2000	Yes	Yes	2000	Yes
JP-4	(1) JP-4	530	950	D mg/kg	7-SB7-8-8.3	3 / 7	10 - 10	--	NA	640	Yes	Yes	60000	No
Diesel Range, as diesel	(1) TPHd	13	800	D mg/kg	7-SB7-8-8.3	5 / 7	10 - 10	--	NA	640	Yes	Yes	60000	No
Oil Range, as oil	(1) TPHo	140	8400	D mg/kg	7-SB7-8-8.3	5 / 7	100 - 100	--	NA	640	Yes	Yes	60000	No
Gasoline Range	(1) TPHg	8.1	1700	mg/kg	7-SB7-8-8.3	5 / 7	5 - 5	--	NA	410	Yes	Yes	1200	Yes
<b>Inorganics</b>														
Arsenic	7440-38-2	1.9	9.9	mg/kg	7-SB7-1-3	6 / 11	2 - 7.5	22.5	No	0.68	Yes	No	1308	No
Barium	7440-39-3	11	729	mg/kg	7-SB7-8-8.3	11 / 11	NA	429	Yes	1500	No	No	39474	No
Beryllium	7440-41-7	0.33 J	0.55 J	mg/kg	7-SB5-8-8.6	2 / 8	0.23 - 0.62	1.1	No	16	No	No	256	No
Chromium	(1) 7440-47-3	6.3	17.5	mg/kg	7-SB7-1-3	11 / 11	NA	41.7	No	12000	No	No	5455	No
Copper	7440-50-8	10.5	24.3	mg/kg	7-SB5-8-8.6	11 / 11	NA	165	No	310	No	No	50375	No
Lead	7439-92-1	4.5	443	mg/kg	SB3-3.5	11 / 11	NA	29.8	Yes	200 (a)	Yes	Yes	4000	No
Mercury	7439-97-6	0.09	0.11	mg/kg	7-SB7-3.4-5.2	2 / 8	0.08 - 0.13	--	NA	1.1	No	No	349	No
Nickel	7440-02-0	7.2	16.1	mg/kg	7-SB7-1-3	10 / 11	7.3 - 7.3	31.4	No	150	No	No	3846	No
Selenium	7782-49-2	0.37 B	0.6 B	mg/kg	SB3-3.5	3 / 3	NA	0.7	No	39	No	No	1950	No
Zinc	7440-66-6	36.6	158	mg/kg	SB3-3.5	11 / 11	NA	118	Yes	2300	No	No	76667	No

Notes:  
-- = not available  
> = greater than  
B = analyte detected in method blank  
CAS = Chemical Abstracts Service  
COPC = chemical of potential concern  
D = analytical result calculated from a greater dilution than the primary analysis  
J = estimated concentration  
mg/kg = milligram per kilogram  
MT DEQ = Montana Department of Environmental Quality  
NA = not applicable  
USEPA = United States Environmental Protection Agency

**Appendix A**  
**Table 2.4.2a**  
**Site 7 - Subsurface Soil Screening (> 2 feet below ground surface) - Hypothetical Future Resident**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
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- (1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:  
 Chromium(III), Insoluble Salts was used as a surrogate for Chromium  
 Xylenes was used as a surrogate for m,p-xylenes  
 Total petroleum hydrocarbons were evaluated in agreement with MT DEQ guidance (2018) using the following fractional assumptions:  
 JP-4 used 70% C9-C18 aliphatics and 30% C11-C22 aromatics  
 Diesel Range, as diesel used 60% C11-C22 aromatics and 40% C9-C18 aliphatics  
 Oil Range, as oil used 70% as C11-C22 aromatics and 30% C9-C18 aliphatics  
 Gasoline Range used 100% C9-C10 aromatics
- (2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4
- (3) Screening levels was obtained from the following sources (in order of preference):  
 Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)  
 United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)  
 (a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)
- (4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level
- (5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):  
 Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)  
 United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)  
 United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)
- (6) Maximum detected concentration compared to the higher of the risk-based screening level or background

References:  
 MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>  
 MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)  
 MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.  
 USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.4.2b  
Site 7 - Subsurface Soil Screening (> 2 feet below ground surface) - Commercial/Industrial Worker  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Volatile Organic Compounds</b>														
2-Hexanone	591-78-6	0.007 J	0.007 J	mg/kg	7-DW1-3.2-4.2	1 / 9	0.011 - 1.6	--	NA	130	No	No	200	No
4-Methyl-2-Pentanone	108-10-1	0.019	0.019	mg/kg	7-DW1-3.2-4.2	1 / 9	0.011 - 1.6	--	NA	14000	No	No	33000	No
Acetone	67-64-1	0.1 J	1.8	mg/kg	7-SB7-3.4-5.2 DL	9 / 12	1.4 - 150	--	NA	110000	No	No	70000	No
Benzene	71-43-2	0.83 J	2.6 J	mg/kg	SB3-3.5	2 / 12	0.006 - 7.3	--	NA	0.33	Yes	Yes	0.3	Yes
Carbon Disulfide	75-15-0	0.001 J	0.001 J	mg/kg	7-DW1-3.2-4.2	1 / 9	0.011 - 1.6	--	NA	350	No	No	770	No
Chloroform	67-66-3	0.001 J	0.73 J	mg/kg	7-SB5-8-8.6	3 / 9	0.011 - 1.6	--	NA	1.40	No	No	1018	No
Ethylbenzene	100-41-4	0.18 J	24	mg/kg	SB3-5.5	6 / 12	0.006 - 1.4	--	NA	130	No	No	130	No
Methyl Ethyl Ketone	78-93-3	0.005 J	0.015	mg/kg	7-DW1-3.2-4.2	3 / 9	1.4 - 1.6	--	NA	19000	No	No	27000	No
Toluene	108-88-3	0.14 J	140	mg/kg	SB3-5.5	5 / 12	0.006 - 1.4	--	NA	100	Yes	Yes	100	Yes
Total Xylenes	1330-20-7	1.5	80	mg/kg	7-SB5-8-8.6	4 / 9	0.011 - 1.4	--	NA	610	No	No	1600	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.019 J	42	mg/kg	SB3-3.5	7 / 10	0.37 - 0.37	--	NA	35	Yes	Yes	35	Yes
bis(2-Ethylhexyl)phthalate	117-81-7	0.14 J	5.4	mg/kg	SB3-3.5	6 / 10	0.37 - 1.4	--	NA	160	No	No	418	No
Di-n-butylphthalate	84-74-2	0.14 J	0.14 J	mg/kg	SB4-5	1 / 3	3.8 - 3.8	--	NA	8200	No	No	1400	No
Di-n-Octylphthalate	117-84-0	0.043 J	0.043 J	mg/kg	7-DW1-3.2-4.2	1 / 7	0.37 - 1.4	--	NA	820	No	No	630	No
Fluoranthene	206-44-0	0.017 J	0.017 J	mg/kg	7-DW1-3.2-4.2	1 / 7	0.37 - 1.4	--	NA	440	No	No	440	No
Fluorene	86-73-7	0.039 J	0.063 J	mg/kg	7-SB7-8-8.3	4 / 7	0.37 - 0.77	--	NA	180	No	No	180	No
Naphthalene	91-20-3	0.016 J	22	mg/kg	SB3-3.5	7 / 10	0.37 - 0.37	--	NA	62	No	No	62	No
Phenanthrene	85-01-8	0.012 J	0.17 J	mg/kg	7-SB7-8-8.3	4 / 7	0.37 - 1.4	--	NA	430	No	No	430	No
Pyrene	129-00-0	0.018 J	0.018 J	mg/kg	7-DW1-3.2-4.2	1 / 7	0.37 - 1.4	--	NA	430	No	No	430	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum hydrocarbons	(1) TPH	44	19000	mg/kg	SB3-3.5	3 / 3	NA	--	NA	2000	Yes	Yes	2000	Yes
JP-4	(1) JP-4	530	950 D	mg/kg	7-SB7-8-8.3	3 / 7	10 - 10	--	NA	640	Yes	Yes	60000	No
Diesel Range, as diesel	(1) TPHd	13	800 D	mg/kg	7-SB7-8-8.3	5 / 7	10 - 10	--	NA	640	Yes	Yes	60000	No
Oil Range, as oil	(1) TPHo	140	8400 D	mg/kg	7-SB7-8-8.3	5 / 7	100 - 100	--	NA	640	Yes	Yes	60000	No
Gasoline Range	(1) TPHg	8.1	1700	mg/kg	7-SB7-8-8.3	5 / 7	5 - 5	--	NA	410.00	Yes	Yes	1200	Yes
<b>Inorganics</b>														
Arsenic	7440-38-2	1.9	9.9	mg/kg	7-SB7-1-3	6 / 11	2 - 7.5	22.5	No	3	Yes	No	1308	No
Barium	7440-39-3	11	729	mg/kg	7-SB7-8-8.3	11 / 11	NA	429	Yes	22000	No	No	39474	No
Beryllium	7440-41-7	0.33 J	0.55 J	mg/kg	7-SB5-8-8.6	2 / 8	0.23 - 0.62	1.1	No	230	No	No	256	No
Chromium	(1) 7440-47-3	6.3	17.5	mg/kg	7-SB7-1-3	11 / 11	NA	41.7	No	180000	No	No	5455	No
Copper	7440-50-8	10.5	24.3	mg/kg	7-SB5-8-8.6	11 / 11	NA	165	No	4700.0	No	No	50375	No
Lead	7439-92-1	4.5	443	mg/kg	SB3-3.5	11 / 11	NA	29.8	Yes	923	No	No	4000	No
Mercury	7439-97-6	0.09	0.11	mg/kg	7-SB7-3.4-5.2	2 / 8	0.08 - 0.13	--	NA	5	No	No	349	No
Nickel	7440-02-0	7.2	16.1	mg/kg	7-SB7-1-3	10 / 11	7.3 - 7.3	31.4	No	2200	No	No	3846	No
Selenium	7782-49-2	0.37 B	0.6 B	mg/kg	SB3-3.5	3 / 3	NA	0.7	No	580	No	No	1950	No
Zinc	7440-66-6	36.6	158	mg/kg	SB3-3.5	11 / 11	NA	118	Yes	35000	No	No	76667	No

Notes:  
-- = not available  
> = greater than  
B = analyte detected in method blank  
D = analytical result calculated from a greater dilution than the primary analysis  
CAS = Chemical Abstracts Service  
COPC = chemical of potential concern  
J = estimated concentration  
mg/kg = milligram per kilogram  
MT DEQ = Montana Department of Environmental Quality

**Appendix A**  
**Table 2.4.2b**  
**Site 7 - Subsurface Soil Screening (> 2 feet below ground surface) - Commercial/Industrial Worker**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
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NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Chromium(III), Insoluble Salts was used as a surrogate for Chromium

Xylenes was used as a surrogate for m,p-xylenes

Total petroleum hydrocarbons were evaluated in agreement with MT DEQ guidance (2018) using the following fractional assumptions:

JP-4 used 70% C9-C18 aliphatics and 30% C11-C22 aromatics

Diesel Range, as diesel used 60% C11-C22 aromatics and 40% C9-C18 aliphatics

Oil Range, as oil used 70% as C11-C22 aromatics and 30% C9-C18 aliphatics

Gasoline Range used 100% C9-C10 aromatics

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a commercial/industrial exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

**References:**

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.5.1a  
Site 8 - Surface Soil Screening (0 to 2 feet below ground surface) - Hypothetical Future Resident  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Volatile Organic Compounds</b>														
1,2-Dichloroethene	540-59-0	0.005	J 0.005	J mg/kg	8-SB8-0.5-2.5	1 / 4	0.011 - 0.056	--	NA	6	No	No	1764	No
2-Hexanone	591-78-6	0.002	J 0.018	J mg/kg	8-SB7-0.5-2.5DL	5 / 6	0.011 - 0.011	--	NA	20	No	No	200	No
4-Methyl-2-Pentanone	108-10-1	0.006	J 0.025	J mg/kg	8-SB7-0.5-2.5	4 / 6	0.011 - 0.027	--	NA	3300	No	No	33000	No
Acetone	67-64-1	0.028	J 0.95	J mg/kg	8-SB7-0.5-2.5DL	8 / 9	0.11 - 0.11	--	NA	7000	No	No	70000	No
Carbon Disulfide	75-15-0	0.001	J 0.001	J mg/kg	8-SB7-0.5-2.5	3 / 6	0.011 - 0.056	--	NA	77	No	No	770	No
Ethylbenzene	100-41-4	0.008	0.008	mg/kg	SB6-1.5	1 / 7	0.005 - 0.056	--	NA	6	No	No	130	No
m/p-Xylene	(1) 179601-23-1	0.011	0.014	mg/kg	SB6-1.5	2 / 3	0.005 - 0.005	--	NA	72	No	No	1600	No
Methyl Ethyl Ketone	78-93-3	0.002	J 0.093	J mg/kg	8-SB7-0.5-2.5DL	6 / 6	NA	--	NA	2700	No	No	27000	No
o-Xylene	95-47-6	0.009	0.01	mg/kg	SB1-1.5	2 / 3	0.005 - 0.005	--	NA	64	No	No	336842	No
Toluene	108-88-3	0.001	J 0.046	J mg/kg	SB6-1.5	4 / 9	0.005 - 0.056	--	NA	610	No	No	100	No
Total Xylenes	1330-20-7	0.001	J 0.004	J mg/kg	8-SB7-0.5-2.5DL	4 / 6	0.011 - 0.011	--	NA	72	No	No	1600	No
trans-1,2-Dichloroethene	156-60-5	0.008	0.008	mg/kg	SB6-1.5	1 / 3	0.005 - 0.006	--	NA	7	No	No	1029	No
<b>Semivolatile Organic Compounds</b>														
bis(2-Ethylhexyl)phthalate	117-81-7	0.055	J 0.98	J mg/kg	8-SB8-0.5-2.5	4 / 5	0.37 - 0.37	--	NA	39	No	No	418	No
Di-n-Butyl Phthalate	84-74-2	0.017	J 0.017	J mg/kg	8-SB8-0.5-2.5	1 / 3	0.73 - 1.5	--	NA	630	No	No	1400	No
Di-n-Octylphthalate	117-84-0	0.006	J 0.006	J mg/kg	8-SB9-1-3	1 / 5	0.37 - 1.5	--	NA	63	No	No	630	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum hydrocarbons	(1) TPH	22	140	mg/kg	SB1-1.5	2 / 3	NA	--	NA	490	No	No	2000	No
Diesel Range, as diesel	(1) TPHd	55	55	mg/kg	8-SB7-0.5-2.5	1 / 5	10 - 10	--	NA	77	No	No	60000	No
Oil Range, as oil	(1) TPHo	15	1700	mg/kg	8-SB7-0.5-2.5	2 / 5	100 - 100	--	NA	77	Yes	Yes	60000	No
Gasoline Range	(1) TPHg	180	180	mg/kg	8-SB6-0.5-2.4	1 / 5	5 - 5	--	NA	52	Yes	Yes	1200	No
<b>Inorganics</b>														
Arsenic	7440-38-2	3.2	22.4	mg/kg	8-SB9-1-3	8 / 8	NA	22.5	No	0.7	Yes	No	1308	No
Barium	7440-39-3	73.4	436	mg/kg	8-SB7-0.5-2.5	8 / 8	NA	429	Yes	1500	No	No	39474	No
Beryllium	7440-41-7	0.36	J 0.62	J mg/kg	8-SB8-0.5-2.5	5 / 5	NA	1.1	No	16	No	No	256	No
Cadmium	7440-43-9	0.48	J 0.48	J mg/kg	8-SB8-0.5-2.5	1 / 5	0.33 - 0.36	0.7	No	0.7	No	No	--	NA
Chromium	(1) 7440-47-3	8.9	15.3	mg/kg	8-SB6-0.5-2.4	8 / 8	NA	41.7	No	0.3	Yes	No	5455	No
Copper	7440-50-8	5.2	37.4	mg/kg	8-SB6-0.5-2.4	8 / 8	NA	165	No	310	No	No	50375	No
Lead	7439-92-1	6.7	17.2	mg/kg	8-SB9-1-3	8 / 8	NA	29.8	No	200	(a)	No	4000	No
Nickel	7440-02-0	7.5	B 12.5	mg/kg	8-SB8-0.5-2.5	7 / 8	6.9 - 6.9	31.4	No	150	No	No	3846	No
Zinc	7440-66-6	26	137	mg/kg	8-SB7-0.5-2.5	8 / 8	NA	118	Yes	2300	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Total petroleum hydrocarbons used C11-C22 aromatics

C5-C8 Aliphatic was used as a surrogate for Gasoline Range

C9-C12 Aliphatic was used as a surrogate for Diesel Range, as diesel and Oil Range, as oil

Chromium(III), Insoluble Salts was used as a surrogate for Chromium

Xylenes was used as a surrogate for m/p-Xylene

**Appendix A**  
**Table 2.5.1a**  
**Site 8 - Surface Soil Screening (0 to 2 feet below ground surface) - Hypothetical Future Resident**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
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(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

**References:**

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. May. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.5.1b  
Site 8 - Surface Soil Screening (0 to 2 feet below ground surface) - Commercial/Industrial Worker  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Volatile Organic Compounds</b>														
1,2-Dichloroethene	540-59-0	0.005	J 0.005	J mg/kg	8-SB8-0.5-2.5	1 / 4	0.011 - 0.056	--	NA	37	No	No	1764	No
2-Hexanone	591-78-6	0.002	J 0.018	J mg/kg	8-SB7-0.5-2.5DL	5 / 6	0.011 - 0.011	--	NA	130	No	No	200	No
4-Methyl-2-Pentanone	108-10-1	0.006	J 0.025	J mg/kg	8-SB7-0.5-2.5	4 / 6	0.011 - 0.027	--	NA	14000	No	No	33000	No
Acetone	67-64-1	0.028	J 0.95	J mg/kg	8-SB7-0.5-2.5DL	8 / 9	0.11 - 0.11	--	NA	110000	No	No	70000	No
Carbon Disulfide	75-15-0	0.001	J 0.001	J mg/kg	8-SB7-0.5-2.5	3 / 6	0.011 - 0.056	--	NA	350	No	No	770	No
Ethylbenzene	100-41-4	0.008	0.008	mg/kg	SB6-1.5	1 / 7	0.005 - 0.056	--	NA	28	No	No	130	No
m/p-Xylene	(1) 179601-23-1	0.011	0.014	mg/kg	SB6-1.5	2 / 3	0.005 - 0.005	--	NA	310	No	No	1600	No
Methyl Ethyl Ketone	78-93-3	0.002	J 0.093	J mg/kg	8-SB7-0.5-2.5DL	6 / 6	NA	--	NA	19000	No	No	27000	No
o-Xylene	95-47-6	0.009	0.01	mg/kg	SB1-1.5	2 / 3	0.005 - 0.005	--	NA	280	No	No	336842	No
Toluene	108-88-3	0.001	J 0.046	J mg/kg	SB6-1.5	4 / 9	0.005 - 0.056	--	NA	5500	No	No	100	No
Total Xylenes	1330-20-7	0.001	J 0.004	J mg/kg	8-SB7-0.5-2.5DL	4 / 6	0.011 - 0.011	--	NA	310	No	No	1600	No
trans-1,2-Dichloroethene	156-60-5	0.008	0.008	mg/kg	SB6-1.5	1 / 3	0.005 - 0.006	--	NA	30	No	No	1029	No
<b>Semivolatile Organic Compounds</b>														
bis(2-Ethylhexyl)phthalate	117-81-7	0.055	J 0.98	J mg/kg	8-SB8-0.5-2.5	4 / 5	0.37 - 0.37	--	NA	160	No	No	418	No
Di-n-Butyl Phthalate	84-74-2	0.017	J 0.017	J mg/kg	8-SB8-0.5-2.5	1 / 3	0.73 - 1.5	--	NA	8200	No	No	1400	No
Di-n-Octylphthalate	117-84-0	0.006	J 0.006	J mg/kg	8-SB9-1-3	1 / 5	0.37 - 1.5	--	NA	820	No	No	630	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum hydrocarbons	(1) TPH	22	140	mg/kg	SB1-1.5	2 / 3	NA	--	NA	3900	No	No	2000	No
Diesel Range, as diesel	(1) TPHd	55	55	mg/kg	8-SB7-0.5-2.5	1 / 5	10 - 10	--	NA	360	No	No	60000	No
Oil Range, as oil	(1) TPHo	15	1700	mg/kg	8-SB7-0.5-2.5	2 / 5	100 - 100	--	NA	360	Yes	Yes	60000	No
Gasoline Range	(1) TPHg	180	180	mg/kg	8-SB6-0.5-2.4	1 / 5	5 - 5	--	NA	290	No	No	1200	No
<b>Inorganics</b>														
Arsenic	7440-38-2	3.2	22.4	mg/kg	8-SB9-1-3	8 / 8	NA	22.5	No	3	Yes	No	1308	No
Barium	7440-39-3	73.4	436	mg/kg	8-SB7-0.5-2.5	8 / 8	NA	429	Yes	22000	No	No	39474	No
Beryllium	7440-41-7	0.36	J 0.62	J mg/kg	8-SB8-0.5-2.5	5 / 5	NA	1.1	No	230	No	No	256	No
Cadmium	7440-43-9	0.48	J 0.48	J mg/kg	8-SB8-0.5-2.5	1 / 5	0.33 - 0.36	0.7	No	10	No	No	--	NA
Chromium	(1) 7440-47-3	8.9	15.3	mg/kg	8-SB6-0.5-2.4	8 / 8	NA	41.7	No	6.3	Yes	No	5455	No
Copper	7440-50-8	5.2	37.4	mg/kg	8-SB6-0.5-2.4	8 / 8	NA	165	No	4700	No	No	50375	No
Lead	7439-92-1	6.7	17.2	mg/kg	8-SB9-1-3	8 / 8	NA	29.8	No	923	(a) No	No	4000	No
Nickel	7440-02-0	7.5	B 12.5	mg/kg	8-SB8-0.5-2.5	7 / 8	6.9 - 6.9	31.4	No	2200	No	No	3846	No
Zinc	7440-66-6	26	137	mg/kg	8-SB7-0.5-2.5	8 / 8	NA	118	Yes	35000	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

J = estimated concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

RSL = Regional Screening Level

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Total petroleum hydrocarbons used C11-C22 aromatics

C5-C8 Aliphatic was used as a surrogate for Gasoline Range

C9-C12 Aliphatic was used as a surrogate for Diesel Range, as diesel and Oil Range, as oil

Chromium(III), Insoluble Salts was used as a surrogate for Chromium

Xylenes was used as a surrogate for m/p-Xylene

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

**Appendix A**  
**Table 2.5.1b**  
**Site 8 - Surface Soil Screening (0 to 2 feet below ground surface) - Commercial/Industrial Worker**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
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(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. May. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.5.2a  
Site 8 - Subsurface Soil Screening (> 2 feet below ground surface) - Hypothetical Future Resident  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
<b>Volatile Organic Compounds</b>														
1,1,2-Trichloroethane	79-00-5	0.001 J	0.001 J	mg/kg	8-SB6-4.5-5.7	1 / 7	0.011 - 1.4	--	NA	0.2	No	No	110	No
1,2/1,4-Dichlorobenzene	(1) 1,2/1,4-DCB	0.18	0.18	mg/kg	SB4-1.5	1 / 5	0.005 - 0.006	--	NA	180	No	No	36000	No
1,2-Dichlorobenzene	95-50-1	0.24 J	0.24 J	mg/kg	SB4-1.5	1 / 5	0.34 - 3.8	--	NA	180	No	No	36000	No
1,2-Dichloroethene	540-59-0	0.009 J	0.086 J	mg/kg	8-SB8-9.5-10.5	2 / 7	0.011 - 1.4	--	NA	6	No	No	1764	No
2-Hexanone	591-78-6	0.002 J	0.011 J	mg/kg	8-SB6-4.5-5.7	4 / 12	0.011 - 1.5	--	NA	20	No	No	200	No
Acetone	67-64-1	0.024 J	0.91 J	mg/kg	8-SB8-4.5-5.5DL	14 / 17	0.011 - 0.11	--	NA	7000	No	No	70000	No
Carbon Disulfide	75-15-0	0.001 J	0.001 J	mg/kg	8-SB6-4.5-5.7	4 / 12	0.011 - 1.5	--	NA	77	No	No	770	No
Chlorobenzene	108-90-7	0.035	0.035	mg/kg	SB4-1.5	1 / 5	0.005 - 0.006	--	NA	28	No	No	3590	No
Ethylbenzene	100-41-4	0.001 J	0.25 J	mg/kg	8-SB8-9.5-10.5	2 / 12	0.005 - 1.4	--	NA	130	No	No	130	No
Methyl Ethyl Ketone	78-93-3	0.002 J	0.011 J	mg/kg	8-SB7-4.5-5.8	7 / 12	0.011 - 1.5	--	NA	2700	No	No	27000	No
Methylene Chloride	75-09-2	0.002	0.09 J	mg/kg	8-SB8-4.5-5.5DL	3 / 7	0.011 - 0.011	--	NA	35	No	No	159	No
Toluene														
Total Xylenes	1330-20-7	0.001 J	1.9	mg/kg	8-SB8-9.5-10.5	8 / 12	0.011 - 1.5	--	NA	610	No	No	1600	No
Trichloroethene	79-01-6	0.004 J	0.26	mg/kg	SB4-1.5	2 / 5	0.005 - 0.006	--	NA	0.4	No	No	73	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.22 J	0.22 J	mg/kg	8-SB8-9.5-10.5	1 / 6	0.36 - 0.37	--	NA	35	No	No	35	No
bis(2-Ethylhexyl)phthalate	117-81-7	0.1 J	0.19 J	mg/kg	8-SB7-8.9-10.3	4 / 10	0.36 - 0.37	--	NA	39	No	No	418	No
Di-n-Butyl Phthalate	84-74-2	0.026 J	0.026 J	mg/kg	8-SB8-9.5-10.5	1 / 6	0.36 - 0.37	--	NA	630	No	No	1400	No
Di-n-Octylphthalate	117-84-0	0.012 J	0.014 J	mg/kg	8-SB7-8.9-10.3	3 / 10	0.36 - 1.4	--	NA	63	No	No	630	No
Naphthalene	91-20-3	0.38 J	0.38 J	mg/kg	8-SB8-9.5-10.5	1 / 6	0.36 - 0.37	--	NA	62	No	No	62	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum hydrocarbons	TPH	26	26	mg/kg	SB2-3	1 / 5	NA	--	NA	2000	No	No	2000	No
JP-4	(1) JP-4	240	240	mg/kg	8-SB8-9.5-10.5	1 / 10	10 - 10	--	NA	640	No	No	60000	No
Diesel Range, as diesel	(1) TPHd	340	340	mg/kg	8-SB8-9.5-10.5	1 / 10	10 - 10	--	NA	640	No	No	60000	No
Oil Range, as oil	(1) TPHo	260	260	mg/kg	8-SB8-9.5-10.5	1 / 10	100 - 100	--	NA	640	No	No	60000	No
Gasoline Range	(1) TPHg	1200	1200	mg/kg	8-SB8-9.5-10.5	1 / 10	5 - 5	--	NA	410	Yes	Yes	1200	Yes
<b>Inorganics</b>														
Arsenic	7440-38-2	2.3	22.2	mg/kg	SB3-3	15 / 15	NA	22.5	No	0.7	Yes	No	1308	No
Barium	7440-39-3	78.3	302	mg/kg	SB2-3	15 / 15	NA	429	No	1500	No	No	39474	No
Beryllium	7440-41-7	0.26 J	0.45 J	mg/kg	8-SB8-9.5-10.5	10 / 10	NA	1.1	No	16	No	No	256	No
Chromium	7440-47-3	6.1	15.6	mg/kg	SB4-5.5	15 / 15	NA	41.7	No	12000	No	No	5455	No
Copper	7440-50-8	6	24.9	mg/kg	8-SB9-4.5-5.5	15 / 15	NA	165	No	310	No	No	50375	No
Lead	7439-92-1	5.1	14.9 N	mg/kg	SB4-1.5	15 / 15	NA	29.8	No	200	(a) No	No	4000	No
Mercury	7439-97-6	0.14	0.14	mg/kg	8-SB10-9-9.9	1 / 10	0.07 - 0.11	--	NA	1.1	No	No	349	No
Nickel	7440-02-0	7.8	11.2	mg/kg	8-SB10-9-9.9	12 / 15	6.2 - 7.2	31.4	No	150	No	No	3846	No
Selenium	7782-49-2	0.28 J	0.37 J	mg/kg	8-SB7-8.9-10.3	4 / 15	0.17 - 0.34	0.7	No	39	No	No	1950	No
Thallium	7440-28-0	0.42	0.42	mg/kg	8-SB8-9.5-10.5	1 / 10	0.33 - 0.39	0.41	Yes	0.1	Yes	Yes	78	No
Zinc	7440-66-6	20.2	56.4	mg/kg	8-SB9-4.5-5.5	15 / 15	NA	118	No	2300	No	No	76667	No

Notes:  
-- = not available  
> = greater than  
CAS = Chemical Abstracts Service  
COPC = chemical of potential concern  
J = estimated concentration  
mg/kg = milligram per kilogram  
MT DEQ = Montana Department of Environmental Quality  
NA = not applicable  
N = Spiked sample recovery not within control limits

**Appendix A**  
**Table 2.5.2a**  
**Site 8 - Subsurface Soil Screening (> 2 feet below ground surface) - Hypothetical Future Resident**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching Screening Level?
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USEPA = United States Environmental Protection Agency

- (1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:
  - Dichlorobenzene, 1,2- was used as a surrogate for 1,2/1,4-Dichlorobenzene
  - C11-C22 aromatics was used as a surrogate for total petroleum hydrocarbons
  - C5-C8 Aliphatic was used as a surrogate for Gasoline Range
  - C9-C12 Aliphatic was used as a surrogate for Diesel Range, as diesel; Oil Range, as oil, and JP-4
  - Chromium(III), Insoluble Salts was used as a surrogate for Chromium
- (2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4
- (3) Screening levels was obtained from the following sources (in order of preference):
  - Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)
  - United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)
    - (a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)
- (4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level
- (5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):
  - Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)
  - United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)
  - United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

- MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>
- MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)
- MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.
- USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.5.2b  
Site 8 - Subsurface Soil Screening (> 2 feet below ground surface) - Commercial/Industrial Worker  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Volatile Organic Compounds</b>														
1,1,2-Trichloroethane	79-00-5	0.001 J	0.001 J	mg/kg	8-SB6-4.5-5.7	1 / 7	0.011 - 1.4	--	NA	0.6	No	No	110	No
1,2/1,4-Dichlorobenzene	(1) 1,2/1,4-DCB	0.18	0.18	mg/kg	SB4-1.5	1 / 5	0.005 - 0.006	--	NA	930	No	No	36000	No
1,2-Dichlorobenzene	95-50-1	0.24 J	0.24 J	mg/kg	SB4-1.5	1 / 5	0.34 - 3.8	--	NA	930	No	No	36000	No
1,2-Dichloroethene	540-59-0	0.009 J	0.086 J	mg/kg	8-SB8-9.5-10.5	2 / 7	0.011 - 1.4	--	NA	37	No	No	1764	No
2-Hexanone	591-78-6	0.002 J	0.011 J	mg/kg	8-SB6-4.5-5.7	4 / 12	0.011 - 1.5	--	NA	130	No	No	200	No
Acetone	67-64-1	0.024 J	0.91 J	mg/kg	8-SB8-4.5-5.5DL	14 / 17	0.011 - 0.11	--	NA	110000	No	No	70000	No
Carbon Disulfide	(1) 75-15-0	0.001 J	0.001 J	mg/kg	8-SB6-4.5-5.7	4 / 12	0.011 - 1.5	--	NA	610	No	No	1600	No
Chlorobenzene	108-90-7	0.035	0.035	mg/kg	SB4-1.5	1 / 5	0.005 - 0.006	--	NA	130	No	No	3590	No
Ethylbenzene	100-41-4	0.001 J	0.25 J	mg/kg	8-SB8-9.5-10.5	2 / 12	0.005 - 1.4	--	NA	130	No	No	130	No
Methyl Ethyl Ketone	78-93-3	0.002 J	0.011 J	mg/kg	8-SB7-4.5-5.8	7 / 12	0.011 - 1.5	--	NA	19000	No	No	27000	No
Methylene Chloride	75-09-2	0.002	0.09 J	mg/kg	8-SB8-4.5-5.5DL	3 / 7	0.011 - 0.011	--	NA	320	No	No	159	No
Toluene	108-88-3	0.001 J	0.42 J	mg/kg	8-SB8-9.5-10.5	8 / 17	0.005 - 1.5	--	NA	100	No	No	100	No
Total Xylenes	1330-20-7	0.001 J	1.9 J	mg/kg	8-SB8-9.5-10.5	8 / 12	0.011 - 1.5	--	NA	610	No	No	1600	No
Trichloroethene	79-01-6	0.004 J	0.26	mg/kg	SB4-1.5	2 / 5	0.005 - 0.006	--	NA	1.9	No	No	73	No
<b>Semivolatile Organic Compounds</b>														
2-Methylnaphthalene	91-57-6	0.22 J	0.22 J	mg/kg	8-SB8-9.5-10.5	1 / 6	0.36 - 0.37	--	NA	35	No	No	35	No
bis(2-Ethylhexyl)phthalate	117-81-7	0.1 J	0.19 J	mg/kg	8-SB7-8.9-10.3	4 / 10	0.36 - 0.37	--	NA	160	No	No	418	No
Di-n-Butyl Phthalate	84-74-2	0.026 J	0.026 J	mg/kg	8-SB8-9.5-10.5	1 / 6	0.36 - 0.37	--	NA	8200	No	No	1400	No
Di-n-Octylphthalate	117-84-0	0.012 J	0.014 J	mg/kg	8-SB7-8.9-10.3	3 / 10	0.36 - 1.4	--	NA	820	No	No	630	No
Naphthalene	91-20-3	0.38 J	0.38 J	mg/kg	8-SB8-9.5-10.5	1 / 6	0.36 - 0.37	--	NA	62	No	No	62	No
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum hydrocarbons	TPH	26	26	mg/kg	SB2-3	1 / 5	NA	--	NA	2000	No	No	2000	No
JP-4	(1) JP-4	240	240	mg/kg	8-SB8-9.5-10.5	1 / 10	10 - 10	--	NA	640	No	No	60000	No
Diesel Range, as diesel	(1) TPHd	340	340	mg/kg	8-SB8-9.5-10.5	1 / 10	10 - 10	--	NA	640	No	No	60000	No
Oil Range, as oil	(1) TPHo	260	260	mg/kg	8-SB8-9.5-10.5	1 / 10	100 - 100	--	NA	640	No	No	60000	No
Gasoline Range	(1) TPHg	1200	1200	mg/kg	8-SB8-9.5-10.5	1 / 10	5 - 5	--	NA	410	Yes	Yes	1200	Yes
<b>Inorganics</b>														
Arsenic	7440-38-2	2.3	22.2	mg/kg	SB3-3	15 / 15	NA	22.5	No	3.0	Yes	No	1308	No
Barium	7440-39-3	78.3	302	mg/kg	SB2-3	15 / 15	NA	429	No	22000	No	No	39474	No
Beryllium	7440-41-7	0.26 J	0.45 J	mg/kg	8-SB8-9.5-10.5	10 / 10	NA	1.1	No	230	No	No	256	No
Chromium	(1) 7440-47-3	6.1	15.6	mg/kg	SB4-5.5	15 / 15	NA	41.7	No	180000	No	No	5455	No
Copper	7440-50-8	6	24.9	mg/kg	8-SB9-4.5-5.5	15 / 15	NA	165	No	4700	No	No	50375	No
Lead	7439-92-1	5.1	14.9 N	mg/kg	SB4-1.5	15 / 15	NA	29.8	No	923 (a)	No	No	4000	No
Mercury	7439-97-6	0.14	0.14	mg/kg	8-SB10-9-9.9	1 / 10	0.07 - 0.11	--	NA	5	No	No	349	No
Nickel	7440-02-0	7.8	11.2	mg/kg	8-SB10-9-9.9	12 / 15	6.2 - 7.2	31.4	No	2200	No	No	3846	No
Selenium	7782-49-2	0.28 J	0.37 J	mg/kg	8-SB7-8.9-10.3	4 / 15	0.17 - 0.34	0.7	No	580	No	No	1950	No
Thallium	7440-28-0	0.42	0.42	mg/kg	8-SB8-9.5-10.5	1 / 10	0.33 - 0.39	0.41	Yes	1.2	No	No	78	No
Zinc	7440-66-6	20.2	56.4	mg/kg	8-SB9-4.5-5.5	15 / 15	NA	118	No	35000	No	No	76667	No

Notes:  
-- = not available  
> = greater than  
CAS = Chemical Abstracts Service  
COPC = chemical of potential concern  
J = estimated concentration  
mg/kg = milligram per kilogram

**Appendix A**  
**Table 2.5.2b**  
**Site 8 - Subsurface Soil Screening (> 2 feet below ground surface) - Commercial/Industrial Worker**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
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MT DEQ = Montana Department of Environmental Quality

NA = not applicable

N = Spiked sample recovery not within control limits

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Dichlorobenzene, 1,2- was used as a surrogate for 1,2/1,4-Dichlorobenzene

C11-C22 aromatics was used as a surrogate for total petroleum hydrocarbons

C5-C8 Aliphatic was used as a surrogate for Gasoline Range

C9-C12 Aliphatic was used as a surrogate for Diesel Range, as diesel; Oil Range, as oil, and JP-4

Chromium(III), Insoluble Salts was used as a surrogate for Chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a commercial/industrial exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

**References:**

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

MT DEQ. 2021. Evaluating Lead in Soil – Memorandum. Contaminated Site Cleanup Bureau. 14 June.

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.6.1a  
Site 6 - Sediment Screening - Hypothetical Future Resident  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency	Range of Detection Limits	Background (2)	Maximum Detected > Background?	Screening Level (3)	Maximum Detected > Screening Level?	COPC? (4)	Leaching to Groundwater Screening Level (5)	Maximum Detected > Leaching to Groundwater Screening Level?
<b>Total Petroleum Hydrocarbons</b>														
Total Petroleum Hydrocarbons (1)	TPH	1700	3000	mg/kg	SD2	4 / 4	--	--	NA	490	Yes	Yes	2000	Yes
<b>Inorganics</b>														
Arsenic	7440-38-2	4.9	6.3	mg/kg	SD1	4 / 4	--	22.5	No	0.68	Yes	No	1308	No
Barium	7440-39-3	269	344	mg/kg	SD2(D)	4 / 4	--	429	No	1500	No	No	39474	No
Cadmium	7440-43-9	5.4	6.4	mg/kg	SD2	4 / 4	--	0.7	Yes	0.7	Yes	Yes	--	NA
Chromium	(1) 7440-47-3	43.2	58.8	mg/kg	SD3	4 / 4	--	41.7	Yes	12000	No	No	5455	No
Copper	7440-50-8	34.6	48.5	mg/kg	SD3	4 / 4	--	165	No	310	No	No	50375	No
Lead	7439-92-1	211	529	mg/kg	SD2	4 / 4	--	29.8	Yes	200 (a)	Yes	Yes	4000	No
Mercury	7439-97-6	0.06 B	0.061 B	mg/kg	SD2	3 / 4	0.044 - 0.044	--	NA	1.1	No	No	349	No
Nickel	7440-02-0	15.6	18.9	mg/kg	SD1	4 / 4	--	31.4	No	150	No	No	3846	No
Selenium	7782-49-2	0.41 B	0.41 B	mg/kg	SD1	1 / 4	0.34 - 0.37	0.7	No	39	No	No	1950	No
Zinc	7440-66-6	238	284	mg/kg	SD2	4 / 4	--	118	Yes	2300	No	No	76667	No

Notes:

-- = not available

> = greater than

B = analyte detected in method blank

CAS = Chemical Abstracts Service

COPC = chemical of potential concern

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

NA = not applicable

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals lacking toxicity values or with multiple forms:

Total petroleum hydrocarbons used C11-C22 aromatics

Chromium used trivalent chromium

(2) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(3) Screening levels was obtained from the following sources (in order of preference):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater ) (MT DEQ 2018)

United States Environmental Protection Agency Regional Screening Level for a residential exposure scenario based on a target risk of 1E-6 or a target hazard of 0.1 (USEPA 2022)

(a) Screening levels for lead were selected in agreement with MT DEQ guidance (2021)

(4) A chemical was selected as a COPC if the chemical was greater than the maximum of the background level or screening level

(5) Leaching to groundwater screening level selected/calculated from the following sources (in agreement with Surface and Subsurface Soil Screening Flowchart - Part 2 - Leaching to groundwater; MT DEQ 2018):

Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018)

United States Environmental Protection Agency Maximum Contaminant Level-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

United States Environmental Protection Agency risk-based soil screening level for the protection of groundwater (10 dilution attenuation factor) (USEPA 2022)

References:

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 2.7.1  
Groundwater Screening - Detected Chemicals  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Chemical (1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency (2)	Range of Detection Limits	Groundwater Screening Level (3)	Screening Level Source	Maximum Detected > Screening Level?
<b>Extractable Petroleum Hydrocarbons (EPH)</b>										
C9-C18 ALIPHATIC	C9-C18 Aliphatic	66	520000	ug/L	7-MW35(3)-N	45 / 46	240-240	1400	MT DEQ RBSL	Yes
C11-C22 AROMATIC	C19-C36 Aliphatic	94	46000	ug/L	7-MW35(3)-N	42 / 46	120 - 13000	0.6	USEPA RSL	Yes
C19-C36 ALIPHATIC	C11-C22 Aromatic	55 J	47000	ug/L	4-MW5-N	19 / 46	170 - 240	1100	MT DEQ RBSL	Yes
TEPH	Total EPH	170	570000	ug/L	7-MW35(3)-N	50 / 74	290 - 310	1000	MT DEQ RBSL	Yes
<b>Volatile Petroleum Hydrocarbons (VPH)</b>										
BENZENE	71-43-2	0.15	43	J ug/L	7-MW6-N	81 / 161	0.5 - 6.7	5	MT DEQ 7	Yes
C5-C8 ALIPHATIC	C5-C8 Aliphatic	4.7	2800	J ug/L	7-MW35-N	100 / 161	3.2 - 20	650	MT DEQ RBSL	Yes
C5-C8 ALIPHATIC, ADJUSTED	C5-C8 Aliphatic Adj	4.7	2600	J ug/L	7-MW35-N	99 / 160	3.2 - 20	650	MT DEQ RBSL	Yes
C9-C10 AROMATIC	C9-C10 Aromatic	0.48	27000	J- ug/L	7-MW6-N	103 / 160	20 - 40	1100	MT DEQ RBSL	Yes
C9-C12 ALIPHATIC	C9-C12 Aliphatic	2	3600	ug/L	4-MW5-N	95 / 159	3.2 - 71	1400	MT DEQ RBSL	Yes
C9-C12 ALIPHATIC, ADJUSTED	C9-C12 Aliphatic Adj	2.3	20000	J- ug/L	7-MW6-N	79 / 159	2.2 - 42.2	1400	MT DEQ RBSL	Yes
ETHYLBENZENE	100-41-4	0.24	290	J ug/L	4-MW5-N	77 / 160	0.5 - 0.5	700	MT DEQ 7	No
NAPHTHALENE	91-20-3	1.1	74	J ug/L	4-MW5-N	60 / 161	2 - 10	100	MT DEQ 7	No
tert-BUTYL METHYL ETHER	1634-04-4	0.22	4.9	J- ug/L	7-MW22(3)-N	24 / 157	2 - 20	30	MT DEQ 7	No
TOLUENE	108-88-3	0.15	140	J+ ug/L	7-MW35-N	25 / 159	0.5 - 5	1000	MT DEQ 7	No
TOTAL XYLENES	1330-20-7	0.27	J- 800	J ug/L	4-MW5-N	45 / 160	1 - 10	10000	MT DEQ 7	No
TVPH	TVPH	20	J+ 5300	J+ ug/L	7-MW35(3)-N	111 / 160	8.2 - 91	650	MT DEQ RBSL	Yes
<b>Volatile Organic Compounds</b>										
1,1,2,2-TETRACHLOROETHANE	79-34-5	1	1	ug/L	4-MW3A-N	2 / 107	1 - 10	2	MT DEQ 7	No
1,1,2-TRICHLOROETHANE	79-00-5	1	7.8	ug/L	7-MW26-N	12 / 107	1 - 10	3	MT DEQ 7	Yes
1,1-DICHLOROETHANE	75-34-3	0.25	5.8	ug/L	6-MW1-N	40 / 107	1 - 10	2.8	USEPA RSL	Yes
1,1-DICHLOROETHENE	75-35-4	0.26	0.26	ug/L	8-MW7-N	1 / 107	1 - 10	7	MT DEQ 7	No
1,2,3-TRICHLOROBENZENE	87-61-6	0.21	J- 0.64	ug/L	7-MW28-N	3 / 107	1 - 10	0.7	USEPA RSL	No
1,2,3-TRICHLOROPROPANE	96-18-4	0.6	3	ug/L	4-MW3A-N	3 / 107	3 - 30	0.00075	USEPA RSL	Yes
1,2,4-TRICHLOROBENZENE	120-82-1	0.21	0.56	ug/L	7-MW28-N	2 / 107	1 - 10	70	MT DEQ 7	No
1,2,4-TRIMETHYLBENZENE	95-63-6	0.15	660	ug/L	7-MW35-N	36 / 107	1 - 4	5.6	USEPA RSL	Yes
1,2-DICHLOROETHANE	107-06-2	0.13	1	ug/L	6-MW1-N	12 / 107	1 - 10	4	MT DEQ 7	No
1,2-DICHLOROPROPANE	78-87-5	0.52	5	ug/L	4-MW5-FD	4 / 107	1 - 10	5	MT DEQ 7	Yes
1,3,5-TRIMETHYLBENZENE	108-67-8	0.16	140	ug/L	4-MW3A-N	16 / 107	1 - 4	6	USEPA RSL	Yes
2-BUTANONE	78-93-3	4.6	5.4	ug/L	7-MW12-N	3 / 107	6 - 60	560	USEPA RSL	No
2-HEXANONE	591-78-6	5	5	ug/L	7-MW26-N	1 / 107	5 - 50	3.8	USEPA RSL	Yes
4-METHYL-2-PENTANONE	108-10-1	1.6	5	ug/L	4-MW3A-N	3 / 107	5 - 50	630	USEPA RSL	No
ACETONE	67-64-1	2.7	84	ug/L	8-MW14-N	9 / 107	10 - 100	1800	USEPA RSL	No
BENZENE	71-43-2	0.21	9.2	ug/L	4-MW5-N	29 / 107	0.5 - 6.7	5	MT DEQ 7	Yes
BROMODICHLOROMETHANE	75-27-4	1	1	ug/L	4-MW3A-N	2 / 107	1 - 10	10	MT DEQ 7	No
CARBON DISULFIDE	75-15-0	0.22	2	ug/L	4-MW3A-N	8 / 107	2 - 20	81	USEPA RSL	No
CARBON TETRACHLORIDE	56-23-5	2.6	8.6	ug/L	7-MW128-N	10 / 107	2 - 20	3	MT DEQ 7	Yes
CHLOROETHANE	75-00-3	2	2	ug/L	7-MW26-N	1 / 107	2 - 20	830	USEPA RSL	No
CHLOROFORM	67-66-3	1	J+ 4.3	J+ ug/L	4-MW2-N	21 / 107	0.24 - 10	70	MT DEQ 7	No
CHLOROMETHANE	74-87-3	1.2	1.2	ug/L	7-MW17-N	1 / 107	2 - 20	600	MT DEQ 7	No
cis-1,2-DICHLOROETHYLENE	156-59-2	0.16	370	ug/L	8-MW13-N	71 / 107	1 - 10	70	MT DEQ 7	Yes
ETHYLBENZENE	100-41-4	0.16	240	ug/L	4-MW5-FD	28 / 107	0.5 - 0.5	700	MT DEQ 7	No
ISOPROPYLBENZENE	98-82-8	0.2	99	ug/L	7-MW35-N	36 / 107	1 - 4	45	USEPA RSL	Yes
m,p-XYLENE (1)	108-38-3/106-42-3	0.15	J- 640	ug/L	4-MW5-FD	24 / 107	2 - 10	10000	MT DEQ 7	No

**Appendix A**  
**Table 2.7.1**  
**Groundwater Screening - Detected Chemicals**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical	(1)	CAS Number	Minimum Detected / Qualifier	Maximum Detected / Qualifier	Units	Location of Maximum	Detection Frequency (2)	Range of Detection Limits	Groundwater Screening Level (3)	Screening Level Source	Maximum Detected > Screening Level?
NAPHTHALENE		91-20-3	0.24	67	ug/L	4-MW5-FD	22 / 107	2 - 10	100	MT DEQ 7	No
n-BUTYLBENZENE		104-51-8	0.2	J- 68	ug/L	7-MW35-N	28 / 107	1 - 4	100	USEPA RSL	No
n-PROPYLBENZENE		103-65-1	0.17	150	ug/L	7-MW35-N	30 / 107	1 - 4	66	USEPA RSL	Yes
o-XYLENE		95-47-6	0.2	1.6	ug/L	4-MW5-N	12 / 107	1 - 10	10000	MT DEQ 7	No
p-ISOPROPYLTOLUENE	(1)	99-87-6	0.2	46	ug/L	7-MW35-N	24 / 107	1 - 4	45	USEPA RSL	Yes
sec-BUTYLBENZENE		135-98-8	0.59	75	ug/L	7-MW35-N	39 / 107	1 - 4	200	USEPA RSL	No
t-BUTYLBENZENE		98-06-6	0.23	2	ug/L	4-MW5-FD	24 / 107	1 - 10	69	USEPA RSL	No
tert-BUTYLMETHYLEETHER		1634-04-4	0.34	0.35	J- ug/L	8-MW8-N	2 / 107	2 - 20	30	MT DEQ 7	No
TETRACHLOROETHYLENE		127-18-4	0.23	1.5	ug/L	8-MW10-N	6 / 107	1 - 10	5	MT DEQ 7	No
TOLUENE		108-88-3	0.18	1.2	ug/L	4-MW5-FD	16 / 107	0.5 - 5	1000	MT DEQ 7	No
TOTAL 1,2-DICHLOROETHENE	(1)	540-59-0	0.16	370	ug/L	8-MW13-N	71 / 107	1 - 10	7	MT DEQ 7	Yes
trans-1,2-DICHLOROETHENE		156-60-5	0.15	1.1	ug/L	8-MW1-N	12 / 107	1 - 10	100	MT DEQ 7	No
TRICHLOROETHYLENE		79-01-6	0.16	16	ug/L	7-MW28-N	55 / 107	1 - 10	5	MT DEQ 7	Yes
VINYL CHLORIDE		75-01-4	0.15	28	ug/L	8-MW4-N	22 / 107	1.5 - 15	0.2	MT DEQ 7	Yes

Notes:  
> = greater than  
Adj = adjusted  
CAS = Chemical Abstracts Service  
J = estimated concentration  
J- = estimated concentration (negative bias)  
J+ = estimated concentration (positive bias)  
NA = not applicable  
TVPH = total volatile petroleum hydrocarbon  
ug/L = microgram per liter  
(1) The following surrogates were used for chemicals lacking toxicity values or multiple forms  
Cumene was used as a surrogate for P-CYMENE (p-ISOPROPYLTOLUENE)  
Dichloroethylene, 1,1- was used as a surrogate for TOTAL 1,2-DICHLOROETHENE  
Xylene, m- was used as a surrogate for M,P-XYLENE (SUM OF ISOMERS)  
(2) Number of detected / number of samples  
(3) Screening values were obtained from the following hierarchy:  
MT DEQ 7 = Circular DEQ 7 Montana Numeric Water Quality Standards (Human Health Standards for Groundwater). June 2019.  
MT DEQ RBSL = Montana Department of Environmental Quality Risk-Based Screening Level (Montana Risk-Based Corrective Action Guidance for Petroleum Releases). May 2018.  
USEPA RSL = United States Environmental Protection Agency Regional Screening Level for Tapwater based on target risk of 1E-06 for carcinogens and target hazard quotient of 0.1 for noncarcinogens. November 2022.

**Appendix A**  
**Table 3.1**  
**Site 4 - Exposure Point Concentrations - Surface Soil (0 to 2 feet below ground surface)**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical	CAS Number	Units	95% UCL (1)	Distribution	Maximum Concentration	EPC (2)	Statistic (1,2)
<b>Total Petroleum Hydrocarbons</b> Total Petroleum Hydrocarbons	TPH	mg/kg	1975	Lognormal	1500	1500	Maximum Concentration

Notes:

-- = not applicable/not calculated

CAS = Chemical Abstracts Service

mg/kg = milligram per kilogram

95 UCL = 95 percent upper confidence limit of the mean concentration

EPC = exposure point concentration

(1) EPC is the 95 UCL or the maximum detected concentration if sufficient number of samples are not available to calculate a UCL

(2) 95 UCL and UCL Statistic as recommended by ProUCL (United States Environmental Protection Agency Version 5.1.002, 2016)

**Appendix A**  
**Table 3.3a**  
**Site 6 - Exposure Point Concentrations - Surface Soil (0 to 2 feet below ground surface)**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical	CAS Number	Units	95% UCL (1)	Distribution	Maximum Concentration	EPC (2)	Statistic (1,2)
<b>Semivolatile Organic Compounds</b>							
Benzo(a)pyrene	50-32-8	mg/kg	--	--	0.38	0.38	Maximum Concentration
<b>Total Petroleum Hydrocarbons</b>							
Total Petroleum Hydrocarbons	TPH	mg/kg	15,905	Data do not follow a Discernible Distribution at 5% Significance Level	13,000	13,000	Maximum Concentration
JP-4	JP-4	mg/kg	--	--	1,300	1,300	Maximum Concentration
Diesel Range, as diesel	TPHd	mg/kg	772	Detected Data appear Normal Distributed at 5% Significance Level	1,100	772	95% KM (t) UCL
Oil Range, as oil	TPHo	mg/kg	1,955	Detected Data appear Normal Distributed at 5% Significance Level	3,700	1,955	95% KM (t) UCL
Gasoline Range	TPHg	mg/kg	--	--	2,600	2,600	Maximum Concentration
<b>Inorganics</b>							
Cadmium	7440-43-9	mg/kg	3.737	Detected Data appear Normal Distributed at 5% Significance Level	11.9	3.737	95% KM (t) UCL
Chromium	7440-47-3	mg/kg	48.85	Data do not follow a Discernible Distribution (0.05)	83.1	48.85	95% Chebyshev (Mean, Sd) UCL
Lead	7439-92-1	mg/kg	617.8	Data do not follow a Discernible Distribution (0.05)	758	90.82	Mean (3)
Thallium	7440-28-0	mg/kg	--	--	0.42	0.42	Maximum Concentration

Notes:

-- = not applicable/not calculated

CAS = Chemical Abstracts Service

mg/kg = milligram per kilogram

95 UCL = 95 percent upper confidence limit of the mean concentration

EPC = exposure point concentration

(1) EPC is the 95 UCL or the maximum detected concentration if sufficient number of samples are not available to calculate a UCL or the 95 UCL exceeds the maximum concentration

(2) 95 UCL and UCL Statistic as recommended by ProUCL (United States Environmental Protection Agency Version 5.1.002, 2016)

**Appendix A**  
**Table 3.3b**  
**Site 6 - Exposure Point Concentrations - Subsurface Soil (> 2 feet below ground surface)**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical	CAS Number	Units	95% UCL (1)	Distribution	Maximum Concentration	EPC (2)	Statistic (1,2)
<b>Volatile Organic Compounds</b>							
Trichloroethylene (TCE)	79-01-6	mg/kg	0.935	Detected Data appear Approximate Normal Distributed at 5% Significance Level	4	0.935	95% KM (t) UCL
<b>Total Petroleum Hydrocarbons</b>							
Total Petroleum Hydrocarbons	TPH	mg/kg	3,486	Detected Data appear Approximate Normal Distributed at 5% Significance Level	8,100	3,486	95% KM (t) UCL
JP-4	JP-4	mg/kg	3,428	Detected Data appear Approximate Normal Distributed at 5% Significance Level	7,800	3,428	95% KM (t) UCL
Diesel Range, as diesel	TPHd	mg/kg	2,438	Detected Data appear Gamma Distributed at 5% Significance Level	2,800	2,438	95% KM Bootstrap t UCL
Oil Range, as oil	TPHo	mg/kg	38,321	Detected Data appear Gamma Distributed at 5% Significance Level	14,000	14,000	Maximum Concentration
Gasoline Range	TPHg	mg/kg	6,229	Detected Data appear Normal Distributed at 5% Significance Level	17,000	6,229	95% KM (t) UCL

Notes:

-- = not applicable/not calculated

CAS = Chemical Abstracts Service

mg/kg = milligram per kilogram

95 UCL = 95 percent upper confidence limit of the mean concentration

EPC = exposure point concentration

(1) EPC is the 95 UCL or the maximum detected concentration if sufficient number of samples are not available to calculate a UCL or the 95 UCL exceeds the maximum concentration

(2) 95 UCL and UCL Statistic as recommended by ProUCL (United States Environmental Protection Agency Version 5.1.002, 2016)

**Appendix A**  
**Table 3.3c**  
**Site 6 - Exposure Point Concentrations - Sediment**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base Great Falls**  
**International Airport**  
**Great Falls, Montana**

Chemical	CAS Number	Units	95% UCL (1)	Distribution	Maximum Concentration	EPC (2)	Statistic (1,2)
<b>Total Petroleum Hydrocarbons</b>							
Total Petroleum Hydrocarbons	TPH	mg/kg	3,091	Normal	3,000	3,000	95% Student's-t UCL
<b>Inorganics</b>							
Lead	7439-92-1	mg/kg	486.6	Normal	529	315	Arithmetic Mean (3)

Notes:

-- = not applicable/not calculated

CAS = Chemical Abstracts Service

mg/kg = milligram per kilogram

95 UCL = 95 percent upper confidence limit of the mean concentration

EPC = exposure point concentration

(1) EPC is the 95 UCL or the maximum detected concentration if sufficient number of samples are not available to calculate a UCL or the 95 UCL exceeds the maximum concentration

(2) 95 UCL and UCL Statistic as recommended by ProUCL (United States Environmental Protection Agency Version 5.1.002, 2016)

**Appendix A**  
**Table 3.4b**  
**Site 7 - Exposure Point Concentrations - Subsurface Soil (> 2 feet below ground surface)**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical	CAS Number	Units	95% UCL (1)	Distribution	Maximum Concentration	EPC (2)	Statistic (1,2)
<b>Volatile Organic Compounds</b>							
Benzene	71-43-2	mg/kg	1.93	No discernable distribution	2.6	1.93	95% KM (Chebyshev) UCL
Chloroform	67-66-3	mg/kg	0.543	Detected Data appear Approximate Normal at 5% Significance Level	0.73	0.543	95% KM (t) UCL
Toluene	108-88-3	mg/kg	43.02	Detected Data appear Normal at 5% Significance Level	140	43.02	95% KM (t) UCL
<b>Semivolatile Organic Compounds</b>							
2-Methylnaphthalene	91-57-6	mg/kg	54.69	Detected data appear Gamma Distributed at 5% Significance Level	42	42	Maximum Concentration
<b>Total Petroleum Hydrocarbons</b>							
JP-4	JP-4	mg/kg	668.9	Detected Data appear Normal at 5% Significance Level	950	668.9	95% KM (t) UCL
Diesel Range, as diesel	TPHd	mg/kg	597.9	Detected Data appear Normal at 5% Significance Level	800	597.9	95% KM (t) UCL
Oil Range, as oil	TPHo	mg/kg	5821	Detected Data appear Normal at 5% Significance Level	8400	5821	95% KM (t) UCL
Gasoline Range	TPHg	mg/kg	1178	Detected Data appear Normal at 5% Significance Level	1700	1178	95% KM (t) UCL
<b>Inorganics</b>							
Lead	7439-92-1	mg/kg	240.1	No discernable distribution	443	63.2	(3) Mean Concentration

Notes:

-- = not applicable/not calculated

CAS = Chemical Abstracts Service

mg/kg = milligram per kilogram

95 UCL = 95 percent upper confidence limit of the mean concentration

EPC = exposure point concentration

(1) EPC is the 95 UCL or the maximum detected concentration if sufficient number of samples are not available to calculate a UCL or the UCL exceeds the maximum concentration

(2) 95 UCL and UCL Statistic as recommended by ProUCL (United States Environmental Protection Agency Version 5.1.002, 2016)

(3) In agreement with USEPA Guidance, the EPC for lead is the arithmetic mean concentration

**Appendix A**  
**Table 3.5a**  
**Site 8 - Exposure Point Concentrations - Surface Soil (0 to 2 feet below ground surface)**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical	CAS Number	Units	95% UCL (1)	Distribution	Maximum Concentration	EPC (2)	Statistic (1,2)
<b>Total Petroleum Hydrocarbons</b>							
Oil Range, as oil	TPHo	mg/kg	--	--	1700	1700	Maximum Concentration
Gasoline Range	TPHg	mg/kg	--	--	180	180	Maximum Concentration

Notes:

-- = not applicable/not calculated

CAS = Chemical Abstracts Service

mg/kg = milligram per kilogram

95 UCL = 95 percent upper confidence limit of the mean concentration

EPC = exposure point concentration

(1) EPC is the 95 UCL or the maximum detected concentration if sufficient number of samples are not available to calculate a UCL

(2) 95 UCL and UCL Statistic as recommended by ProUCL (United States Environmental Protection Agency Version 5.1.002, 2016)

**Appendix A**  
**Table 3.5b**  
**Site 8 - Exposure Point Concentrations - Subsurface Soil (> 2 feet below ground surface)**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Chemical	CAS Number	Units	95% UCL (1)	Distribution	Maximum Concentration	EPC (2)	Statistic (1,2)
<b>Total Petroleum Hydrocarbons</b>							
Gasoline Range	TPHg	mg/kg	--	--	1200	1200	Maximum Concentration
<b>Inorganics</b>							
Thallium	7440-28-0	mg/kg	--	--	0.42	0.42	Maximum Concentration

Notes:

-- = not applicable/not calculated

CAS = Chemical Abstracts Service

mg/kg = milligram per kilogram

95 UCL = 95 percent upper confidence limit of the mean concentration

EPC = exposure point concentration

(1) EPC is the 95 UCL or the maximum detected concentration if sufficient number of samples are not available to calculate a UCL

(1) 95 UCL and UCL Statistic as recommended by ProUCL (United States Environmental Protection Agency Version 5.1.002, 2016)

**Appendix A**  
**Table 4.1a**  
**Site 4 - Cumulative Risk Calculations - Surface Soil (0 to 2 feet below ground surface)**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Media / Exposure Pathway	Chemical (1)	CAS Number	Units	EPC (2)	Background (3)	Hypothetical Future Resident			
						Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)
Soil (0 to 2 ft bgs)	<b>Total Petroleum Hydrocarbons</b>								
	Total Petroleum Hydrocarbons (100% C11-C22 aromatics) <sup>(1)</sup>	TPH	mg/kg	1,500	--	--	--	4.90E+02	3.8E-01
	Soil Risk/Hazard (ingestion, dermal contact, inhalation of particulates)					Media-Specific Cancer Risk :	--	Media-Specific Noncancer Hazard :	0.4

Notes:

**Bold** indicates a cumulative cancer risk greater than 1E-06 or a noncancer hazard greater than unity (1).

-- = not available/applicable

CAS = Chemical Abstracts Service

EPC = exposure point concentration

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

SL = Screening Level

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals without toxicity values or multiple forms:

Total petroleum hydrocarbons were evaluated in agreement with MT DEQ guidance (2018) using the following fractional assumptions:

Total petroleum hydrocarbons used 100% C11-C22 aromatics

(2) EPCs provided in Table 3 Series.

(3) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(4) Cancer and noncancer based SLs obtained from the MT DEQ guidance (2018) based on a target cancer risk of 1E-06 and a target noncancer hazard of 0.125

(5) Potential cumulative cancer risk and noncancer hazard calculated as:

$$\text{Potential Cumulative Cancer Risk or Noncancer Hazard} = \frac{\text{EPC}}{\text{SL}} \times \text{Target Risk (1E-6) or Target Hazard (0.1)}$$

References

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 4.3a  
Site 6 - Cumulative Risk Calculations - Surface Soil (0 to 2 feet below ground surface)  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Media / Exposure Pathway	Chemical (1)	CAS Number	Units	EPC (2)	Background (3)	Hypothetical Future Resident				Commercial/Industrial Worker			
						Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)	Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)
Soil (0 to 2 ft bgs)	<b>Semivolatile Organic Compounds</b>												
	Benzo(a)pyrene	50-32-8	mg/kg	0.38	--	1.10E-01	3.45E-06	1.80E+00	2.1E-02	--	--	--	--
	<b>Total Petroleum Hydrocarbons</b>												
	JP-4 (70% C9-C18 aliphatic)	(1) JP-4	mg/kg	910	--	--	--	1.10E+02	8.3E-01	--	--	5.40E+02	1.7E-01
	JP-4 (30% C11-C22 aromatic)	(1) JP-4	mg/kg	390	--	--	--	4.90E+02	8.0E-02	--	--	2.00E+03	2.0E-02
	Diesel Range, as diesel (60% C11-C22 aromatic)	(1) TPHd	mg/kg	463	--	--	--	4.90E+02	9.4E-02	--	--	2.00E+03	2.3E-02
	Diesel Range, as diesel (40% C9-C18 aliphatic)	(1) TPHd	mg/kg	309	--	--	--	1.10E+02	2.8E-01	--	--	5.40E+02	5.7E-02
	Oil Range, as oil (70% C11-C22 aromatic)	(1) TPHo	mg/kg	1,369	--	--	--	4.90E+02	2.8E-01	--	--	2.00E+03	6.8E-02
	Oil Range, as oil (30% C9-C18 aliphatic)	(1) TPHo	mg/kg	587	--	--	--	1.10E+02	5.3E-01	--	--	5.40E+02	1.1E-01
	Gasoline Range (100% C9-C10 aromatic)	(1) TPHg	mg/kg	2,600	--	--	--	1.30E+02	2.0E+00	--	--	7.20E+02	3.6E-01
	<b>Inorganics</b>												
	Cadmium	7440-43-9	mg/kg	4	0.7	2.10E+03	1.78E-09	7.10E-01	5.3E-01	--	--	--	--
	Chromium	(1) 7440-47-3	mg/kg	49	41.7	--	--	1.20E+04	4.1E-04	--	--	1.80E+05	2.7E-05
	Lead	(6) 7439-92-1	mg/kg	91	29.8	--	--	2.00E+02	--	--	--	--	--
	Thallium	7440-28-0	mg/kg	0.42	0.41	--	--	7.80E-02	5.4E-01	--	--	--	--
Soil Risk/Hazard (ingestion, dermal contact, inhalation of particulates) (6)						Media-Specific Cancer Risk :	<b>3E-06</b>	Media-Specific Noncancer Hazard :	<b>5</b>	Media-Specific Cancer Risk :	--	Media-Specific Noncancer Hazard :	<b>1</b>

Notes:

**Bold indicates** a cumulative cancer risk greater than 1E-06 or a noncancer hazard greater than unity (1)

-- = not available/applicable

CAS = Chemical Abstracts Service

EPC = exposure point concentration

ft bgs = feet below ground surface

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

SL = Screening Level

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals without toxicity values or multiple forms:

Total petroleum hydrocarbons were evaluated in agreement with MT DEQ guidance (2018) using the following fractional assumptions:

JP-4 used 70% C9-C18 aliphatics and 30% C11-C22 aromatics

Diesel Range, as diesel used 60% C11-C22 aromatics and 40% C9-C18 aliphatics

Oil Range, as oil used 70% as C11-C22 aromatics and 30% C9-C18 aliphatics

Gasoline Range used 100% C9-C10 aromatics

Chromium used trivalent chromium

(2) EPCs provided in Table 3 Series, Total petroleum hydrocarbon EPCs were calculated using the fractional assumptions provided in footnote (1)

(3) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(4) Cancer and noncancer based SLs obtained from the USEPA Regional Screening Levels (USEPA, 2022) based on a cancer risk of 1E-06 and a noncancer hazard of 0.1 for residential and commercial/industrial worker exposure scenarios, total petroleum hydrocarbon screening levels obtained from MT DEQ guidance (2018) based on a target cancer risk of 1E-06 and a target noncancer hazard of 0.125 for residential and commercial/industrial worker exposure scenarios

(5) Potential cumulative cancer risk and noncancer hazard calculated as:

$$\text{Potential Cumulative Cancer Risk or Noncancer Hazard} = \frac{\text{EPC}}{\text{SL}} \times \text{Target Risk (1E-6) or Target Hazard (0.1)}$$

(6) In agreement with USEPA guidance (2022), lead is presented for comparison purposes only and not included in cumulative risk and hazard calculations

References

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 4.3b  
Site 6 - Cumulative Risk Calculations - Subsurface Soil (> 2 feet below ground surface)  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Media / Exposure Pathway	Chemical (1)	CAS Number	Units	EPC (2)	Background (3)	Hypothetical Future Resident				Commercial/Industrial Worker			
						Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)	Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)
Soil (> 2 ft bgs)	<b>Volatile Organic Compounds</b>												
	Trichloroethylene (TCE)	79-01-6	mg/kg	0.94	--	9.40E-01	9.95E-07	4.10E-01	2.3E-01	6.00E+00	1.56E-07	1.90E+00	4.9E-02
	<b>Total Petroleum Hydrocarbons</b>												
	JP-4 (70% C9-C18 aliphatic)	<sup>(1)</sup> JP-4	mg/kg	2,400	--	--	--	1.10E+02	2.7E+00	--	--	5.40E+02	5.6E-01
	JP-4 (30% C11-C22 aromatic)	<sup>(1)</sup> JP-4	mg/kg	1,028	--	--	--	4.90E+02	2.6E-01	--	--	2.00E+03	6.4E-02
	Diesel Range, as diesel (60% C11-C22 aromatic)	<sup>(1)</sup> TPHd	mg/kg	1,463	--	--	--	4.90E+02	3.7E-01	--	--	2.00E+03	9.1E-02
	Diesel Range, as diesel (40% C9-C18 aliphatic)	<sup>(1)</sup> TPHd	mg/kg	975	--	--	--	1.10E+02	1.1E+00	--	--	5.40E+02	2.3E-01
	Oil Range, as oil (70% C11-C22 aromatic)	<sup>(1)</sup> TPHo	mg/kg	9,800	--	--	--	4.90E+02	2.5E+00	--	--	2.00E+03	6.1E-01
	Oil Range, as oil (30% C9-C18 aliphatic)	<sup>(1)</sup> TPHo	mg/kg	4,200	--	--	--	1.10E+02	4.8E+00	--	--	5.40E+02	9.7E-01
	Gasoline Range (100% C9-C10 aromatic)	<sup>(1)</sup> TPHg	mg/kg	6,229	--	--	--	1.30E+02	6.0E+00	--	--	7.20E+02	1.1E+00
Soil Risk/Hazard (ingestion, dermal contact, inhalation of particulates)						Media-Specific Cancer Risk :	1E-06	Media-Specific Noncancer Hazard :	<b>18</b>	Media-Specific Cancer Risk :	2E-07	Media-Specific Noncancer Hazard :	<b>4</b>

Notes:

**Bold indicates** a cumulative cancer risk greater than 1E-06 or a noncancer hazard greater than unity (1).

-- = not available/applicable

> = greater than

CAS = Chemical Abstracts Service

EPC = exposure point concentration

ft bgs = feet below ground surface

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

SL = Screening Level

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals without toxicity values or multiple forms:

Total petroleum hydrocarbons were evaluated in agreement with MT DEQ guidance (2018) using the following fractional assumptions:

JP-4 used 70% C9-C18 aliphatics and 30% C11-C22 aromatics

Diesel Range, as diesel used 60% C11-C22 aromatics and 40% C9-C18 aliphatics

Oil Range, as oil used 70% as C11-C22 aromatics and 30% C9-C18 aliphatics

Gasoline Range used 100% C9-C10 aromatics

(2) EPCs provided in Table 3 Series, Total petroleum hydrocarbon EPCs were calculated using the fractional assumptions provided in footnote (1)

(3) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(4) Cancer and noncancer based SLs obtained from the USEPA Regional Screening Levels (USEPA, 2022) based on a cancer risk of 1E-06 and a noncancer hazard of 0.1 for residential and commercial/industrial worker exposure scenarios, total petroleum hydrocarbon SLs obtained from MT DEQ guidance (2018) based on a target cancer risk of 1E-06 and a target noncancer hazard of 0.125 for residential and commercial/worker exposure scenarios

(5) Potential cumulative cancer risk and noncancer hazard calculated as:

$$\text{Potential Cumulative Cancer Risk or Noncancer Hazard} = \frac{\text{EPC}}{\text{SL}} \times \text{Target Risk (1E-6) or Target Hazard (0.1)}$$

References

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 4.3c  
Site 6 - Cumulative Risk Calculations - Sediment  
Human Health Risk Assessment  
Montana Air National Guard Base Great Falls  
International Airport  
Great Falls, Montana

Media / Exposure Pathway	Chemical (1)	CAS Number	Units	EPC (2)	Background (3)	Hypothetical Future Resident				Commercial/Industrial Worker			
						Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)	Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)
	<b>Total Petroleum Hydrocarbons</b>												
	Total Petroleum Hydrocarbons (100% C11-C22 aromatics) <sup>(1)</sup>	TPH	mg/kg	3,000	--	--	--	4.90E+02	6.1E-01	--	--	2.00E+03	1.5E-01
	<b>Inorganics</b>												
	Lead <sup>(6)</sup>	7439-92-1	mg/kg	315	29.8	--	--	--	--	--	--	--	--
	Soil Risk/Hazard (ingestion, dermal contact, inhalation of particulates) (6)					Media-Specific Cancer Risk :	--	Media-Specific Noncancer Hazard :	1	Media-Specific Cancer Risk :	--	Media-Specific Noncancer Hazard :	0.2

Notes:

**Bold** indicates a cumulative cancer risk greater than 1E-06 or a noncancer hazard greater than unity (1).

-- = not available/applicable

CAS = Chemical Abstracts Service

EPC = exposure point concentration

ft bgs = feet below ground surface

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

SL = Screening Level

TPH = total petroleum hydrocarbon

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals without toxicity values or multiple forms:

Total petroleum hydrocarbons were evaluated in agreement with MT DEQ guidance (2018) using the following fractional assumptions:

Total petroleum hydrocarbons used 100% C11-C22 aromatics

(2) EPCs provided in Table 3 Series.

(3) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(4) SL for TPH obtained from the Montana Department of Environmental Quality Risk-Based Screening Level (> 20 feet to groundwater) (MT DEQ 2018) based on a noncancer hazard of 0.125 for a residential exposure scenario

(5) Potential cumulative cancer risk and noncancer hazard calculated as:

$$\text{Potential Cumulative Cancer Risk or Noncancer Hazard} = \frac{\text{EPC}}{\text{SL}} \times \text{Target Risk (1E-6) or Target Hazard (0.1)}$$

(6) In agreement with USEPA guidance (2022), lead is presented for comparison purposes only and not included in cumulative risk and hazard calculations.

References

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 4.4b  
Site 7 - Cumulative Risk Calculations - Subsurface Soil (> 2 feet below ground surface)  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Media / Exposure Pathway	Chemical (1)	CAS Number	Units	EPC (2)	Background (3)	Hypothetical Future Resident				Commercial/Industrial Worker				
						Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)	Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)	
Soil (> 2 ft bgs)	<b>Volatile Organic Compounds</b>													
	Benzene	71-43-2	mg/kg	1.9	--	1.20E+00	1.6E-06	8.20E+00	2.4E-02	5.10E+00	3.8E-07	4.20E+01	4.6E-03	
	Chloroform	67-66-3	mg/kg	0.5	--	3.20E-01	1.7E-06	2.00E+01	2.7E-03	--	--	--	--	
	Toluene	108-88-3	mg/kg	43	--	--	--	4.90E+02	8.8E-03	--	--	4.70E+03	9.2E-04	
	<b>Semivolatile Organic Compounds</b>													
	2-Methylnaphthalene	91-57-6	mg/kg	42	--	--	--	2.40E+01	1.8E-01	--	--	3.00E+02	1.4E-02	
	<b>Total Petroleum Hydrocarbons</b>													
	JP-4 (70% C9-C18 aliphatic)	(1) JP-4	mg/kg	468	--	--	--	1.10E+02	4.3E-01	--	--	5.40E+02	8.7E-02	
	JP-4 (30% C11-C22 aromatic)	(1) JP-4	mg/kg	201	--	--	--	4.90E+02	4.1E-02	--	--	2.00E+03	1.0E-02	
	Diesel Range, as diesel (60% C11-C22 aromatic)	(1) TPHd	mg/kg	359	--	--	--	4.90E+02	7.3E-02	--	--	2.00E+03	1.8E-02	
	Diesel Range, as diesel (40% C9-C18 aliphatic)	(1) TPHd	mg/kg	239	--	--	--	1.10E+02	2.2E-01	--	--	5.40E+02	4.4E-02	
	Oil Range, as oil (70% C11-C22 aromatic)	(1) TPHo	mg/kg	4,075	--	--	--	4.90E+02	8.3E-01	--	--	2.00E+03	2.0E-01	
	Oil Range, as oil (30% C9-C18 aliphatic)	(1) TPHo	mg/kg	1,746	--	--	--	1.10E+02	1.6E+00	--	--	5.40E+02	3.2E-01	
	Gasoline Range (100% C9-C10 aromatic)	(1) TPHg	mg/kg	1,178	--	--	--	1.30E+02	9.1E-01	--	--	7.20E+02	1.6E-01	
	<b>Inorganics</b>													
Lead	(6) 7439-92-1	mg/kg	63	30	--	--	2.00E+02	--	--	--	--	--	--	
Soil Risk/Hazard (ingestion, dermal contact, inhalation of particulates) (6)						Media-Specific Cancer Risk :	<b>3E-06</b>	Media-Specific Noncancer Hazard :	<b>4</b>	Media-Specific Cancer Risk :	4E-07	Media-Specific Noncancer Hazard :	1	

Notes:

**Bold** indicates a cumulative cancer risk greater than 1E-06 or a noncancer hazard greater than unity (1).

-- = not available/applicable

> = greater than

CAS = Chemical Abstracts Service

EPC = exposure point concentration

ft bgs = feet below ground surface

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

SL = Screening Level

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals without toxicity values or multiple forms:

Total petroleum hydrocarbons were evaluated in agreement with MT DEQ guidance (2018) using the following fractional assumptions:

JP-4 used 70% C9-C18 aliphatics and 30% C11-C22 aromatics

Diesel Range, as diesel used 60% C11-C22 aromatics and 40% C9-C18 aliphatics

Oil Range, as oil used 70% as C11-C22 aromatics and 30% C9-C18 aliphatics

Gasoline Range used 100% C9-C10 aromatics

(2) EPCs provided in Table 3 Series, Total petroleum hydrocarbon EPCs were calculated using the fractional assumptions provided in footnote (1)

(3) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(4) Cancer and noncancer based SLs obtained from the USEPA Regional Screening Levels (USEPA, 2022) based on a cancer risk of 1E-06 and a noncancer hazard of 0.1 for residential and commercial/industrial worker exposure scenarios, total petroleum hydrocarbon screening levels obtained from MT DEQ guidance (2018) based on a target cancer risk of 1E-06 and a target noncancer hazard of 0.125 for residential and commercial/worker exposure scenarios

(5) Potential cumulative cancer risk and noncancer hazard calculated as:

$$\text{Potential Cumulative Cancer Risk or Noncancer Hazard} = \frac{\text{EPC}}{\text{SL}} \times \text{Target Risk (1E-6) or Target Hazard (0.1)}$$

(6) In agreement with USEPA guidance (2022), lead is presented for comparison purposes only and not included in cumulative risk and hazard calculations.

References

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

**Appendix A**  
**Table 4.5a**  
**Site 8 - Cumulative Risk Calculations - Surface Soil (0 to 2 feet below ground surface)**  
**Human Health Risk Assessment**  
**Montana Air National Guard Base**  
**Great Falls International Airport**  
**Great Falls, Montana**

Media / Exposure Pathway	Chemical (1)	CAS Number	Units	EPC (2)	Background (3)	Hypothetical Future Resident				Commercial/Industrial Worker				
						Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)	Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)	
Soil (0 to 2 ft bgs)	<b>Total Petroleum Hydrocarbons</b>													
	Oil Range, as oil (70% C11-C22 aromatic) <sup>(1)</sup>	TPHo	mg/kg	1,190	--	--	--	4.90E+02	2.4E-01	--	--	2.00E+03	6.0E-02	
	Oil Range, as oil (30% C9-C18 aliphatic) <sup>(1)</sup>	TPHo	mg/kg	510	--	--	--	1.10E+02	4.6E-01	--	--	5.40E+02	9.4E-02	
	Gasoline Range (100% C9-C10 aromatic) <sup>(1)</sup>	TPHg	mg/kg	180	--	--	--	1.30E+02	1.4E-01	--	--	--	--	
	Soil Risk/Hazard (ingestion, dermal contact, inhalation of particulates)					Media-Specific Cancer Risk	--	Media-Specific Noncancer Hazard	1	Media-Specific Cancer Risk	--	Media-Specific Noncancer Hazard	0.2	

Notes:

**Bold** indicates a cumulative cancer risk greater than 1E-06 or a noncancer hazard greater than unity (1).

-- = not available/applicable

CAS = Chemical Abstracts Service

EPC = exposure point concentration

ft bgs = feet below ground surface

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

SL = Screening Level

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals without toxicity values or multiple forms:

Total petroleum hydrocarbons were evaluated in agreement with MT DEQ guidance (2018) using the following fractional assumptions:

Oil Range, as oil used 70% as C11-C22 aromatics and 30% C9-C18 aliphatics

Gasoline Range used 100% C9-C10 aromatics

(2) EPCs provided in Table 3 Series.

(3) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(4) Cancer and noncancer based RSLs obtained from the USEPA Regional Screening Levels (USEPA, 2022) based on a cancer risk of 1E-06 and a noncancer hazard of 0.1 for residential and commercial/industrial worker exposure scenarios.

(5) Potential cumulative cancer risk and noncancer hazard calculated as:

$$\text{Potential Cumulative Cancer Risk or Noncancer Hazard} = \frac{\text{EPC}}{\text{SL}} \times \text{Target Risk (1E-6) or Target Hazard (0.1)}$$

References

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>

Appendix A  
Table 4.5b  
Site 8 - Cumulative Risk Calculations - Subsurface Soil (> 2 feet below ground surface)  
Human Health Risk Assessment  
Montana Air National Guard Base  
Great Falls International Airport  
Great Falls, Montana

Media / Exposure Pathway	Chemical (1, 2)	CAS Number	Units	EPC (2)	Background (3)	Hypothetical Future Resident				Commercial/Industrial Worker			
						Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)	Cancer-based SL (4)	Cancer Risk (5)	Noncancer-based SL (4)	Noncancer Hazard (5)
	<b>Total Petroleum Hydrocarbons</b>												
	Gasoline Range (100% C9-C10 aromatic) <sup>(1)</sup>	TPHg	mg/kg	1,200	--	--	--	1.30E+02	9.2E-01	--	--	7.20E+02	1.7E-01
	<b>Inorganics</b>												
	Thallium	7440-28-0	mg/kg	0.42	0.41	--	--	7.80E-02	5.4E-01	--	--	--	--
	Soil Risk/Hazard (ingestion, dermal contact, inhalation of particulates)					Media-Specific Cancer Risk :	--	Media-Specific Noncancer Hazard :	1	Media-Specific Cancer Risk :	--	Media-Specific Noncancer Hazard :	0.2

Notes:

**Bold** indicates a cumulative cancer risk greater than 1E-06 or a noncancer hazard greater than unity (1).

> = greater than

-- = not available/applicable

CAS = Chemical Abstracts Service

EPC = exposure point concentration

ft bgs = feet below ground surface

mg/kg = milligram per kilogram

MT DEQ = Montana Department of Environmental Quality

SL = Screening Level

USEPA = United States Environmental Protection Agency

(1) The following surrogates were used for chemicals without toxicity values or multiple forms:

Total petroleum hydrocarbons were evaluated in agreement with MT DEQ guidance (2018) using the following fractional assumptions:

Gasoline Range used 100% C9-C10 aromatics

(2) EPCs provided in Table 3 Series, Total petroleum hydrocarbon EPCs were calculated using the fractional assumptions provided in footnote (1)

(3) Background Concentrations of Inorganic Constituents in Montana Surface Soils (MT DEQ 2013) Table 4-4

(4) Cancer and noncancer based SLs obtained from the USEPA Regional Screening Levels (USEPA, 2022) based on a cancer risk of 1E-06 and a noncancer hazard of 0.1 for residential and commercial/industrial worker exposure scenarios, total petroleum hydrocarbon screening levels obtained from MT DEQ guidance (2018) based on a target cancer risk of 1E-06 and a target noncancer hazard of 0.125 for residential and commercial/industrial worker exposure scenarios

(5) Potential cumulative cancer risk and noncancer hazard calculated as:

$$\text{Potential Cumulative Cancer Risk or Noncancer Hazard} = \frac{\text{EPC}}{\text{SL}} \times \text{Target Risk (1E-6) or Target Hazard (0.1)}$$

References

MT DEQ. 2013. Project Report Background Concentrations of Inorganic Constituents in Montana Surface Soils. 2013. September. Available at: <http://deq.mt.gov/Land/statesuperfund/background>

MT DEQ. 2018. Montana Risk-Based Corrective Action Guidance for Petroleum Releases. Final. May. Available at: [https://deq.mt.gov/Land/statesuperfund/rbca\\_guide](https://deq.mt.gov/Land/statesuperfund/rbca_guide)

USEPA. 2022. Regional Screening Levels. November. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls>



## Alternative 1 - No Action

Task	Calendar Year	Year	Labor Cost	ODC and Travel Cost	Total Cost	Inflation	NPV
Kick Off Meeting	2025		\$ 4,918.00	\$ 2,222.69	\$ 7,140.69		\$ 7,140.00
Well Abandonment WP	2025		\$ 7,802.00	\$ 940.00	\$ 8,742.00		\$ 17,107.00
Well Abandonment and Report	2025		\$ 34,562.00	\$ 246,317.00	\$ 280,879.00		\$ 280,879.00
Five Year Review	2029	5	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 30,191.31
	2034	10	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 26,043.29
	2039	15	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 22,465.17
	2044	20	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 19,378.65
	2049	25	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 16,716.19
	2054	30	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 14,419.54
<b>Total</b>			\$ 239,282.00	\$ 267,479.69	\$ 506,761.69		\$ 434,340.15

Cost By Site	Labor	ODC and Travel	Total	Net Present Worth
Site 4 (16 % of Costs)	\$ 38,285.12	\$ 42,796.75	\$ 81,081.87	\$ 69,494.42
Site 6 (18 % of Costs)	\$ 43,070.76	\$ 48,146.34	\$ 91,217.10	\$ 78,181.23
Site 7 (46 % of Costs)	\$ 110,069.72	\$ 123,040.66	\$ 233,110.38	\$ 199,796.47
Site 8 (20 % of Costs)	\$ 47,856.40	\$ 53,495.94	\$ 101,352.34	\$ 86,868.03
<b>All Sites</b>	\$ 239,282.00	\$ 267,479.69	\$ 506,761.69	\$ 434,340.15

## Alternative 2- LUCS

Task	Calendar Year	Year	Labor Cost	ODC and Travel Cost	Total Cost		NPV
Kick Off Meeting	2025		\$ 4,918.00	\$ 2,222.69	\$ 7,140.69		7140
LUC Implementation	2025		\$ 15,873.00	\$ 1,234.00	\$ 17,107.00		17107
	2025	1	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 10,929.40
	2026	2	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 10,611.07
	2027	3	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 10,302.01
	2028	4	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 10,001.95
	2029	5	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 9,710.63
	2030	6	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 9,427.80
	2031	7	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 9,153.20
	2032	8	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 8,886.60
	2033	9	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 8,627.77
	2034	10	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 8,376.47
	2035	11	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 8,132.50
	2036	12	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,895.63
	2037	13	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,665.66
	2038	14	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,442.39
	2039	15	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,225.62
	2040	16	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,015.17
	2041	17	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,810.84
	2042	18	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,612.47
	2043	19	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,419.87
	2044	20	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,232.88
	2045	21	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,051.34
	2046	22	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,875.09
	2047	23	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,703.97
	2048	24	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,537.84
	2049	25	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,376.54
	2050	26	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,219.94
	2051	27	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,067.90
	2052	28	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 4,920.30
	2053	29	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 4,776.99
	2054	30	\$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 4,776.99
Five Year Review	2029	5	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 30,191.31
	2034	10	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 26,043.29
	2039	15	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 22,465.17
	2044	20	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 19,378.65
	2049	25	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 16,716.19
	2054	30	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 14,419.54
Soil Sampling Sites 6 and 7	2034	10	\$ 8,023.00	\$ 27,767.00	\$ 35,790.00	3%	\$ 26,631.12
	2044	20	\$ 8,023.00	\$ 27,767.00	\$ 35,790.00	3%	\$ 19,816.06
	2054	30	\$ 8,023.00	\$ 27,767.00	\$ 35,790.00	3%	\$ 14,745.01
<b>Total</b>			<b>\$ 532,990.00</b>	<b>\$ 156,477.69</b>	<b>\$ 689,467.69</b>		<b>\$ 435,440.15</b>

Cost By Site	Labor	ODC and Travel	Total	Net Present Worth
Site 4 (16 % of Costs)	\$ 85,278.40	\$ 25,036.43	\$ 110,314.83	\$ 69,670.42
Site 6 (18 % of Costs)	\$ 95,938.20	\$ 28,165.98	\$ 124,104.18	\$ 78,379.23
Site 7 (46 % of Costs)	\$ 245,175.40	\$ 71,979.74	\$ 317,155.14	\$ 200,302.47
Site 8 (20 % of Costs)	\$ 106,598.00	\$ 31,295.54	\$ 137,893.54	\$ 87,088.03
<b>All Sites</b>	<b>\$ 532,990.00</b>	<b>\$ 156,477.69</b>	<b>\$ 689,467.69</b>	<b>\$ 435,440.15</b>

Alternative 3 - LUCS with LTM/MNA and LNAPL Removal

Task	Calendar Year	Year	Labor Cost	ODC and Travel Cost	Total Cost	Inflation	NPV
Kick Off Meeting		2025	\$ 4,918.00	\$ 2,222.69	\$ 7,140.69		7140
LUC Implimentation		2025	\$ 15,873.00	\$ 1,234.00	\$ 17,107.00		17107
		2025	1 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 10,929.40
		2026	2 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 10,611.07
		2027	3 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 10,302.01
		2028	4 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 10,001.95
		2029	5 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 9,710.63
		2030	6 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 9,427.80
		2031	7 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 9,153.20
		2032	8 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 8,886.60
		2033	9 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 8,627.77
		2034	10 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 8,376.47
		2035	11 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 8,132.50
		2036	12 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,895.63
		2037	13 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,665.66
		2038	14 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,442.39
		2039	15 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,225.62
		2040	16 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 7,015.17
		2041	17 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,810.84
		2042	18 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,612.47
		2043	19 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,419.87
		2044	20 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,232.88
		2045	21 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 6,051.34
		2046	22 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,875.09
		2047	23 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,703.97
		2048	24 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,537.84
		2049	25 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,376.54
		2050	26 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,219.94
		2051	27 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 5,067.90
		2052	28 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 4,920.30
		2053	29 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 4,776.99
		2054	30 \$ 9,871.00	\$ 1,724.00	\$ 11,595.00	3%	\$ 4,776.99
		2025	1 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 63,153.93
		2026	2 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 61,314.49
		2027	3 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 59,528.63
		2028	4 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 57,794.79
		2029	5 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 56,111.45
		2030	6 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 54,477.13
		2031	7 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 52,890.42
		2032	8 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 51,349.92
		2033	9 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 49,854.29
		2034	10 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 48,402.23
		2035	11 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 46,992.45
		2036	12 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 45,623.74
		2037	13 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 44,294.89
		2038	14 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 43,004.75
		2039	15 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 41,752.18
		2040	16 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 40,536.10
		2041	17 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 39,355.44
		2042	18 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 38,209.16
		2043	19 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 37,096.28
		2044	20 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 36,015.80
		2045	21 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 34,966.80
		2046	22 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 33,948.35
		2047	23 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 32,959.56
		2048	24 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 31,999.57
		2049	25 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 31,067.55
		2050	26 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 30,162.67
		2051	27 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 29,284.14
		2052	28 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 28,431.21
		2053	29 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 27,603.11
		2054	30 \$ 35,000.00	\$ 32,000.00	\$ 67,000.00	3%	\$ 27,603.11
Five Year Review		2029	5 \$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 30,191.31
		2034	10 \$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 26,043.29
		2039	15 \$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 22,465.17
		2044	20 \$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 19,378.65
		2049	25 \$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 16,716.19
		2054	30 \$ 32,000.00	\$ 3,000.00	\$ 35,000.00	3%	\$ 14,419.54
Soil Sampling Sites 6 and 7		2034	10 \$ 8,023.00	\$ 27,767.00	\$ 35,790.00	3%	\$ 26,631.12
		2044	20 \$ 8,023.00	\$ 27,767.00	\$ 35,790.00	3%	\$ 19,816.06
		2054	30 \$ 8,023.00	\$ 27,767.00	\$ 35,790.00	3%	\$ 14,745.01
<b>Total</b>			<b>\$ 1,582,990.00</b>	<b>\$ 1,116,477.69</b>	<b>\$ 2,699,467.69</b>		<b>\$ 1,711,224.29</b>

Cost By Site	Labor	ODC and Travel	Total	Net Present Worth
Site 4 (16 % of Costs)	\$ 253,278.40	\$ 178,636.43	\$ 431,914.83	\$ 273,795.89
Site 6 (18 % of Costs)	\$ 284,938.20	\$ 200,965.98	\$ 485,904.18	\$ 308,020.37
Site 7 (46 % of Costs)	\$ 728,175.40	\$ 513,579.74	\$ 1,241,755.14	\$ 787,163.17
Site 8 (20 % of Costs)	\$ 316,598.00	\$ 223,295.54	\$ 539,893.54	\$ 342,244.86
<b>All Sites</b>	<b>\$ 1,582,990.00</b>	<b>\$ 1,116,477.69</b>	<b>\$ 2,699,467.69</b>	<b>\$ 1,711,224.29</b>

**Cost Estimate for Groundwater Remedial Alternative 4a Enhanced Bioremediation (EVO or magnesium sulfate injections)**

<b>Task</b>	<b>Labor Cost</b>	<b>ODC and Travel Cost</b>	<b>Total Cost</b>	<b>Net Present Worth</b>
<b>Capital Costs</b>				
Kick Off Meeting	\$3,514.98	\$2,187.62	\$5,702.60	\$5,702.60
Remedial Design	\$30,188.94	\$1,857.41	\$32,046.35	\$32,046.35
Pipeline Removal, System Installation and Startup	\$66,464.03	\$134,995.98	\$201,460.01	\$201,460.01
<b>O&amp;M Costs</b>				
Groundwater Monitoring & Reporting - Year 1	\$64,952.04	\$ 21,913.76	\$86,865.80	\$84,335.73
Groundwater Monitoring & Reporting - Year 2	\$64,952.04	\$ 21,913.76	\$86,865.80	\$81,879.35
Groundwater Monitoring & Reporting - Year 3	\$64,952.04	\$ 21,913.76	\$86,865.80	\$79,494.51
Groundwater Monitoring & Reporting (Site 7 only) and Site Closeout of other sites - Year 4	\$59,117.62	\$141,253.28	\$200,370.90	\$178,026.95
Groundwater Monitoring & Reporting - Year 5 (Site 7 only)	\$21,829.65	\$ 10,956.88	\$32,786.53	\$28,281.95
Groundwater Monitoring & Reporting - Year 6 (Site 7 only)	\$40,473.64	\$ 70,626.64	\$111,100.28	\$93,044.73
Groundwater Monitoring & Reporting - Year 7 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$10,663.38
Groundwater Monitoring & Reporting - Year 8 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$10,352.80
Groundwater Monitoring & Reporting - Year 9 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$10,051.26
Groundwater Monitoring & Reporting - Year 10 (Site 7 only)	\$21,829.65	\$ 10,956.88	\$32,786.53	\$24,396.26
Groundwater Monitoring & Reporting - Year 11 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$9,474.27
Groundwater Monitoring & Reporting - Year 12 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$9,198.32
Groundwater Monitoring & Reporting - Year 13 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$8,930.41
Groundwater Monitoring & Reporting - Year 14 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$8,670.30
Groundwater Monitoring & Reporting - Year 15 (Site 7 only)	\$21,829.65	\$ 10,956.88	\$32,786.53	\$21,044.43
Groundwater Monitoring & Reporting - Year 16 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$8,172.59
Groundwater Monitoring & Reporting - Year 17 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$7,934.56
Groundwater Monitoring & Reporting - Year 18 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$7,703.45
Groundwater Monitoring & Reporting - Year 19 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$7,479.08
Groundwater Monitoring & Reporting - Year 20 (Site 7 only)	\$21,829.65	\$ 10,956.88	\$32,786.53	\$18,153.11
Groundwater Monitoring & Reporting - Year 21 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$7,049.75
Groundwater Monitoring & Reporting - Year 22 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$6,844.42
Groundwater Monitoring & Reporting - Year 23 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$6,645.07
Groundwater Monitoring & Reporting - Year 24 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$6,451.52
Groundwater Monitoring & Reporting - Year 25 (Site 7 only)	\$21,829.65	\$ 10,956.88	\$32,786.53	\$15,659.03
Groundwater Monitoring & Reporting - Year 26 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$6,081.18
Groundwater Monitoring & Reporting - Year 27 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$5,904.05
Groundwater Monitoring & Reporting - Year 28 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$5,732.09
Groundwater Monitoring & Reporting - Year 29 (Site 7 only)	\$8,731.86	\$ 4,382.75	\$13,114.61	\$5,565.14
Groundwater Monitoring & Reporting - Year 30 (Site 7 only)	\$21,829.65	\$ 10,956.88	\$32,786.53	\$13,507.62
CERCLA 5-Year Review Cost	-	-	\$ 151,157.94	\$151,157.94
<b>Total Net Present Worth for Enhanced Bio Alternative 4c MgSO4 ERD</b>				<b>\$1,177,094.20</b>

**Cost Estimate for Groundwater Remedial Alternative 4a Enhanced Bioremediation (EVO or magnesium sulfate injections)**

<b>Costs by Site</b>	<b>Labor</b>	<b>ODC and Travel</b>	<b>Total</b>	<b>Net Present Worth</b>
Site 4 (10% of Costs)	\$69,149.86	\$56,567.58	\$140,833.23	\$117,709.42
Site 5 (5% of Costs)	\$34,574.93	\$28,283.79	\$70,416.61	\$58,854.71
Site 6 (15% of Costs)	\$103,724.78	\$84,851.37	\$211,249.84	\$176,564.13
Site 7 (50% of Costs)	\$345,749.28	\$282,837.89	\$704,166.14	\$588,547.10
Site 8 (20% of Costs)	\$138,299.71	\$113,135.16	\$281,666.46	\$235,418.84
<b>All Sites</b>	<b>\$691,498.57</b>	<b>\$565,675.78</b>	<b>\$1,408,332.28</b>	<b>\$1,177,094.20</b>

Note: Costs differences are deminis between EVO Injections and magnesium sulfate injections are are deminis (3 percent)

**Cost Estimate for Remedial Alternative 4b - Biosparge/Biovent and LTM**

<b>Task</b>	<b>Labor Cost</b>	<b>ODC and Travel Cost</b>	<b>Total Cost</b>	<b>Net Present Worth</b>
<b>Capital Costs</b>				
Kick Off Meeting	\$3,514.98	\$2,187.62	\$5,702.60	\$5,702.60
Remedial Design	\$30,614.64	\$1,595.81	\$32,210.45	\$32,210.45
Pipeline Removal, System Installation and Startup	\$73,507.03	\$87,853.48	\$161,360.51	\$161,360.51
<b>O&amp;M Costs</b>				
System and Groundwater Monitoring & Reporting - Year 1	\$84,026.14	\$ 95,423.89	\$179,450.03	\$174,223.33
System and Groundwater Monitoring & Reporting - Year 2	\$84,026.14	\$ 95,423.89	\$179,450.03	\$169,148.86
Groundwater Monitoring & Reporting - Year 3	\$84,026.14	\$ 95,423.89	\$179,450.03	\$164,222.20
Groundwater Monitoring & Reporting - Year 4	\$71,018.66	\$ 152,238.29	\$223,256.95	\$198,360.91
Groundwater Monitoring & Reporting - Year 5	\$33,730.69	\$ 9,267.57	\$42,998.26	\$37,090.68
Groundwater Monitoring & Reporting - Year 6	\$52,374.68	\$ 80,654.83	\$133,029.50	\$111,410.11
Groundwater Monitoring & Reporting - Year 7	\$13,492.28	\$ 3,707.03	\$17,199.30	\$13,984.61
Groundwater Monitoring, Reporting & Site Closeout - Year 8	\$13,492.28	\$ 3,707.03	\$17,199.30	\$13,577.29
Groundwater Monitoring & Reporting - Year 9 (Site 7 only)	\$13,492.28	\$ 3,707.03	\$17,199.30	\$13,181.83
Groundwater Monitoring & Reporting - Year 10 (Site 7 only)	\$33,730.69	\$ 9,267.57	\$42,998.26	\$31,994.74
Groundwater Monitoring & Reporting - Year 11 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$7,765.71
Groundwater Monitoring & Reporting - Year 12 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$7,539.53
Groundwater Monitoring & Reporting - Year 13 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$7,319.93
Groundwater Monitoring & Reporting - Year 14 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$7,106.73
Groundwater Monitoring & Reporting - Year 15 (Site 7 only)	\$33,730.69	\$ 9,267.57	\$42,998.26	\$27,598.95
Groundwater Monitoring & Reporting - Year 16 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$6,698.77
Groundwater Monitoring & Reporting - Year 17 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$6,503.66
Groundwater Monitoring & Reporting - Year 18 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$6,314.24
Groundwater Monitoring & Reporting - Year 19 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$6,130.33
Groundwater Monitoring & Reporting - Year 20 (Site 7 only)	\$33,730.69	\$ 9,267.57	\$42,998.26	\$23,807.09
Groundwater Monitoring & Reporting - Year 21 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$5,778.42
Groundwater Monitoring & Reporting - Year 22 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$5,610.12
Groundwater Monitoring & Reporting - Year 23 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$5,446.72
Groundwater Monitoring & Reporting - Year 24 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$5,288.07
Groundwater Monitoring & Reporting - Year 25 (Site 7 only)	\$33,730.69	\$ 9,267.57	\$42,998.26	\$20,536.21
Groundwater Monitoring & Reporting - Year 26 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$4,984.52
Groundwater Monitoring & Reporting - Year 27 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$4,839.34
Groundwater Monitoring & Reporting - Year 28 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$4,698.38
Groundwater Monitoring & Reporting - Year 29 (Site 7 only)	\$8,432.67	\$ 2,316.89	\$10,749.56	\$4,561.54
Groundwater Monitoring & Reporting - Year 30 (Site 7 only)	\$33,730.69	\$ 9,267.57	\$42,998.26	\$17,714.71
CERCLA 5-Year Review Cost	-	-	\$ 128,926.35	\$128,926.35
<b>Total Net Present Worth for Alternative 4b Biosparge and Vent</b>				<b>\$1,441,637.43</b>

**Cost Estimate for Remedial Alternative 4b - Biosparge/Biovent and LTM**

<b>Costs by Site</b>	<b>Labor</b>	<b>ODC and Travel</b>	<b>Total</b>	<b>Net Present Worth</b>
Site 4 (10% of Costs)	\$86,089.21	\$71,459.84	\$170,441.69	\$144,163.74
Site 5 (5% of Costs)	\$43,044.61	\$35,729.92	\$85,220.85	\$72,081.87
Site 6 (15% of Costs)	\$129,133.82	\$107,189.77	\$255,662.54	\$216,245.61
Site 7 (50% of Costs)	\$430,446.07	\$357,299.22	\$852,208.47	\$720,818.71
Site 8 (20% of Costs)	\$172,178.43	\$142,919.69	\$340,883.39	\$288,327.49
<b>All Sites</b>	<b>\$860,892.13</b>	<b>\$714,598.45</b>	<b>\$1,704,416.94</b>	<b>\$1,441,637.43</b>



**FINAL (VERSION 3) DECISION DOCUMENT  
SITE 2 – DRAINAGE DITCH OFF OLD POWER  
CHECK PAD**

**120<sup>TH</sup> FIGHTER WING  
MONTANA AIR NATIONAL GUARD  
GREAT FALLS, MONTANA**

**Prepared for:**

**Air National Guard Readiness Center  
Andrews Air Force Base, Maryland**

**Prepared by:**

**Science Applications International Corporation  
11251 Roger Bacon Drive,  
Reston, Virginia 20190**

**December 2004**

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## LIST OF ACRONYMS

120 FW	120 <sup>th</sup> Fighter Wing
AFB	Air Force Base
ANG	Air National Guard
ANGRC	Air National Guard Readiness Center
B2EHP	Bis(2-Ethylhexyl)phthalate
BLS	Below Land Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CRDL	Contract Required Detection Limit
DAF	Dilution Attenuation Factor
DNBP	di-N-butylphthalate
DOD	U.S. Department of Defense
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
ES	Parsons Engineering Science, Inc.
gpm	Gallons per Minute
GRO	Gasoline-Range Organics
HMTC	Hazardous Materials Technical Center
HQ	Hazard Quotient
IRP	Installation Restoration Program
LD50	Median Lethal Dose
MANG	Montana Air National Guard
MCL	Maximum Contaminant Level
MTDEQ	Montana Department of Environmental Quality
NAS	National Academy of Sciences
NFA	No Further Action
NPL	National Priorities List
NRC	National Research Council
ORNL	Oak Ridge National Laboratory
OWS	Oil/Water Separator
PA	Preliminary Assessment
POL	Petroleum, Oil, and Lubricants
ppm	Parts per Million
PRE	Preliminary Risk Evaluation
PRG	Preliminary Remediation Goal
RBSL	Risk-Based Screening Level
RI	Remedial Investigation
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SSL	Soil Screening Level
SVOC	Semivolatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compound
VPH	Volatile Petroleum Hydrocarbons
VCRA	Voluntary Cleanup and Redevelopment Act

## 1. INTRODUCTION

This report presents data gathered for the Drainage Ditch Off Old Power Check Pad (herein referred to as Site 2) during the Preliminary Assessment (PA), Site Investigation (SI), and subsequent groundwater monitoring at the 120<sup>th</sup> Fighter Wing (120 FW), Montana Air National Guard (MANG), Great Falls, Montana. The PA was completed in 1988 by the Hazardous Materials Technical Center (HMTC) (HMTC 1988). The SI was completed by Parsons Engineering Science, Inc. (ES) (ES 1992). Supplemental groundwater samples were collected in April and July 2000 by Science Applications International Corporation (SAIC) (SAIC 2000). This document has been prepared to present the data gathered during the PA, SI, and subsequent groundwater monitoring, which support the decision for No Further Action (NFA).

### 1.1 STATUTORY AUTHORITY

Authority for responding to releases or threats of releases from a hazardous waste site is addressed in Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. Executive Order (EO) 12580 delegates to the Air National Guard Readiness Center (ANGRC) the response authority for Air National Guard (ANG) sites, whether or not the sites are on the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL). Under CERCLA Section 104(b), the ANGRC is authorized to investigate, survey, test, or gather other data required to identify the existence, extent, and nature of contaminants, including the extent of danger to human health or welfare and the environment. In addition, the ANGRC is authorized to undertake planning, engineering, and other studies or investigations appropriate to directing response actions that prevent, limit, or mitigate the risk to human health or welfare and the environment.

### 1.2 FACILITY LOCATION AND BACKGROUND

The 120 FW is located at the Great Falls International Airport within Cascade County, Montana, approximately 3 miles southwest of Great Falls. Great Falls is located in central Montana, as shown in Figure 1-1. The base's facilities occupy approximately 125 acres of land and consist of more than 50 buildings. The land, leased from the airport authority by the Federal Government and licensed to the 120 FW, is located in the southeast corner of the 1,762-acre airport. Agricultural land borders the base on the west. The area along Interstate 15, immediately south of the base, is designated for industrial and commercial uses. Part of the open area southwest of the airport is used for active outdoor recreation. Residential areas are located on and below the Sun River bench north and northeast of the base. The Sun River Bench is a topographic feature approximately 350 feet above the Sun and Missouri Rivers south and southwest of Great Falls.

The mission of the 120 FW is to serve the U.S. Air Force and the U.S. Department of Defense (DOD) with a defense fighter group that can be mobilized in time of war or national emergency. In addition, as part of the North American air defense system, the 120 FW ensures air sovereignty in its assigned air defense sectors and provides aircraft to intercept airborne threats.

The base first was used as a military installation before World War II, when the 7th Ferry Group of the Army Air Corps was headquartered at what was then called Gore Field.

MANG began as the 186th Fighter Squadron on June 27, 1947, with Lt. Col. Willard S. Sperry as commander. The 186th Fighter Squadron was activated during the Korean War and served at Moody Air Force Base (AFB), Georgia, and later at George AFB, California. The unit was deactivated on December 31, 1952.

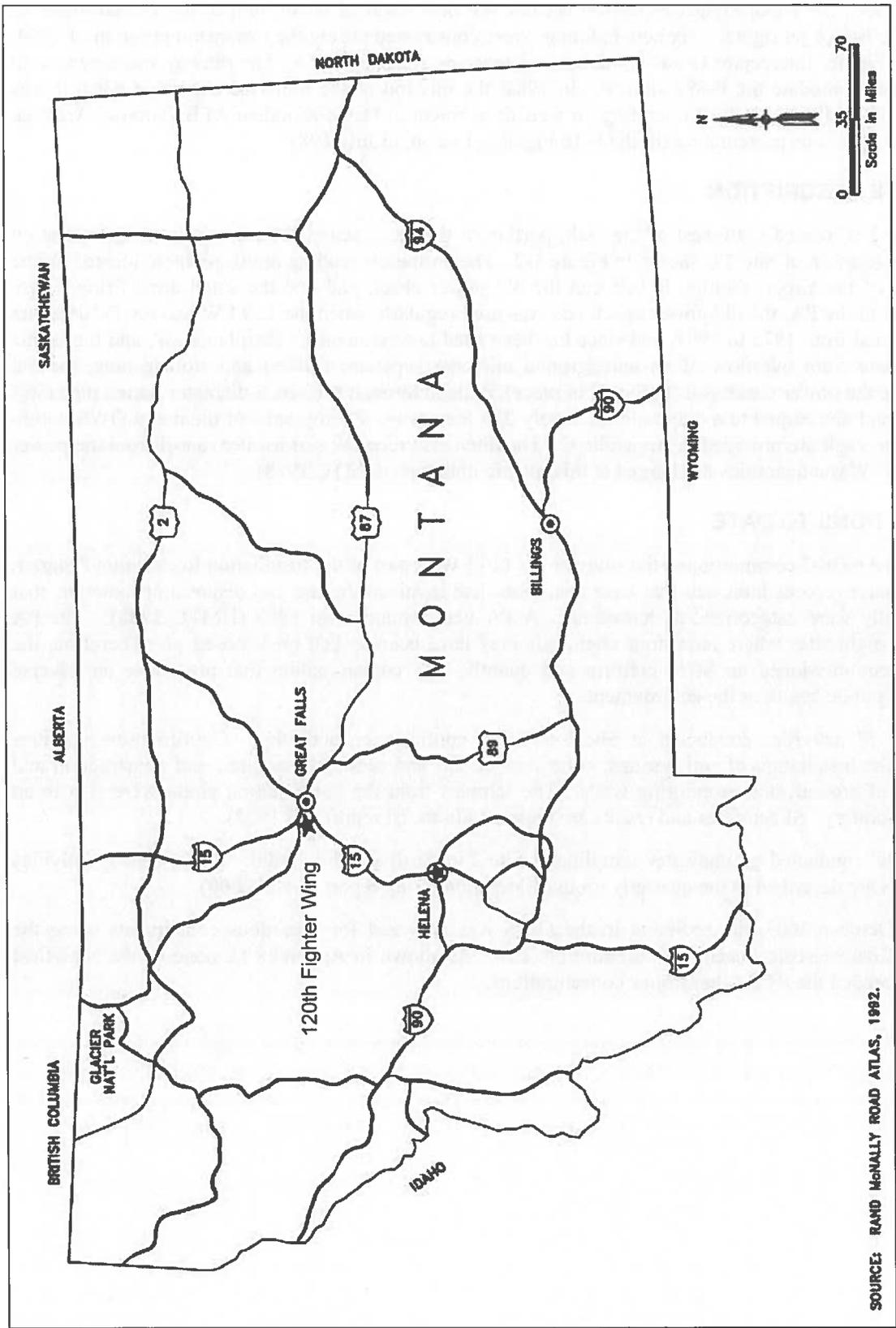


Figure 1-1. Location Map of Montana Air National Guard

In 1953, the 186th Fighter Squadron became the first National Guard unit in the United States to acquire the F-86A jet fighter. Six new buildings were constructed during the expansion program of 1954. The 120<sup>th</sup> Fighter Interceptor Group came into existence on April 16, 1956. The runway was extended in 1960 to accommodate the F-89J aircraft. In 1984, the mission of the unit was expanded when it was assigned the additional task of operating an alert detachment at Davis-Monthan AFB, Tucson, Arizona. The unit acquired its present aircraft, the F-16 Fighting Falcon, in July 1987.

### **1.3 SITE DESCRIPTION**

Site 2 is located northwest of the main portion of the base, across the runway from the operation area. The location of Site 2 is shown in Figure 1-2. The northeast-trending drainage ditch, located on the west side of the airport facility, is between the old power check pad and the small arms firing range. According to the PA, the old power check pad was used regularly when the 120 FW had the F-106 Delta Dart assigned from 1972 to 1987, and since has been used less frequently. Petroleum, oil, and lubricants (POL) waste from overflow of an underground oil/water separator (OWS) and storage tank, located adjacent to the power check pad (both still in place), drained through a 10-inch-diameter buried pipe (still in place) and discharged to a ditch approximately 250 feet away. Photographs of the metal OWS within its concrete vault are provided in Appendix C. The ditch also receives stormwater runoff from the power check pad. Waste quantities discharged at this site are unknown (HMTC 1988).

### **1.4 ACTIONS TO DATE**

The ANGRC commissioned the study at the 120 FW as part of the Installation Restoration Program (IRP) because records indicated that base operations had involved the use and disposal of materials that subsequently were categorized as hazardous. A PA was conducted in 1988 (HMTC 1988). The PA identified eight sites where hazardous chemicals may have been spilled or disposed of. Therefore, the ANGRC commissioned an SI to confirm and quantify any contamination that may have an adverse impact on public health or the environment.

The SI activities conducted at Site 2 included confirmation activities. Confirmation activities included the installation of soil borings, collection of soil and sediment samples, and construction and sampling of groundwater monitoring wells. The samples from the confirmation phase were sent to an offsite laboratory. SI activities and results are presented in the SI report (ES 1992).

SAIC conducted groundwater sampling at Site 2 in April and July 2000. The sampling activities and results are described in the quarterly groundwater monitoring report (SAIC 2000).

In October 2003, the sediment in the OWS was analyzed for hazardous constituents using the Toxicity Characteristic Leaching Procedure (TCLP). As shown in Appendix C, none of the analytical results exceeded the RCRA-hazardous concentrations.



## 2. SITE INVESTIGATION RESULTS

This section presents information on the regional and site-specific geology and hydrogeology at MANG. Confirmation sampling results for soil, sediment, and groundwater also are presented.

### 2.1 GEOLOGY AND HYDROGEOLOGY

The following sections present information on the regional and site-specific geology and hydrogeology.

#### 2.1.1 Regional Geology

The base is situated on sandy loams, silt loams, and loamy sands of the Tally-Azaar-Litten Association (SCS 1982). These soils typically have a low shrink-swell potential and a high infiltration rate, with estimated permeabilities ranging from 2 to 20 inches per hour. Total thickness of the soil ranges from 20 inches to greater than 40 inches.

The base is located on the northeastern edge of the Sun River bench, a plateau of Cretaceous-aged rock, which rises approximately 350 feet above Great Falls and slopes gently to the northwest. The rock units that underlie the base are, in descending order, the Taft Hill and Flood Members of the Blackleaf Formation, which belong to the Colorado Group, and the Kootenai Formation, all of which are of Cretaceous age; Morrison and Swift Formations of Jurassic age; and the Madison Group of Mississippian age. Erosional members of the Taft Hill outcrop at and around the base, constituting the majority of the unconsolidated to semiconsolidated material found in the upper 15 to 20 feet of material underlying the base. The Flood Member is the first competent rock encountered at the base.

#### 2.1.2 Regional Hydrogeology

Groundwater at the base is present in each of the rock units mentioned above, with the exception of the Taft Hill. The shallowest groundwater encountered at the base occurs in the upper sandstone of the Flood Member. Regional groundwater flow in the area is to the west-northwest.

The Flood Member on the Sun River bench is a perched aquifer (Wilke 1983). North and west of the bench, hydrologic conditions change from perched to water table to confined. The relatively impermeable shale in the underlying Kootenai and the shales found in the middle of the Flood Member retard the vertical movement of water, producing the perched condition. The general groundwater flow in the Flood Member is to the north-northwest. However, considering seasonal fluctuations, surface topography, and variations in the underlying confining shales of the area, there may be localized areas where the groundwater flow direction is different. This is typical of groundwater in perched conditions and is evident at the base.

Wells completed in the Flood Member are less than 100 feet deep and are important sources of water for domestic and stock uses on the bench. Water levels in the wells range from 20 to 100 feet below land surface (BLS). Reported well yields range from 6 to 40 gallons per minute (gpm) (Wilke 1983). The Flood Member is recharged primarily from infiltration of precipitation on the bench. Groundwater movement is generally downdip, or to the northwest, except near outcrop boundaries. Therefore, local gradients at each site at the base are influenced by proximity to local topographic features. This conclusion is supported by the presence of springs along the cliffs that surround the bench. Limited water quality data are available for the Flood Member, but samples indicate that the water is of a sodium sulfate and sodium bicarbonate type, with dissolved solids concentrations ranging from 2,700 to 2,800 mg/L (Wilke 1983).

Groundwater on the Sunset Bench commonly occurs above the sandstone-shale contact of the Flood Member. The shaley beds of the middle unit of the Flood Member retard the vertical movement of

water and cause perched water conditions in the area. Water perched at this contact discharges to a number of springs along the cliff face of the bench. The water levels in the piezometers and wells constructed in the study area are approximately 300 feet higher in altitude than other wells completed in the areas adjacent to the Sun River bench (Wilke 1983). Typically, groundwater is slow to enter the wells because the clayey matrix of the sandstone results in reduced permeability. The groundwater also travels along paths of secondary permeability, such as horizontal and vertical fractures, cavities, and weathered bedding planes.

### **2.1.3 Site-specific Geology and Hydrogeology**

Investigation of the eight sites at the base produced data that are in general agreement with the regional geologic and hydrogeologic information presented above. Drilling activities at Site 2 confirmed that the near-surface geology consists of thin soils underlain by bedrock. The locations of the well and piezometers for Site 2 are shown in Figure 2-1. The hydrogeology of Site 2 was evaluated along with an adjacent site, the Current Fire Training Area (Site 1).

The subsurface lithology at Site 2 consists of soil and weathered sandstone underlain by hard sandstone. Surface soils consisting of light brown, sandy, silty soil extend to 2 feet BLS. Weathered sandstone was encountered at depths as shallow as 2 feet BLS at Site 2. Four piezometers were used to define the lithology and groundwater flow direction for the two sites. The data gathered from the two monitoring wells also were used to help define the hydrogeology of the area associated with Sites 1 and 2. Piezometer data were evaluated and the groundwater flow direction was determined to be to the north-northwest. Monitoring well 2-MW1 then was constructed downgradient from Site 2.

## **2.2 CONFIRMATION SAMPLING RESULTS**

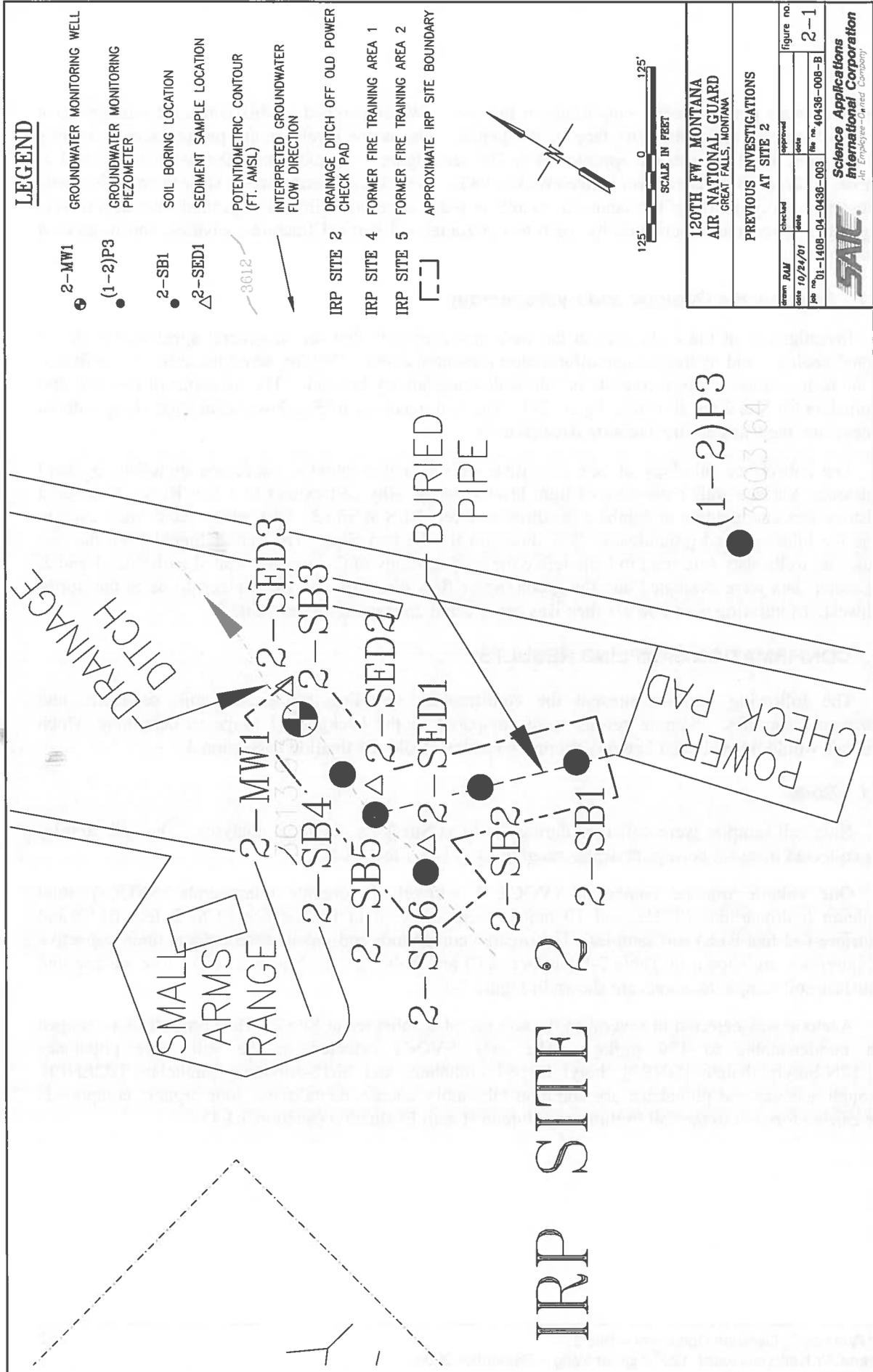
The following sections present the confirmation sampling results for soil, sediment, and groundwater samples. Sample results were compared to the background range to determine which chemicals would be evaluated in the Preliminary Human Health Evaluation in Section 3.

### **2.2.1 Soils**

Nine soil samples were collected during the SI at Site 2 for chemical analyses. The soil samples were collected from six borings at depths ranging from 1 to 3 feet BLS.

One volatile organic compound (VOC), 3 semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), and 10 metals were detected in the surface (0 to 2 feet BLS) and subsurface (>2 feet BLS) soil samples. The organic compounds and metals detected and their respective concentrations are shown in Table 2-1 (surface soil) and Table 2-2 (subsurface soil). The surface and subsurface soil sample locations are shown in Figure 2-1.

Acetone was detected in several of the soil samples collected at Site 2. The concentrations ranged from nondetectable to 170 µg/kg. The only SVOCs detected in the soil were phthalates (i.e., di-N-butylphthalate [DNBP], butyl benzyl phthalate, and bis[2-ethylhexyl]phthalate [B2EHP]). Although acetone and phthalates are common laboratory contaminants, these four organic compounds were carried forward to the soil Preliminary Human Health Evaluation (Section 3.1.1).



**Table 2-1. Chemical Constituents Detected in Surface Soil (0 to 2 feet BLS)  
Site 2 – Drainage Ditch Off Old Power Check Pad  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical	MANG-2 SB1-1.5 <sup>c</sup>	MANG-2 SB2-1.5	MANG-2 SB3-1	MANG-2 SB5-1	MANG-2 SB6-1	Background Comparison	
						Background Range <sup>b</sup>	Max Exceeds Background?
<b>VOCs (µg/kg):</b>							
Acetone <sup>d</sup>	120 J	72 J	ND	70 J	ND	ND-160	No
<b>SVOCs (mg/kg)</b>							
DNBP <sup>d</sup>	ND	ND	ND	ND	<b>4.9 B</b>	ND	Yes (4.9)
Butylbenzylphthalate <sup>d</sup>	ND	ND	ND	ND	<b>1.4 J</b>	ND	Yes (1.4)
B2EHP <sup>d</sup>	ND	ND	ND	ND	<b>2.0</b>	ND	Yes (2.0)
<b>Metals (mg/kg)</b>							
Arsenic	4.9	7.8	4.4	8.7	5.9	5.5 – 16.5 <sup>a</sup>	No
Barium	218	193	160	231	219	101 – 971	No
Cadmium	ND	ND	ND	ND	ND	ND	No
Chromium	10.2	8.7	9.7	11.5	12.3	12.9 – 20.7	No
Copper	13.5*	8.3*	5.5*	12.7*	<b>29.6*</b>	6.9 – 18.7	Yes (29.6)
Lead	<b>14.5</b>	3.7 B	10.2	<b>12.4</b>	<b>17.7</b>	5.5 – 12.2	Yes (17.7)
Mercury	ND	ND	ND	ND	ND	ND	No
Nickel	13.5	9.5*	ND	<b>19.4*</b>	<b>7.4 B*</b>	6.4 – 14.8	Yes (19.4)
Selenium	ND	ND	ND	<b>0.5 B</b>	ND	ND - 0.43	Yes (0.5)
Zinc	36.6	35.6	36.5	<b>58.6</b>	<b>82.3</b>	30.4 – 54.7	Yes (82.3)
<b>TPH (mg/kg)</b>	ND	ND	ND	ND	<b>46</b>	ND	Yes (46)

<sup>a</sup> Regional background range for arsenic provided by MTDEQ.

<sup>b</sup> Background range is based on the six soil samples from the background borings (SB1, SB2, and SB3) (ES 1992).

<sup>c</sup> The format of "MANG-2-SB1-1.5" refers to "Montana Air National Guard, Site 2, Soil Boring 1, 1.5-foot depth."

<sup>d</sup> Acetone and phthalate are common laboratory and sampling contaminants.

ND – Not Detected.

**Bolded** values indicate contaminant concentrations above the background range.

Data qualifiers follow the data. The qualifiers are:

J – The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

B – Reported value is less than the reporting limit, but greater than the instrument detection limit.

\* – Duplicate analysis was not within the control limits set by laboratory QA/QC.

**Table 2-2. Chemical Constituents Detected in Subsurface Soil (>2 feet BLS)  
Site 2 – Drainage Ditch off Old Power Creek Pad  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical	MANG-2 SB2-3 <sup>c</sup>	MANG-2 SB4-2	MANG-2 SB5-2	MANG-2 SB6-2	Background Comparison	
					Background Range <sup>b</sup>	Max Exceeds Background?
<b>VOCs (µg/kg):</b>						
Acetone <sup>d</sup>	ND	ND	170	70 J	ND-160	Yes (170)
<b>SVOCs (mg/kg)</b>						
DNBP <sup>d</sup>	ND	ND	ND	<b>3.4 B</b>	ND	Yes (3.4)
Butylbenzylphthalate <sup>d</sup>	ND	ND	ND	<b>0.66</b>	ND	Yes (0.66)
B2EHP <sup>d</sup>	ND	ND	ND	<b>0.57</b>	ND	Yes (0.57)
<b>Metals (mg/kg)</b>						
Arsenic	6.4	7.4	3	2.9	5.5 – 16.5 <sup>a</sup>	No
Barium	409	215	91.9	174	101 – 971	No
Cadmium	<b>0.38 B</b>	ND	ND	ND	ND	Yes (0.38)
Chromium	11.2	4.8	10.7	11.5	12.9 – 20.7	No
Copper	14.8*	7.7*	10.9*	5.3	6.9 – 18.7	No
Lead	12	11.5	8.7	9.1	5.5 – 12.2	No
Mercury	<b>0.055 B</b>	ND	ND	ND	ND	Yes (0.055)
Nickel	7.8*	ND	ND	ND	6.4 – 14.8	No
Selenium	ND	ND	ND	ND	ND - 0.43	No
Zinc	36	32.3	41.5	33.6	30.4 – 54.7	No
<b>TPH (mg/kg)</b>						
	ND	ND	ND	ND	ND	No

<sup>a</sup> Regional background range for arsenic provided by MTDEQ.

<sup>b</sup> Background range is based on the six soil samples from the background borings (SB1, SB2, and SB3) (ES 1992).

<sup>c</sup> The format of "MANG-2-SB2-3" refers to "Montana Air National Guard, Site 2, Soil Boring 2, 3-foot depth."

<sup>d</sup> Acetone and phthalate are common laboratory and sampling contaminants.

ND – Not Detected.

**Bolded** values indicate contaminant concentrations above the background range.

Data qualifiers follow the data. The qualifiers are:

**J** – The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

**B** – Reported value is less than the reporting limit, but greater than the instrument detection limit.

**\*** – Duplicate analysis was not within the control limits set by laboratory QA/QC.

The TPH analyses of soils indicated low concentrations of contamination in one sample (SB6 at 1 foot BLS) from the site. Sample SB6 contained TPH at 46 mg/kg. Because there is no background TPH concentration, TPH is carried forward to the soil Preliminary Human Health Evaluation (Section 3.1.1).

Seven of the ten metals detected at Site 2 were detected above the background range concentrations presented in Tables 2-1 and 2-2. The background range is based on three soil borings (SB1, SB2, and SB3) located on the south side of the installation, upgradient of past and present base operations in areas where no apparent potential for contamination exists (ES 1992). The metals detected in the soil at Site 2 above background are copper, lead, nickel, selenium, and zinc in surface soils and cadmium and mercury in subsurface soils. These metals were carried forward to the soil Preliminary Human Health Evaluation (Section 3.1.1).

### **2.2.2 Sediment**

Three sediment samples (SED1, SED2, and SED3) were collected during the SI at Site 2 for chemical analyses. The sediment samples were collected at the bottom of the drainage ditch.

The sediment sample locations are shown in Figure 2-1. The results of chemical analyses for the sediment samples are presented in Table 2-3. B2EHP and benzo(b)fluoranthene, the only SVOCs in the sediment, were detected at 2.0 and 1.7 mg/kg, respectively. No VOCs were detected. Benzo(b)fluoranthene (a common product of JP-4 fuel combustion) and B2EHP (a common laboratory contaminant) were carried forward to the sediment Preliminary Human Health Evaluation (Section 3.1.2).

The TPH analyses indicate some contamination in all three sediment samples. The reported concentrations of TPH range from 82 to 590 mg/kg. Because there is no background TPH concentration, TPH is carried forward to the sediment Preliminary Human Health Evaluation (Section 3.1.2).

Eight metals (cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc) were detected in the sediment samples above background range concentrations. These metals were carried forward to the sediment Preliminary Human Health Evaluation (Section 3.1.2).

### **2.2.3 Groundwater**

One monitoring well (2-MW1) was constructed downgradient from Site 2. Water levels measured in the monitoring well were used in conjunction with piezometer data at (1-2)P3 to further evaluate groundwater flow direction and gradient.

The well initially was sampled in October 1990, several days after development. A second round of groundwater sampling was performed in February 1991.

The monitoring well was logged during drilling for lithology and other observations that may indicate contamination. Well MW1 was placed downgradient from the area suspected of contamination, and no observations during drilling indicated the presence of significant contamination in the borehole for the well at Site 2.

**Table 2-3. Chemical Constituents Detected in Sediment  
Site 2 – Drainage Ditch Off Old Power Check Pad  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical	MANG-2 SED1	MANG-2 SED2	MANG-2 SED3	Background Comparison	
				Background Range <sup>a</sup>	Max Exceeds Background?
<b>VOCs (µg/kg):</b>	ND	ND	ND	ND	No
<b>SVOCs (mg/kg)</b>					
Benzo(b)fluoranthene	ND	2.0 J	ND	ND	Yes (2.0)
Bis(2-ethylhexyl)phthalate	ND	1.7 J	ND	ND	Yes (1.7)
<b>Metals (mg/kg)</b>					
Arsenic	6.5S	10.3 S	5.8	5.5 – 16.5 <sup>b</sup>	No
Barium	241	246	150	101 – 971	No
Cadmium	ND	24.2	0.76 B	ND	Yes (24.2)
Chromium	13.8	64.9	14.5	12.9 – 20.7	Yes (64.9)
Copper	16.1	66.9	22.1	6.9 – 18.7	Yes (66.9)
Lead	14.5	131	22.6	5.5 – 12.2	Yes (131)
Mercury	0.04 B	0.19	ND	ND	Yes (0.19)
Nickel	6.2 B	37.5	ND	6.4 – 14.8	Yes (37.5)
Selenium	0.27 B	1.1	0.43 B	ND - 0.43	Yes (1.1)
Zinc	63.1	555	120	30.4 – 54.7	Yes (555)
<b>TPH (mg/kg)</b>	82	590	140	ND	Yes (590)

<sup>a</sup> Background range is based on the six soil samples from the background borings (SB1, SB2, and SB3) (ES 1992).

<sup>b</sup> Regional background range for arsenic provided by MTDEQ.

ND – Not Detected.

**B**oldded values indicate contaminant concentrations above the background range.

Data qualifiers follow the data. The qualifiers are:

**B** – Reported value is less than the reporting limit, but greater than the instrument detection limit.

**N** – Spiked sample recovery was not within the control limits set by laboratory QA/QC.

**S** – Reported value was determined by the method of standard additions.

**J** – The value reported in an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

As shown in Table 2-4, the results of the analyses of the groundwater from both rounds of sampling of MW1 disclosed the presence of no VOCs, one SVOC, one TPH, and six metals.

The metals that were detected in the groundwater at Site 2 include barium (up to 57.8 µg/L), lead (up to 4.7 µg/L), selenium (up to 14.2 µg/L), and zinc (up to 37 µg/L). Lead and barium were detected at concentrations below those detected in the background well (Table 2-4). Arsenic and copper were detected at concentrations below the contract required detection limit (CRDL) in the duplicate sample (MW1-D) collected during the second round of sampling. However, neither arsenic nor copper were detected during the first round or in the primary sample (MW1) of the second round.

During the first round of groundwater sampling in October 1990, TPH was detected in the Site 2 well (2-MW1) at 7 mg/L and in the background well (BG-MW1) at 1 mg/L. However, TPH was not detected in either well during the second round of sampling in February 1991. Consistent with the MTDEQ regulations (MTDEQ 2003), since the groundwater had contained greater than 1 mg/L TPH, two rounds of groundwater samples were collected in April and July 2000 and analyzed for the extractable petroleum hydrocarbon (EPH) and volatile petroleum hydrocarbon (VPH) parameter list. As shown in Table 2-5, no EPH or VPH compounds were detected above the reporting limits. Therefore, due to the absence of petroleum hydrocarbons in the three rounds of groundwater samples collected since October 1990 (and the fact that petroleum hydrocarbons were also detected in the background well during Round 1 in October 1990), TPH is not carried forward to the groundwater Preliminary Human Health Evaluation (Section 3.1.3).

Only one VOC or SVOC was detected in the groundwater (B2EHP). The maximum value of 0.013 mg/L detected in Round 2 is flagged with a "J" to indicate an estimated concentration detected at less than five times the amount in the associated field blank. No VOCs or SVOCs were detected during the VPH and EPH analyses in Rounds 3 and 4. Therefore, this common laboratory contaminant is not carried forward to the groundwater Preliminary Human Health Evaluation (Section 3.1.3).

Four metals (arsenic, copper, selenium, and zinc) were detected above the concentrations in the background monitoring well. The background monitoring well is located on the south side of the installation, upgradient of past and present base operations in areas where no apparent potential for contamination exists (ES 1992). Metals exceeding the background range were carried forward to the groundwater Preliminary Human Health Evaluation (Section 3.1.3).

**Table 2-4. Chemical Constituents Detected in Groundwater (Rounds 1 and 2)  
Site 2 – Drainage Ditch Off Old Power Check Pad  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical	Background		Round 1	Round 2		Max Exceeds Background?
	Round 1 MANG-BG MW1	Round 2 MANG-BG MW1	MANG-2 MW1	MANG-2 MW1	MANG-2 MW1-D	
VOCs (µg/L)	ND	ND	ND	ND	ND	No
SVOCs (µg/L) B2EHP	ND	ND	ND	13 J	4 J	Yes (13)
<b>Metals (µg/L)</b>						
Arsenic	1.1 JB	ND	ND	ND	<b>2.5 B</b>	Yes (2.5)
Barium	56 JB	62.2 B	42 JB	57.8 JB	57.8 B	No
Copper	ND	ND	ND	ND	<b>4.7 B</b>	Yes (4.7)
Lead	4.9 J	4.3 JN	4.7 J	4.2 JN	3.7 JN	No
Selenium	ND	ND	<b>14.2 S</b>	9.7	10.1	Yes (14.2)
Zinc	15 JB*	9.8 JB	<b>37 J*</b>	<b>15 JB</b>	12.8 JB	Yes (37)
<b>Petroleum Hydrocarbons (µg/L)</b>						
TPH	1,000	ND	<b>7,000</b>	ND	ND	Yes (7,000)

Round 1 – Groundwater samples collected in October 1990.

Round 2 – Groundwater samples collected in February 1991.

ND – Not Detected.

**Bolded values indicate contaminant concentrations above the background range.**

Data qualifiers follow the data. The qualifiers are:

- B Reported value is less than the reporting limit, but greater than the instrument detection limit.
- N Spiked sample recovery is not within the control limits set by laboratory QA/QC.
- \* Duplicate analysis is not within the control limits set by laboratory QA/QC.
- S Reported value was determined by the method of standard additions.
- J The value reported in an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

**Table 2-5. Chemical Constituents Detected in Groundwater (Rounds 3 and 4)  
Site 2 – Drainage Ditch Off Old Power Check Pad  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical	Round 3		Round 4		Max Exceeds Background?
	MANG-2 MW1	MANG-2 (1-2)P3	MANG-2 MW1	MANG-2 (1-2)P3	
<b>Petroleum Hydrocarbons (µg/L)</b>					
Extractable Petroleum Hydrocarbons (EPH)	ND	ND	ND	ND	No
Volatile Petroleum Hydrocarbons (VPH)	ND	ND	ND	ND	No

Round 3 – Samples collected in April 2000.

Round 4 – Samples collected in July 2000.

ND – Not Detected.

### 3. RISK EVALUATION

The potential risks to human health and the environment are based on the information presented in the preliminary risk evaluation (PRE) included in the SI report (ES 1992). The PRE was performed using data collected during the SI. The objectives of the PRE were to gather qualitative information on the potential risks to human and environmental receptors posed by the release or threat of release of hazardous substances from the site, to help identify additional data needed to complete a quantitative risk assessment during the Remedial Investigation (RI), and to provide information for the determination that NFA is required if no risks to human and environmental receptors are identified.

The results of the medium-specific investigations described in the previous sections were used to identify chemicals of concern (COCs), chemical concentrations, general release characteristics, the affected environmental media, and exposed or potentially exposed human or environmental receptors. The initial objectives of the PRE were to:

- Select chemicals of potential concern (COPCs)
- Review the factors that affect migration of selected chemicals through the affected media, and identify and evaluate potential migration pathways
- Evaluate the potential toxicities associated with exposure of human or environmental receptors to the selected chemicals against appropriate protective criteria
- Identify potential risks to human or environmental receptors that may be affected by the migration of contaminants along identified pathways.

The results of the 1992 PRE indicated no risk to human health or environmental receptors from Site 2 (ES 1992). Considering that MTDEQ and EPA screening criteria have changed since 1992, these data were re-evaluated in the Preliminary Human Health Evaluation (Section 3.1).

#### 3.1 PRELIMINARY HUMAN HEALTH EVALUATION

The chemicals exceeding the background range for each medium at Site 2 and their associated human health criteria are compared in the following sections. Compounds that did not exceed the background range were eliminated from further evaluation in Section 2.2.

The maximum concentrations in soil and sediment were compared to MTDEQ Risk-Based Screening Levels (RBSLs) and human health criteria for direct contact (inhalation, ingestion, and dermal) and leaching to groundwater. In accordance with the MTDEQ Voluntary Cleanup and Redevelopment Act (VCRA) Application Guide (MTDEQ 2002a), EPA Region IX preliminary remediation goals (PRGs) were used for direct contact criteria and EPA Region IX soil screening levels (SSLs) were used as criteria for leaching to groundwater.

The EPA Region IX PRGs (EPA 2002b) combine the effects of inhalation, dermal, and ingestion factors for chronic effects (hazard quotient [HQ] = 1) and cancer risks (risk =  $1 \times 10^{-6}$ ). In accordance with the MTDEQ VCRA Guide, a dilution attenuation factor (DAF) of 10 is used for the SSLs. The human health criterion for groundwater was based on the MTDEQ Numeric Water Quality Standards (MTDEQ 2002b) in accordance with the VCRA Guide.

##### 3.1.1 Soils

Surface soil samples (0 to 2 feet BLS) were collected at SB1-1.5, SB2-1.5, SB3-1, SB5-1, and SB6-1. A total of three organics and five inorganics exceeded the background range and MTDEQ RBSLs. As shown in Table 3-1, neither chronic (HQ = 1) nor cancer (risk =  $1 \times 10^{-6}$ ) criteria were exceeded in the surface soils for inhalation, ingestion, and dermal contact. In addition, soil leaching criteria were not exceeded in the surface soil.

**Table 3-1. Comparison of Surface Soil (0 to 2 feet BLS) Contaminant Concentrations with Health Criteria for Site 2  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical of Concern		Maximum Release Concentration (mg/kg)	MTDEQ RBSL (commercial)	EPA Region IX PRGs <sup>a</sup> (industrial)	EPA Region IX SSLs <sup>b</sup> (DAF 10)	Health Criterion Exceeded
Organics	DNBP	4.9	NE	62,000	2,700	None
	Butylbenzylphthalate	1.4	NE	100,000	8,100	None
	B2EHP	2.0	NE	120	NE	None
Inorganics	Copper	29.6	NE	41,000	NE	None
	Lead	17.7	NE	750	NE	None
	Nickel	19.4	NE	20,000	70	None
	Selenium	0.5	NE	5,100	3	None
	Zinc	82.3	NE	100,000	6,200	None
TPH		46	50 <sup>c</sup>	NE	NE	None

<sup>a</sup>EPA Region IX PRGs combine chronic factors at HQ = 1 and cancer effects at risk =  $1 \times 10^{-6}$  for inhalation, ingestion, and dermal factors for industrial land uses (EPA 2002b).

<sup>b</sup>EPA Region IX SSLs provide criteria for leaching to groundwater. MTDEQ guidance denotes the use of DAF=10 based on the local geology (MTDEQ 2002a).

<sup>c</sup> According to MTDEQ RBSLs, a screening level of 50 ppm is used for EPH compounds to determine whether a release has occurred at UST sites (MTDEQ 2003).

NE – None Established

The Montana Tier 1 Risk-Based Corrective Action (RBCA) Guidance (MTDEQ 2003) lists screening values to determine whether more evaluation is required. According to the Montana RBCA guidance (MTDEQ 2003), a 50 ppm screening level for extractable petroleum hydrocarbons (EPH) is used to determine whether a release has occurred at UST sites. The maximum detected concentration of 46 mg/kg did not exceed the RBSL of 50 mg/kg.

Subsurface soil samples (>2 feet BLS) were collected at SB2-3, SB4-2, SB5-2, and SB6-2. A total of four organics and two inorganics exceeded the background range. As shown in Table 3-2, neither chronic (HQ = 1) nor cancer (risk =  $1 \times 10^{-6}$ ) criteria were exceeded in the subsurface soils for inhalation, ingestion, and dermal contact. In addition, soil leaching criteria and MTDEQ RBSLs were not exceeded in the subsurface soils.

Because no chronic, cancer, or soil leaching criteria were exceeded in either surface or subsurface soils for inhalation, ingestion, or dermal contact, the Site 2 soils do not pose a potential public health risk for its industrial land use. Based on the location of Site 2 within Great Falls International Airport, Site 2 will not have a residential land use in the future.

### 3.1.2 Sediment

Sediment samples were collected at SED1, SED2, and SED3. A total of two organics and eight inorganics exceeded the background range. As shown in Table 3-3, neither chronic (HQ = 1) nor cancer (risk =  $1 \times 10^{-6}$ ) criteria were exceeded in the sediments for inhalation, ingestion, and dermal contact. However, SSLs were exceeded in the sediments for cadmium and chromium.

The sediment sample collected at the outfall of the power check pad (2-SED2) contained elevated concentrations of cadmium (24.2 mg/kg) and chromium (64.9 mg/kg). Assuming a DAF of 10, these results may indicate that groundwater will be impacted in the downgradient well (2-MW1). However, neither cadmium nor chromium was detected in 2-MW1. In addition, the chromium concentration of 64.9 mg/kg is within the regional background range of 41 to 90 mg/kg (Schacklette & Boerngen 1984).

**Table 3-2. Comparison of Subsurface Soil (>2 feet BLS) Contaminant Concentrations with Health Criteria for Site 2  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical of Concern		Maximum Release Concentration (mg/kg)	MTDEQ RBSL (commercial)	EPA Region IX PRGs <sup>a</sup> (industrial)	EPA Region IX SSLs <sup>b</sup> (DAF 10)	Health Criterion Exceeded
Organics	Acetone	0.17	NE	6,000	8	None
	DNBP	3.4	NE	62,000	2,700	None
	Butylbenzylphthalate	0.66	NE	100,000	8,100	None
	B2EHP	0.57	NE	120	NE	None
Inorganics	Cadmium	0.38	NE	450	4	None
	Mercury	0.055	NE	310	NE	None

<sup>a</sup> EPA Region IX PRGs combine chronic factors at HQ = 1 and cancer effects at risk =  $1 \times 10^{-6}$  for inhalation, ingestion, and dermal factors for industrial land uses (EPA 2002b).

<sup>b</sup> EPA Region IX SSLs provide criteria for leaching to groundwater. MTDEQ guidance denotes the use of DAF=10 based on the local geology (MTDEQ 2002a).

NE – None Established

**Table 3-3. Comparison of Sediment Contaminant Concentrations with Health Criteria for Site 2  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical of Concern		Maximum Release Concentration (mg/kg)	MTDEQ RBSL (commercial)	EPA Region IX PRGs <sup>a</sup> (industrial)	EPA Region IX SSLs <sup>b</sup> (DAF 10)	Health Criterion Exceeded
Organics	Benzo(b)fluoranthene	2	6	2.1	2.0	None
	B2EHP	1.7	NE	120	NE	None
Inorganics	Cadmium	24.2	NE	450	4	SSLs
	Chromium	64.9	NE	450	20	SSLs
	Copper	66.9	NE	41,000	NE	None
	Lead	131	NE	750	NE	None
	Mercury	0.19	NE	310	NE	None
	Nickel	37.5	NE	20,000	70	None
	Selenium	1.10	NE	5,100	3	None
	Zinc	555	NE	100,000	6,200	None
TPH		590	300/600 <sup>c</sup>	NE	NE	RBSL

<sup>a</sup> EPA Region IX PRGs combine chronic factors at HQ = 1 and cancer effects at risk =  $1 \times 10^{-6}$  for inhalation, ingestion, and dermal factors for industrial land uses (EPA 2002b).

<sup>b</sup> EPA Region IX SSLs provide criteria for leaching to groundwater. MTDEQ guidance denotes the use of DAF=10 based on the local geology (MTDEQ 2002a).

<sup>c</sup> Surface soil in commercial land uses with greater than 20 feet to the groundwater has a screening level of 300 mg/kg for C11-C22 aromatics and 600 mg/kg for C9-C18 aliphatics. Based on the MTDEQ comments in the 5 June 2003 letter, jet fuel (the primary contaminant at Site 2) contains approximately 30 percent C11-C22 aromatics and 70 percent C9-C18 aliphatics. Thus, the 590 mg/kg of TPH contains 177 mg/kg of C11-C22 aromatics and 413 mg/kg of C9-C18 aliphatics. Therefore, neither MTDEQ commercial RBSL is exceeded (MTDEQ 2003).

NE – None Established

An examination of the surface soil and sediment samples in the immediate vicinity of the elevated cadmium result (at 2-SED2) indicates that none of the surrounding samples contain an unqualified detection of cadmium. Therefore, the area of cadmium contamination is minimal (i.e., less than 8 ft<sup>2</sup>).

According to the Montana RBCA guidance (MTDEQ 2003), surface soil in commercial land uses with greater than 20 feet to the groundwater has a screening level of 300 mg/kg for C11-C22 aromatics and 600 mg/kg for C9-C18 aliphatics. Based on the MTDEQ comments provided on 5 June 2003, jet fuel (the primary contaminant at Site 2) contains approximately 30 percent C11-C22 aromatics and 70 percent C9-C18 aliphatics. Thus, the 590 mg/kg of TPH contains 177 mg/kg of C11-C22 aromatics and 413 mg/kg of C9-C18 aliphatics. Therefore, neither MTDEQ commercial RBSL is exceeded (MTDEQ 2003).

Because no chronic or cancer criteria were exceeded in the sediments for inhalation, ingestion, or dermal contact, Site 2 does not pose a potential public health risk for direct contact with the sediments. In addition, based on sampling data from the downgradient well (2-MW1), hazardous concentrations of metals or petroleum hydrocarbons are not leaching to the groundwater from the sediments.

### 3.1.3 Groundwater

Four rounds of groundwater samples were collected at 2-MW1 and (1-2)P3 and a total of four metals exceeded the background range. As shown in Table 3-4, none of the MTDEQ Numeric Water Quality Standards (MTDEQ 2002b) was exceeded in the groundwater.

Because no drinking water criteria were exceeded, Site 2 does not pose a potential public health risk for its industrial land use. Based on the location of Site 2 within Great Falls International Airport, Site 2 will not have a residential land use in the future.

**Table 3-4. Comparison of Groundwater Contaminant Concentrations with Health Criteria for Site 2  
120<sup>th</sup> Fighter Wing, Montana Air National Guard, Great Falls, Montana**

Chemical of Concern		Maximum Release Concentration (µg/L)	MTDEQ RBSLs (commercial) (µg/L)	MTDEQ Numeric Water Quality Standards <sup>a</sup> (µg/L)	Source of MTDEQ Criterion <sup>b</sup>	Release Concentration Exceed Criterion?
Inorganics	Arsenic	2.5	NE	20	HA	None <sup>c</sup>
	Copper	4.7	NE	1,300	PP	None
	Selenium	14.2	NE	50	MCL	None
	Zinc	37	NE	2,000	HA	None

<sup>a</sup> The MTDEQ Numeric Water Quality Standards includes the most restrictive of Health Advisories from WQB-7 (MTDEQ 2002b), Priority Pollutants from EPA Priority Toxic Pollutants (EPA 2000), and MCLs from EPA Drinking Water Maximum Contaminant Level (EPA 2000).

<sup>b</sup> The MTDEQ criteria from MTDEQ 2002b are:

HA - Health advisory from EPA's "Drinking Water Standards and Health Advisories."

PP - Drinking Water Pollution Criteria.

MCL - EPA Drinking Water Maximum Contaminant Level.

<sup>c</sup> The maximum arsenic concentration is also below the new Federal MCL of 10 µg/L.

NE - None Established

### 3.2 PRELIMINARY ECOLOGICAL RISK EVALUATION

Qualitative judgments were made in the ecological evaluation to account for the diverse array of species and the less extensive evaluation methods available for risk determinations. The environmental receptors and ecological exposure pathways are summarized as follows:

- ***Environmental Receptors***—Site 2 is located in a short-grass prairie province that is currently influenced by agricultural and urban uses. Wildlife common to short-grass prairies and agricultural areas include small rodents, prairie dogs, jackrabbits, and various songbirds. Because of the industrial nature of the habitat available at Site 2 compared to that in the immediately surrounding area, the area is not attractive to wildlife, including endangered species. In addition, because water is not present in the drainage ditch on a regular basis, aquatic life was not considered a receptor group.
- ***Ecological Exposure Pathways***—The ecological receptors at Site 2 may be exposed to chemical contaminants through direct or indirect pathways. Direct pathways are those that permit direct contact with or ingestion of contaminated media such as soil, sediment, or water. Indirect pathways are those created when an animal consumes other previously contaminated organisms. Exposure media and routes may differ among various organisms due to their physiological and behavioral differences.

The drainage ditch is located in an industrial area (i.e., near the runways between a power check pad and a small firing range) where human activity would be a deterrent to all but the most industry-tolerant wildlife. In addition, the grassland near the ditch is maintained and provides limited cover and food for most ecological receptors. Therefore, exposure to populations of ecological receptors would be minimal because they are unlikely to visit the site and the contaminated area (i.e., within the drainage ditch at the power check pad outfall pipe) is relatively small and insignificant.

Therefore, cleanup levels protective of human health will likely be protective of any ecological receptors' limited exposure. Thus, since there are no significant ecological resources at Site 2, conducting a full ecological risk assessment is not warranted.

#### 4. CONCLUSIONS

The protocols in the MTDEQ VCRA Application Guide (MTDEQ 2002a) were followed to determine if NFA is required for the soils, sediment, and groundwater at Site 2 – Drainage Ditch Off Old Power Check Pad. All soil, sediment, and groundwater samples from Site 2 were compared against background concentrations to determine which chemicals would be evaluated in the human health risk evaluation. The human health risk evaluation for each media type is summarized as follows:

- **Soils**—No human health criteria were exceeded for direct contact or leaching to groundwater.
- **Sediment**—No human health criteria were exceeded for direct contact with sediment. Although cadmium and chromium may present a leaching to groundwater hazard, the actual results from the downgradient well (2-MW1) did not indicate metals contamination. In addition, the chromium results are within the regional background concentrations and the area of cadmium contamination is minimal (i.e., less than 8 ft<sup>2</sup>) based on surrounding surface soil and groundwater samples.
- **Groundwater**—No human health criteria for ingestion of groundwater were exceeded.

The preliminary ecological risk evaluation determined that the drainage ditch is located in an industrial area (i.e., near the runways between a power check pad and a small firing range) where human activity would be a deterrent to all but the most industry-tolerant wildlife. Therefore, cleanup levels protective of human health will likely be protective of any ecological receptors' limited exposure.

Because Site 2 meets commercial/industrial screening levels but not residential screening levels, MTDEQ required that a deed restriction be put in place prior to issuing the NFA letter. The Declaration of Restrictive Covenants on Real Property (signed on 3 December 2004) is provided in Appendix B. After receipt of this deed restriction, MTDEQ issued a letter (signed on 3 December 2004) stating that “no additional remediation is required at this time.” This letter is provided in Appendix A.

## 5. RECOMMENDATIONS

Based on the data from the 1992 SI and the confirmatory groundwater sampling conducted in April and July 2000, it has been determined that there is no risk to human health and the environment from the soils, sediment, and groundwater at Site 2 (under industrial risk criteria). Therefore, as long as this site continues to be used for the same or similar purpose, NFA is required at Site 2 – Drainage Ditch Off Old Power Check Pad.

## 6. REFERENCES

- EPA (U.S. Environmental Protection Agency). 1983. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency and Remedial Response. *Hazardous Waste Land Treatment (Revised Edition)*.
- EPA. 1989. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency and Remedial Response. *Risk Assessment Guidance for Superfund Human Health Evaluation Manual (Part A), OSWER Directive 9285.701A*.
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- EPA. 2002a. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency and Remedial Response. *Preliminary Remediation Goals*. October.
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- ES (Parsons Engineering Science, Inc.). 1992. *Site Investigation Report for the 120<sup>th</sup> Fighter Interceptor Group, Montana Air National Guard, Great Falls International Airport Great Falls, Montana*.
- HMTC (Hazardous Materials Technical Center, Dynamac Corp). 1988. *Preliminary Assessment for the 120<sup>th</sup> Fighter Interceptor Group, Montana Air National Guard, Great Falls International Airport*.
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- SAIC (Science Applications International Corporation). 2000. *Quarterly Groundwater Monitoring Report for July 2000 Data*. September.
- SCS (Soil Conservation Service). 1982. *Soil Survey of Cascade County, Montana*.
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Appendix A

### APPENDIX A

## “No Additional Remediation is Required at this Time” Letter from MTDEQ

Appendix A

Appendix A

Appendix A

Appendix A

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Appendix A



**Montana Department of  
ENVIRONMENTAL QUALITY**

Judy Martz, Governor

P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • [www.deq.state.mt.us](http://www.deq.state.mt.us)

December 3, 2004

Mr. Alan Klavans  
ANG/CEVR  
Building R 47  
3500 Fetchet Avenue  
Andrews AFB, MD 20762-5151

**RE: September 2004, Final (Version 3) Decision Document, Site 2 – Drainage Ditch Off Old Power Check Pad – Great Falls International Airport State Superfund Facility**

Dear Mr. Klavans:

Based upon the information provided by Science Applications International Corporation concerning the property located at the Great Falls International Airport, Montana Air National Guard Site 2, Tract A-101-2, it is the opinion of the Montana Department of Environmental Quality (DEQ) that no additional remediation is required at this portion of the facility provided that the property is not used for residential purposes. When used for purposes other than residential, the property does not pose a significant risk to public health, safety, or welfare or the environment with regard to releases or threatened releases addressed in the decision document. DEQ reserves the right to conduct or require further remedial action at this portion of the facility if a new release occurs, or if the usage of the property has or will change, or if DEQ receives new or different information than presented in the above referenced document.

Therefore, DEQ believes the current and reasonably anticipated future usage of Site 2 is industrial and that no further action is required to ensure that this site, when used as industrial airport property, is protective of the existing and proposed uses. This letter applies only to Site 2, the Drainage Ditch Off Old Power Check Pad, at the Great Falls International Airport and not to the other contaminated areas which remain on Airport property.

Thank you for your cooperation. If you have any questions or comments, please feel free to call me at (406) 841-5072.

Sincerely,

Lawrence Hanson  
Environmental Science Specialist

cc: Denise Martin – DEQ Site Response Section Manager  
Cindy Brooks – DEQ Legal

11/22/04 10:00 AM [unclear] finalofaddletter\_2.doc

APPENDIX B

Declaration of Restrictive Covenant on Real Property

**DECLARATION OF RESTRICTIVE COVENANTS ON REAL PROPERTY**

THIS DECLARATION OF RESTRICTIVE COVENANTS ON REAL PROPERTY is made by the Great Falls Airport Authority as of [insert date].

**RECITALS**

WHEREAS, the Great Falls Airport Authority is the owner of certain real property (the Subject Property) located in Cascade County, Montana, more particularly described as:

WHEREAS, the Great Falls Airport Authority is the owner of certain real property (the Subject Property) located in Cascade County, Montana, more particularly described as:

Tract A-101-2:

A parcel in the northeast quarter of Section 20, and in the south half of Section 17, all in Township 20 North, Range 3 East of the Montana Principal Meridian, Cascade County, Montana, described as commencing at Government Survey Monument G-57 in Gore Field, said monument being located in the centerline of Taxiway "D" at an angle point near the northwest end thereof; thence southeasterly along said centerline 1660.00 feet to a point designated as station 0+00; thence north 81°00' west 33.64 feet to the edge of said Taxiway "D" and the true point of beginning of the said parcel, the two parts of which are more particularly described as follows:

(1) A strip 450 feet wide, being 225 feet on each side of a centerline, said centerline running thence north 81°00' west 316.36 feet to station 3+50 and thence north 60°00' west 79.00 feet to station 4+29;

(2) A strip 170 feet wide, being 85 feet, on each side of a centerline, said centerline running thence north 60°00' west 1111 feet to terminate at station 15+40.

The tract of land above described contains 8.40 acres, more or less.

All of existing Montana Air National Guard Lease Tract A-101-2, as previously described, located in the northeast one-quarter (NE1/4) of Section 20 and in the south one-half of Section 17, all in T.20N., R.3E., P.M.,M., Cascade County, Montana;

LESS and EXCEPTING the northwesterly one (1) acre thereof, being more particularly described as follows;

Beginning at the north-most corner of said Montana Air National Guard Lease Tract A-101-2, said point being the True Point of Beginning, thence along the northeasterly boundary of said Tract A-101-2, S.60°00'E., 256.24 feet; thence S.30°00'W., 170.00 feet to a point on the southwesterly boundary of said Tract A-101-2; thence along said southwesterly boundary, N.60°00'W., 256.24 feet; thence along the northwesterly boundary of said Tract A-101-2, N.30°00'E., 170.00 feet to the True Point of Beginning.

Containing 1.00 acres.

*Cynthia Schlotter  
Great Falls Airport  
2800 Terminal Drive  
Great Falls, Montana 5-9100*

WHEREAS, the Subject Property is located within the Great Falls International Airport State Superfund Facility upon which chromium and cadmium substances (up to 64.9 and 24.2 mg/kg, respectively, in the drainage ditch sediments) are present above residential screening levels; and

WHEREAS, the Montana Air National Guard and the Air Force are seeking approval from the Montana Department of Environmental Quality (DEQ) for a partial lease termination of the Subject Property. To effect the desired action, the Great Falls Airport Authority is willing to record restrictive covenants in order to finalize the partial lease termination:

NOW, THEREFORE, the Great Falls Airport Authority hereby agrees and declares that:

1. No residential development shall occur upon the Subject Property.
2. The provisions of these paragraphs governing the use restrictions of the Subject Property shall run with the land and bind all holders, owners, lessees, occupiers, and purchasers of the Subject Property. These restrictive covenants apply in perpetuity and every subsequent instrument conveying an interest in all or any portion of the Subject Property shall include these Restrictive Covenants.
3. No action shall be taken, allowed, suffered, or omitted on the Subject Property if such action or omission is reasonably likely to create a risk of migration of chromium and cadmium or a potential hazard to public health, safety, or welfare or the environment or result in a disturbance of the structural integrity of any engineering controls designed or utilized at the Facility to contain chromium and cadmium or limit human or environmental exposure to chromium and cadmium.
4. The Great Falls Airport Authority agrees to provide DEQ and its representatives and contractors and all representatives and contractors of any person conducting remedial actions approved by DEQ on the Subject Property access at all reasonable times to the Subject Property.
5. At all times after the Great Falls Airport Authority conveys its interest in the Subject Property and no matter what person or entity is in title to or in possession of the Subject Property, the Great Falls Airport Authority and its agents shall retain the right to enter the Subject Property at reasonable intervals and at reasonable times of the day in order to inspect for violations of the Restrictive Covenants contained herein.
6. DEQ shall be entitled to enforce these covenants as an intended beneficiary thereof. The Great Falls Airport Authority specifically agrees that the remedy of "specific performance" shall be available to DEQ in such proceedings.

7. The Great Falls Airport Authority shall cause the requirements of these Restrictive Covenants to be placed in all instruments that convey an interest in the Subject Property and shall file this document with the county clerk and recorder in Cascade County, Great Falls, Montana.

IN WITNESS WHEREOF, the Great Falls Airport Authority has executed this Declaration of Restrictive Covenants on Real Property as of the first date written above.

Cynthia Schultz  
Great Falls Airport Authority

State of Montana     )  
                              : ss.  
County of Cascade    )

On this 9<sup>th</sup> day of December, 2004, personally appeared Cynthia Schultz, before me, a Notary Public for the State of Montana, known to me to be the person whose name is subscribed to the within instrument and acknowledged to me that he is authorized to execute the same on behalf of the Great Falls Airport Authority and that he did, in fact, execute the same.

IN WITNESS WHEREOF I have hereunto set my hand and affixed my official seal the day and year herein above first written.

Steph L. Yuck  
NOTARY PUBLIC FOR THE STATE OF MONTANA  
Residing at Great Falls, MT  
My Commission Expires: 1/29/07



 R0095316  
Page: 3 of 4  
12/02/2004 09:40A  
24.00 By: RKIRKCGARD  
CASCADE COUNTY, MT CV

*[Faint handwritten notes and a circular diagram or stamp at the top left of the page.]*



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### APPENDIX C

## OWS Site Photographs and TCLP Analytical Results for OWS Sediment

*[Faint text or a small table located below the main title.]*





*OWC*  
*look at the old engine*  
*Test cell.*  
**AFIOH**  
for the Environmental and Chemical Testing

MEMORANDUM FOR: Jerry Devose  
120 MDS/SGPB  
120 MDS/SGPB  
2800 AIRPORT AVE B/BLDG 61 MTANG  
GREAT FALLS IAP, MT 59404-5570

21 October 2003

FROM: AFIOH/SDC  
2350 Gillingham Drive  
Brooks City-Base, TX 78235-5103

REF: Order No.: S0310002

Dear Jerry Devose:

Enclosed are the sample reports from 1 sample received on 10/1/2003.

Please note that any unused portion of your sample(s) will be discarded after 30 days from the date of this report, unless you specifically request otherwise. Should you choose to reproduce this report, we recommend you do so in its entirety so that the quality of the data package is kept intact.

If you have questions, or if we may be of further assistance to you, please do not hesitate to contact us.

Sincerely,

LOURDES GALARZA  
Chief, Program Management  
Tel: (210) 536-6177 (DSN Prefix: 240)  
Fax: (210) 536-4578 (DSN Prefix: 240)

Note: Sample analysis performed by: AFIOH/SDC



AFIOH SDC is accredited by AIHA and NELAC. We comply with all relevant policies.

This report is intended solely for the purpose of the person to who it is addressed. If received in error, please notify the AFIOH/SDC Program Manager listed above.



**AFIOH/SDC**

**CLIENT:** 120 MDS/SGPB  
**Project:**  
**Lab Work Order:** S0310002

**CASE NARRATIVE**

There were no problems associated with the samples or analysis except where noted below.

**Sample Analytical Comments:**

<i>SampID</i>	<i>TestCode</i>	<i>SampType</i>	<i>Comments</i>
S0310002-01A	E8270 TC FULL	MS	2,4,6 - Trichlorophenol has high recovery due to matrix interference
S0310002-01A	E8270 TC FULL	MSD	2,4,6 - Trichlorophenol has high recovery due to matrix interference



**Report of Analysis  
for  
120 MDS/SGPB**

**Lab Order:** S0310002  
**Project:**  
**Lab Sample ID:** S0310002-01A  
**Client Sample ID:** GL030085  
**Site Identifier:** 0198

**Collection Date:** 9/30/2003 9:30:00 AM  
**Date Reported:** 10/21/2003  
**Matrix:** MUNICIPAL OR INDUSTRIAL  
WASTEWATER  
**Sample Location:** END OF RUNWAY ABANDONED ENGINE  
TEST PAD

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
<b>EPA 8260 TCLP VOLATILE ORGANIC COMPOUNDS</b>		Approver: Tony Forjohn		Analyst: MKE		
Trichloroethene	< 0.100	0.100		mg/L	20	10/14/2003 2:10:00 PM
Vinyl Chloride	< 0.100	0.100		mg/L	20	10/14/2003 2:10:00 PM

---

**Qualifiers** ND - Not Detected at the Reporting Limit      S - Spike Recovery outside accepted recovery limits  
J - Analyte detected below quantitation limits      R - RPD outside accepted recovery limits  
B - Analyte detected in the associated Method Blank      E - Value above quantitation range  
\* - Value exceeds Maximum Contaminant Level      H - Exceeds holding time

Work Order: S0310002 Date Reported: 10/21/2003

Client: 120 MDS/SGPB

Project:

## DATES REPORT

Sample ID	Client Sample ID	Sample Type Matrix	Test Name	Collection Date	Rev'd Date	TCLP Date	Prep Date	Analysis Date
S0310002-01A	GL030085	MS Municipal or Industrial Wastewater	ICP METALS, TOTAL	9/30/2003 9:30:00 A	10/1/2003		10/9/2003	10/15/2003
S0310002-01A	GL030085	MSD Municipal or Industrial Wastewater	ICP METALS, TOTAL	9/30/2003 9:30:00 A	10/1/2003		10/9/2003	10/15/2003
S0310002-01A	GL030085	SAMP Municipal or Industrial Wastewater	ICP METALS, TOTAL	9/30/2003 9:30:00 A	10/1/2003		10/9/2003	10/15/2003
S0310002-01A	GL030085	DUP Municipal or Industrial Wastewater	ICP METALS, TOTAL	9/30/2003 9:30:00 A	10/1/2003		10/9/2003	10/15/2003
S0310002-01A	GL030085	DUP Municipal or Industrial Wastewater	MERCURY	9/30/2003 9:30:00 A	10/1/2003		10/9/2003	10/9/2003
S0310002-01A	GL030085	MS Municipal or Industrial Wastewater	MERCURY	9/30/2003 9:30:00 A	10/1/2003		10/9/2003	10/9/2003
S0310002-01A	GL030085	MSD Municipal or Industrial Wastewater	MERCURY	9/30/2003 9:30:00 A	10/1/2003		10/9/2003	10/9/2003
S0310002-01A	GL030085	SAMP Municipal or Industrial Wastewater	MERCURY	9/30/2003 9:30:00 A	10/1/2003		10/9/2003	10/9/2003
S0310002-01A	GL030085	SAMP Municipal or Industrial Wastewater	pH	9/30/2003 9:30:00 A	10/1/2003			10/7/2003
S0310002-01A	GL030085	SAMP Municipal or Industrial Wastewater	SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS	9/30/2003 9:30:00 A	10/1/2003		10/8/2003	10/10/2003
S0310002-01A	GL030085	MS Municipal or Industrial Wastewater	SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS	9/30/2003 9:30:00 A	10/1/2003		10/8/2003	10/10/2003
S0310002-01A	GL030085	MSD Municipal or Industrial Wastewater	SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS	9/30/2003 9:30:00 A	10/1/2003		10/8/2003	10/10/2003
S0310002-01A	GL030085	SAMP Municipal or Industrial Wastewater	VOLATILE ORGANIC COMPOUNDS BY GC/MS	9/30/2003 9:30:00 A	10/1/2003		10/14/2003	10/14/2003
S0310002-01A	GL030085	MS Municipal or Industrial Wastewater	VOLATILE ORGANIC COMPOUNDS BY GC/MS	9/30/2003 9:30:00 A	10/1/2003		10/14/2003	10/14/2003

Work Order: S0310002 Date Reported: 10/21/2003

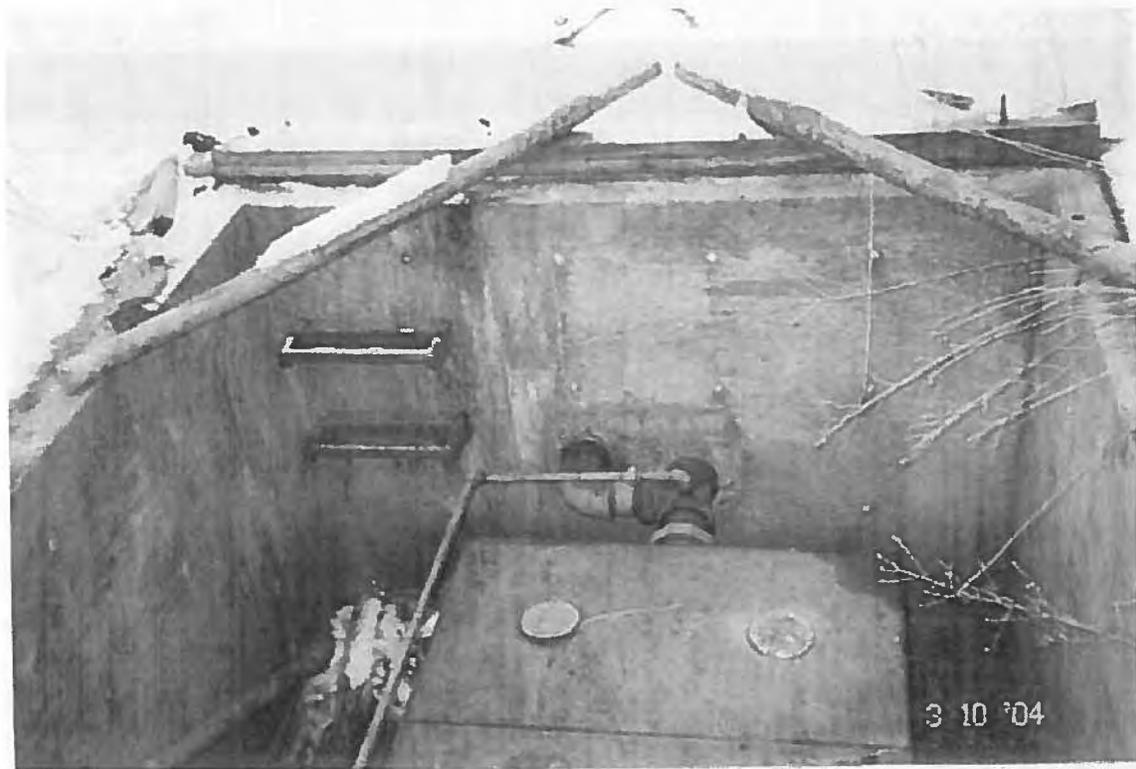
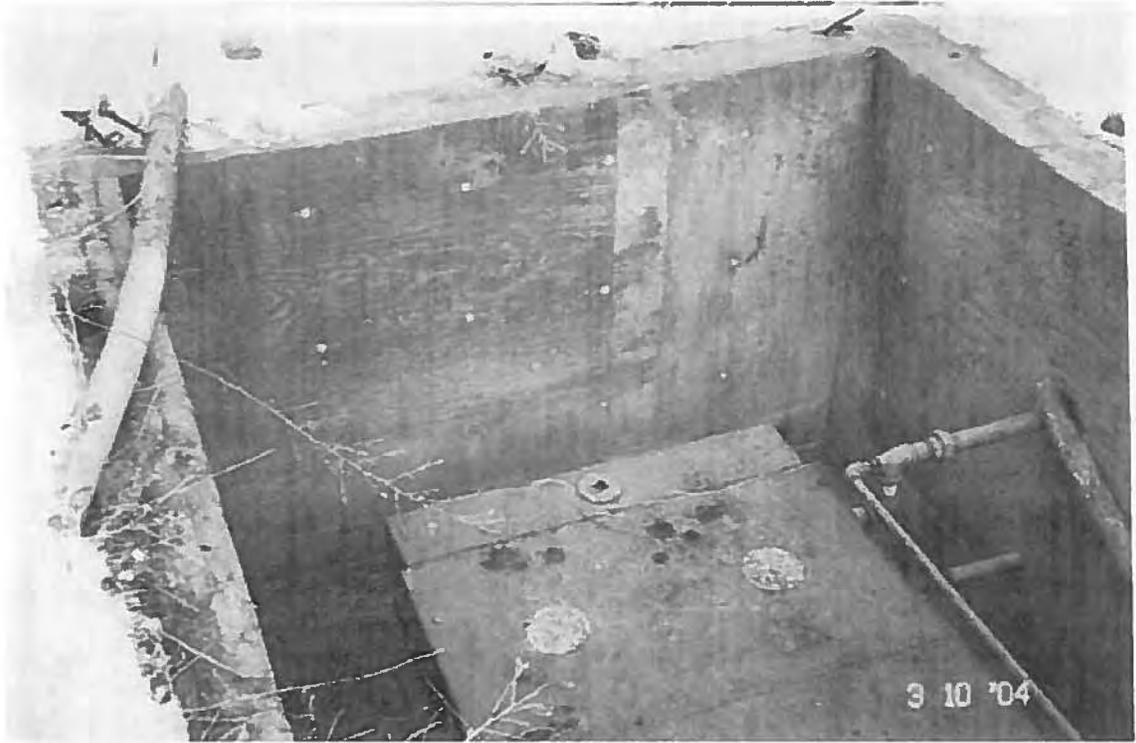
Client: 120 MDS/SGPB

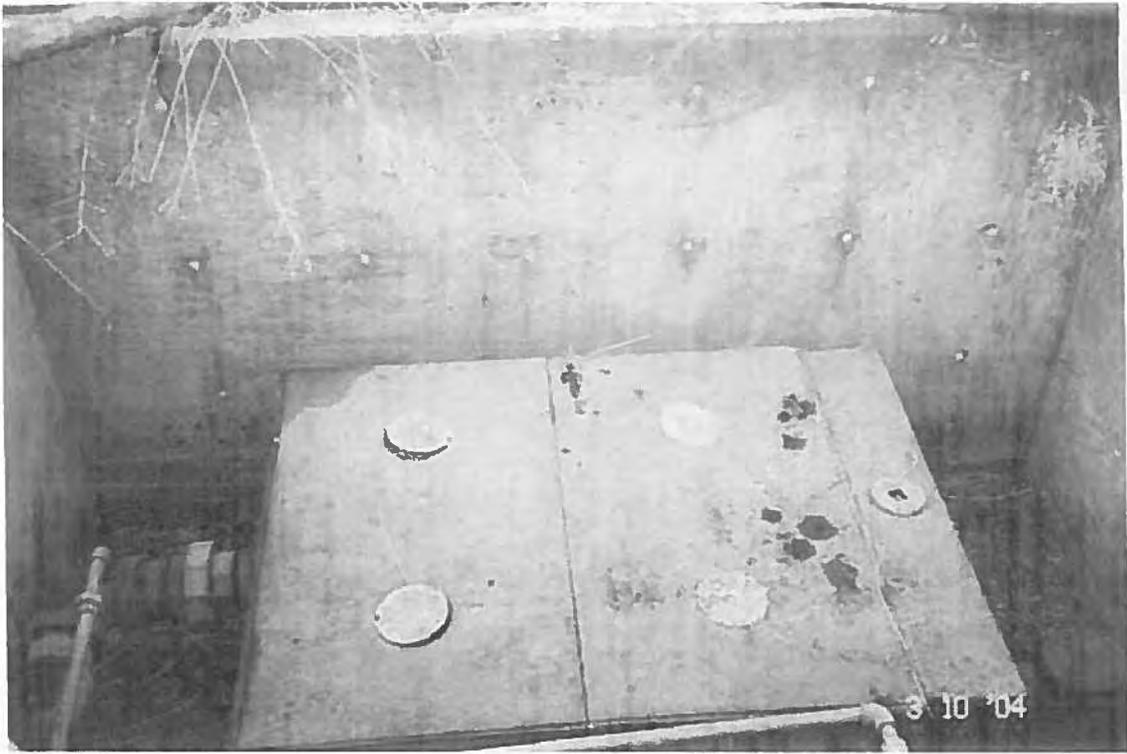
Project:

### DATES REPORT

Sample ID	Client Sample ID	Sample Type	Matrix	Test Name	Collection Date	Revd Date	TC/CP Date	Prep Date	Analysis Date
S0310002-01A	GL030085	MSD	Municipal or Industrial Wastewater	VOLATILE ORGANIC COMPOUNDS BY GC/MS	9/30/2003 9:30:00 A	10/1/2003		10/14/2003	10/14/2003







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# INSTALLATION RESTORATION PROGRAM

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## FINAL DECISION DOCUMENT SITE 3 – NORTH DISPOSAL AND FIRE TRAINING PIT

120TH FIGHTER GROUP  
MONTANA AIR NATIONAL GUARD  
GREAT FALLS INTERNATIONAL AIRPORT  
GREAT FALLS, MONTANA



Science Applications International Corporation  
1710 Goodridge Drive  
McLean, Virginia 22102

**FINAL DECISION DOCUMENT  
SITE 3 – NORTH DISPOSAL AND FIRE TRAINING PIT**

**120TH FIGHTER GROUP  
MONTANA AIR NATIONAL GUARD  
GREAT FALLS INTERNATIONAL AIRPORT  
GREAT FALLS, MONTANA**

**Prepared for:**

**Air National Guard Readiness Center  
Andrews Air Force Base, Maryland**

**Prepared by:**

**Science Applications International Corporation  
11251 Roger Bacon Drive,  
Reston, Virginia 20190**

**National Guard Bureau  
Contract No. DAHA90-94-0007**

**January 2000**

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## LIST OF ACRONYMS

ANGRC	Air National Guard Readiness Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EPM	Extractable Petroleum Hydrocarbons
ES	Engineering Science
FG	Fighter Group
GC	Gas Chromatograph
HAZWRAP	Hazardous Waste Remedial Actions Program
HMTC	Hazardous Materials Technical Center
HNU	HNU Systems Photoionization Meter
IRP	Installation Restoration Program
PA	Preliminary Assessment
PRE	Preliminary Risk Evaluation
PRG	Preliminary Remedial Goal
QA/QC	Quality Assurance/Quality Control
RI	Remedial investigation
SAIC	Science Applications International Corporation
SI	Site Investigation
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
VPH	Volatile Petroleum Hydrocarbon

# 1. INTRODUCTION

## 1.1 PURPOSE OF REPORT

This report presents data gathered for the north disposal and fire training pit (herein referred to as Site 3) during the preliminary assessment (PA) and site investigation (SI) at the 120th Fighter Group (FG), Montana Air National Guard, Great Falls International Airport, Great Falls, Montana. The PA was completed in 1988 by the Hazardous Materials Technical Center (HMTC) (HMTC 1988). The SI was completed by Parsons Engineering Science (ES) (ES 1982). The data gathered during the PA and SI and presented below support the no-action alternative. This document has been prepared to present the data gathered during the PA and SI, which supports the decision for No Further Action.

Work on this report has been completed by Parsons Engineering Science under subcontract to the HAZWRAP Support Contractor Office. The HAZWRAP Support Contractor Office is operated by Martin Marietta Energy Systems, Inc. for the U.S. Department of Energy (DOE). DOE is assisting the Air National Guard Readiness Center (ANGRC) by providing this contract support to the ANGRC Installation Restoration Program (IRP).

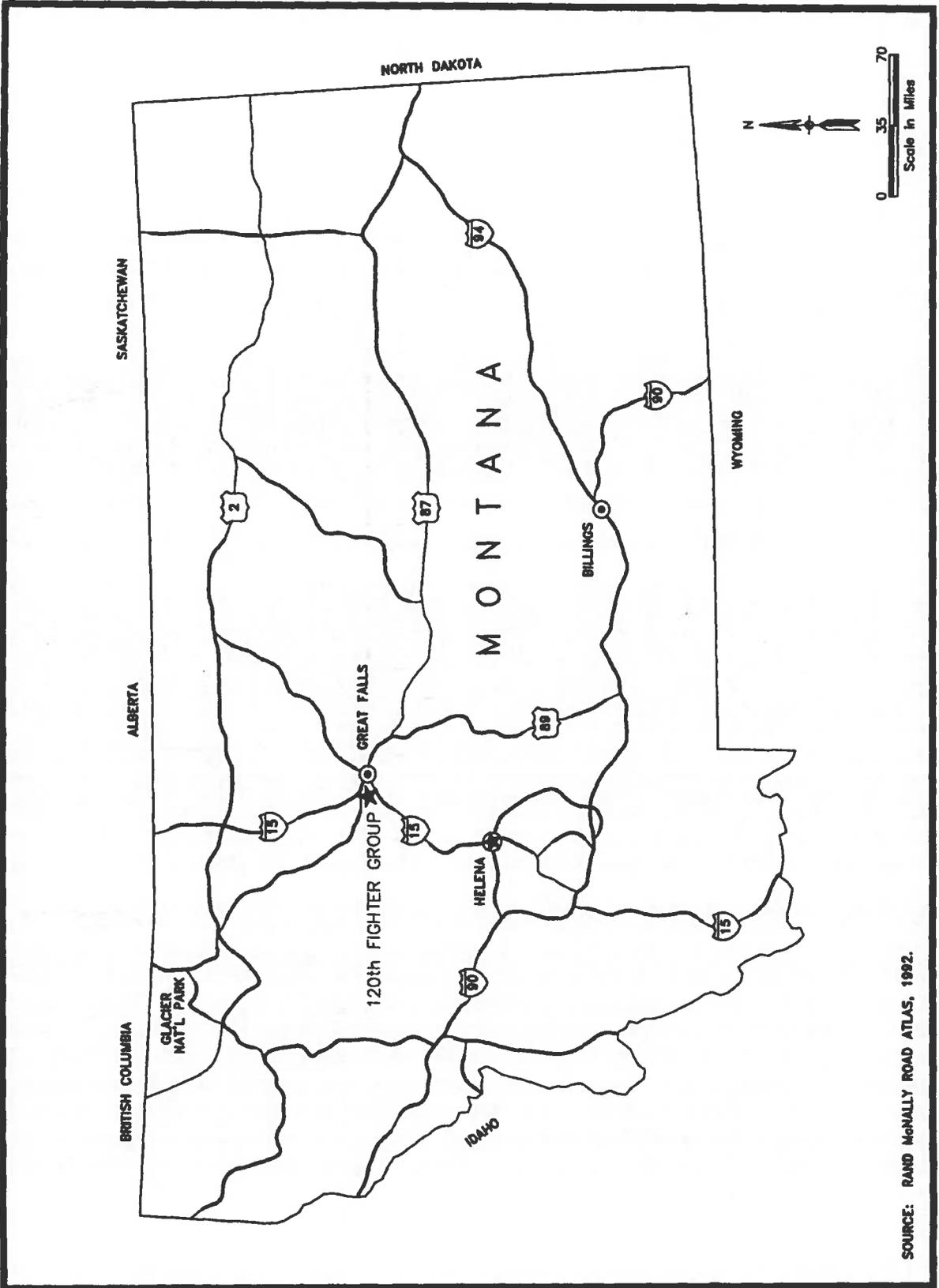
## 1.2 STATUTORY AUTHORITY

Authority for responding to releases or threats of releases from a hazardous waste site is addressed in section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments Re-Authorization Act (SARA), 1986. Executive Order 12580 delegates to the ANGRC the response authority for Air National Guard sites, whether or not the sites are on the National Priorities List of the U.S. Environmental Protection Agency (EPA). Under CERCLA section 104(b), the ANGRC is authorized to investigate, survey, test, or gather other data required to identify the existence, extent, and nature of contaminants, including the extent of danger to human health or welfare and the environment. In addition, the ANGRC is authorized to undertake planning, engineering, and other studies or investigations appropriate to directing response actions that prevent, limit, or mitigate the risk to human health or welfare and the environment.

## 1.3 FACILITY LOCATION AND BACKGROUND

The 120th FG is located at the Great Falls International Airport, Cascade County, Montana, approximately three miles southwest of Great Falls. Great Falls is located in central Montana, as shown in Figure 1-1. The base's facilities, occupying approximately 125 acres of land, consist of over 50 buildings. The land, leased from the airport authority, is located in the southeast corner of the 1,762-acre airport. Agricultural land borders the base on the west. The area along Interstate 15, immediately south of the base, is designated for industrial and commercial uses. Part of the open area southwest of the airport is used for active outdoor recreation. Residential areas are located on and below the Sun River bench north and northeast of the base.

GREAT11.DWG DC KJC 08/10/94



SOURCE: RAND McNALLY ROAD ATLAS, 1992.

Figure 1-1. Location of the 120th Fighter Wing, Montana ANG,  
Great Falls, Montana

The 120th FG's mission is to serve the U.S. Air Force and the Department of Defense (DOD) with a defense fighter group that can be mobilized in time of war or national emergency. Also, as part of the North American air defense system, 120th FG ensures air sovereignty in its assigned air defense sectors and provides aircraft to intercept airborne threats.

The base was first used as a military installation before World War II, when the Army Air Corps' 7th Ferry Group was headquartered at what was then called Gore Field.

The Montana Air National Guard began as the 186th Fighter Squadron on June 27, 1947, with Lt. Col. Willard S. Sperry as commander. The 186th was activated during the Korean War and served at Moody Air Force Base (AFB), Georgia, and later at George AFB, California. The unit was deactivated on December 31, 1952.

In 1953, the 186th became the first National Guard unit in the United States to acquire the F-86A jet fighter. Six new buildings were constructed during the expansion program of 1954. The 120th Fighter Interceptor Group came into existence on April 16, 1956. The runway was extended in 1960 to accommodate the F-89J aircraft. In 1984, the unit's mission was expanded when it was assigned the additional task of operating an alert detachment at Davis-Monthan AFB, Tucson, Arizona. The unit acquired its present aircraft, the F-16 Fighting Falcon, in July 1987.

#### **1.4 SITE DESCRIPTION**

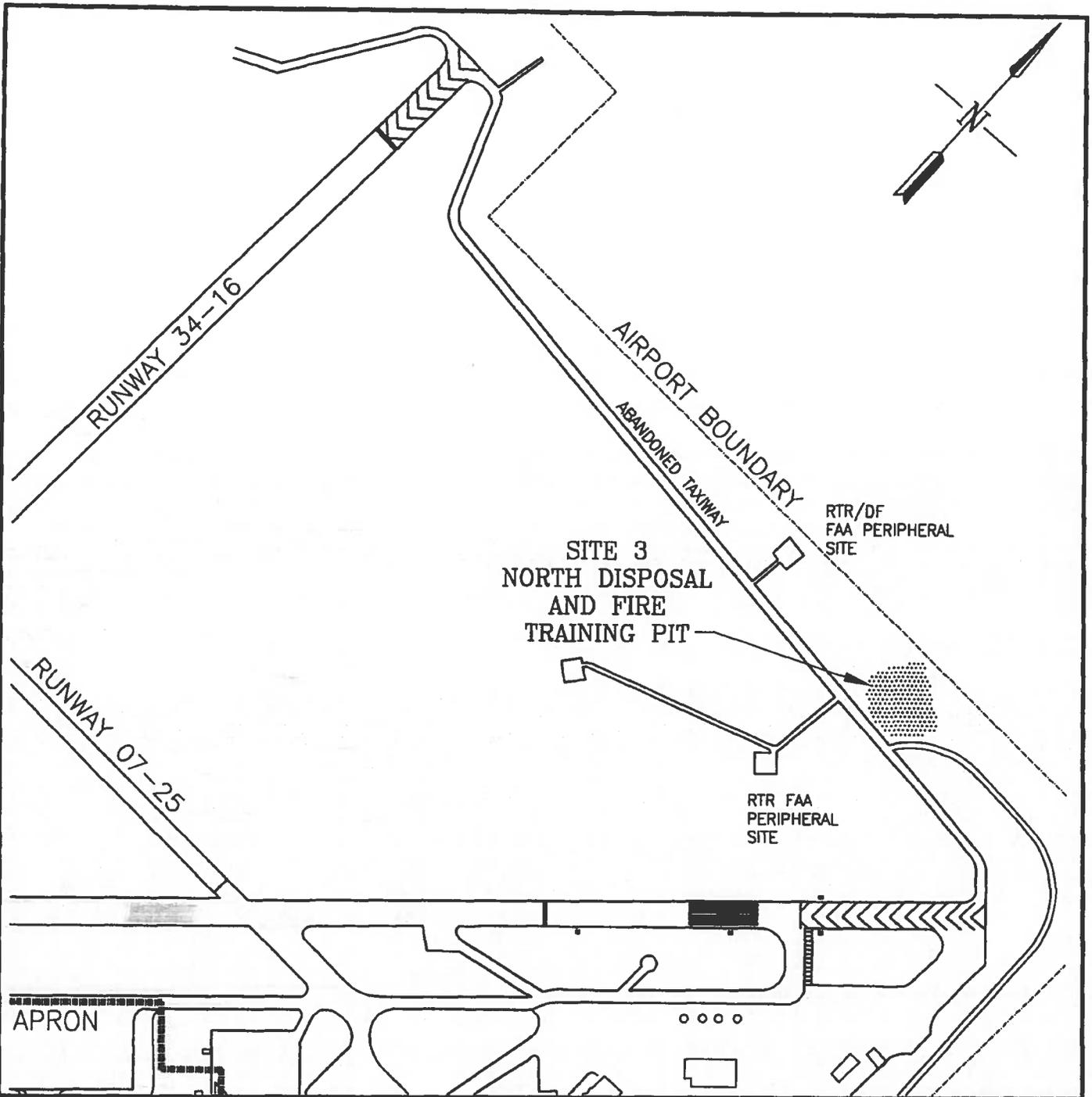
Site 3 is located at the north end of the main runway, at the edge of the Sun River bench. The approximate location of Site 3 is indicated in Figure 1-2. The exact location of the site is not known.

The PA identified three potential sources of contamination released in or near a pit at Site 3: contaminated jet fuel (from 1957 to 1960), waste fuels, oils, thinners, and solvents from fire training activities (from 1966 to 1968) and unknown quantities of flammable liquids disposed of in the pit and surrounding areas over the life of the site. According to the PA, up to 27,000 gallons of fuel may have remained unburned.

The location of the former fire training pit could not be definitively identified during SI field work, and no visual evidence of disposal of the above-described wastes was observed. During the initial phase of SI field work, piles of asphalt-base material, apparently left from runway construction, covered a large area, including the reported location of Site 3. After the soil gas survey was completed, the asphalt piles were removed, leaving a flat area scraped smooth by earth-moving equipment

#### **1.5 ACTIONS TO DATE**

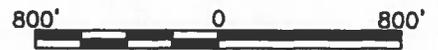
The ANGRC commissioned the study at the 120th FG as part of the IRP because records indicated that base operations had involved use and disposal of materials that were subsequently categorized as hazardous. A PA was conducted in 1988 (HMTTC 1988). The PA identified eight sites where hazardous chemicals may have been spilled or disposed of. Therefore, the ANGRC commissioned an SI to confirm and quantify any contamination that may have an adverse impact on public health or the environment



**LEGEND**



APPROXIMATE SITE LOCATION



SCALE IN FEET

**120th FW-MONTANA  
AIR NATIONAL GUARD  
GREAT FALLS, MT**

**LOCATION OF IRP SITE 3**

Drawn <i>RAM</i>	Checked <i>FJC</i>	Approved	figure no.
date 05/18/99	date 08/28/99	date	1-2
Job no. 01-1408-04-0458-003	file no. 41891-013-A		



**Science Applications  
International Corporation**  
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The SI activities conducted at the site include confirmation. Confirmation activities were soil borings, collection of soil samples, and construction and sampling of groundwater monitoring wells. A complete description of SI activities and results can be found in the SI report (ES 1992).

Groundwater sampling was conducted by Science Applications International Corporation (SAIC) at Site 3 in April and July 1999. A complete description of the sampling activities and results can be found in the SAIC letter report dated September 9, 1999 (SAIC 1999).

## 2. SITE INVESTIGATION RESULTS

### 2.1 GEOLOGY AND HYDROGEOLOGY

#### Regional Geology

The base is situated on sandy, silty loams and loamy sands of the Tally-Azaar-Litten Association (SCS 1982). These soils typically have a low shrink-swell potential and a high infiltration rate, with estimated permeabilities ranging from two to 20 inches per hour. Total thickness of the soil ranges from 20 inches to greater than 40 inches.

The base is located on the northeastern edge of the Sun River bench, a plateau of Cretaceous-aged rock, which rises about 350 feet above Great Falls and slopes gently to the northwest. The rock units that underlie the base are, in descending order, the Taft Hill and Flood Members of the Blackleaf Formation, which belong to the Colorado Group, and the Kootenai Formation, all of which are of Cretaceous age; Morrison and Swift Formations of Jurassic age; and the Madison Group of Mississippian age. Erosional members of the Taft Hill outcrop at and around the base, make up the majority of the unconsolidated to semiconsolidated material found in the upper 15 to 20 feet of material underlying the base. The Flood Member is the first competent rock encountered at the base.

#### Regional Hydrogeology

Groundwater at the base is present in each of the rock units mentioned above, with the exception of the Taft Hill. The shallowest groundwater encountered at the base occurs in the upper sandstone of the Flood Member. Regional groundwater flow in the area is to the west-northwest.

The Flood Member on the Sun River bench is a perched aquifer (Wilke 1983). North and west of the bench, hydrologic conditions change from perched to water table to confined. The relatively impermeable shale in the underlying Kootenai and the shales found in the middle of the Flood Member retard the vertical movement of water, producing the perched condition. The general groundwater flow in the Flood Member is to the north-northwest. However, considering seasonal fluctuations, surface topography, and variations in the underlying confining shales of the arm there may be localized areas where the groundwater flow direction is different. This is typical of groundwater in perched conditions and is evident at the base.

Wells completed in the Flood Member are less than 100 feet deep and are important sources of water for domestic and stock uses on the bench. Water levels in the wells range from 20 to 100 feet below ground level. Reported well yields range from six to 40-gallons per minute (gpm) (Wilke 1983). The Flood Member is recharged mainly from infiltration of precipitation on the bench. Groundwater movement is generally downdip, or to the northwest, except near outcrop boundaries. Therefore, local gradients at each site at the base are influenced by proximity to the chill and local topographic features. This conclusion is supported by the presence of springs along the cliffs that surround the bench. Limited water quality data are available for the Flood Member, but samples indicate that the water is of a sodium sulfate and sodium bicarbonate type, with dissolved solids concentrations ranging from 2,700 to 2,800 milligrams per liter (mg/L) (Wilke 1983).

Groundwater on the Sunset Bench commonly occurs above the sandstone-shale contact of the Flood Member. The shaley beds of the middle unit of the Flood Member retard the vertical movement of water and cause perched water conditions in the area. Water perched at this contact discharges to a number of springs along the cliff face of the bench. The piezometers and wells constructed in the study area have water levels approximately 300 feet higher in altitude than other wells completed in the areas adjacent to the Sun River bench (Wilke 1983). Typically, groundwater is slow to enter the wells because the clayey matrix of the sandstone results in reduced permeability. The groundwater also travels along paths of secondary permeability, such as horizontal and vertical fractures, cavities, and weathered bedding planes.

### **Site Specific Geology and Hydrogeology**

Investigation of the eight sites at the base produced data that are in general agreement with the regional geologic and hydrogeologic research presented above. Drilling activities confirmed that the near-surface geology consists of thin soils underlain by bedrock. The locations of the well and piezometers for Site 3 are shown in Figure 2-1

The geology of Site 3 consists of one and a half to four feet of surface soil composed of brown clayey sand with gravel underlain by weathered sandstone. The thickness of weathered sandstone varies. Competent sandstone occurs at depths ranging from five to 14 feet below ground level. The shale layer was identified at depths ranging from 43 to 49 feet below ground level. Piezometer data were evaluated, and the groundwater flow direction was determined to be to the north-northeast the direction of the nearest edge of the Sun River bench. The monitoring well was then constructed downgradient of the most probable location of Site 3, near the edge of the bench.

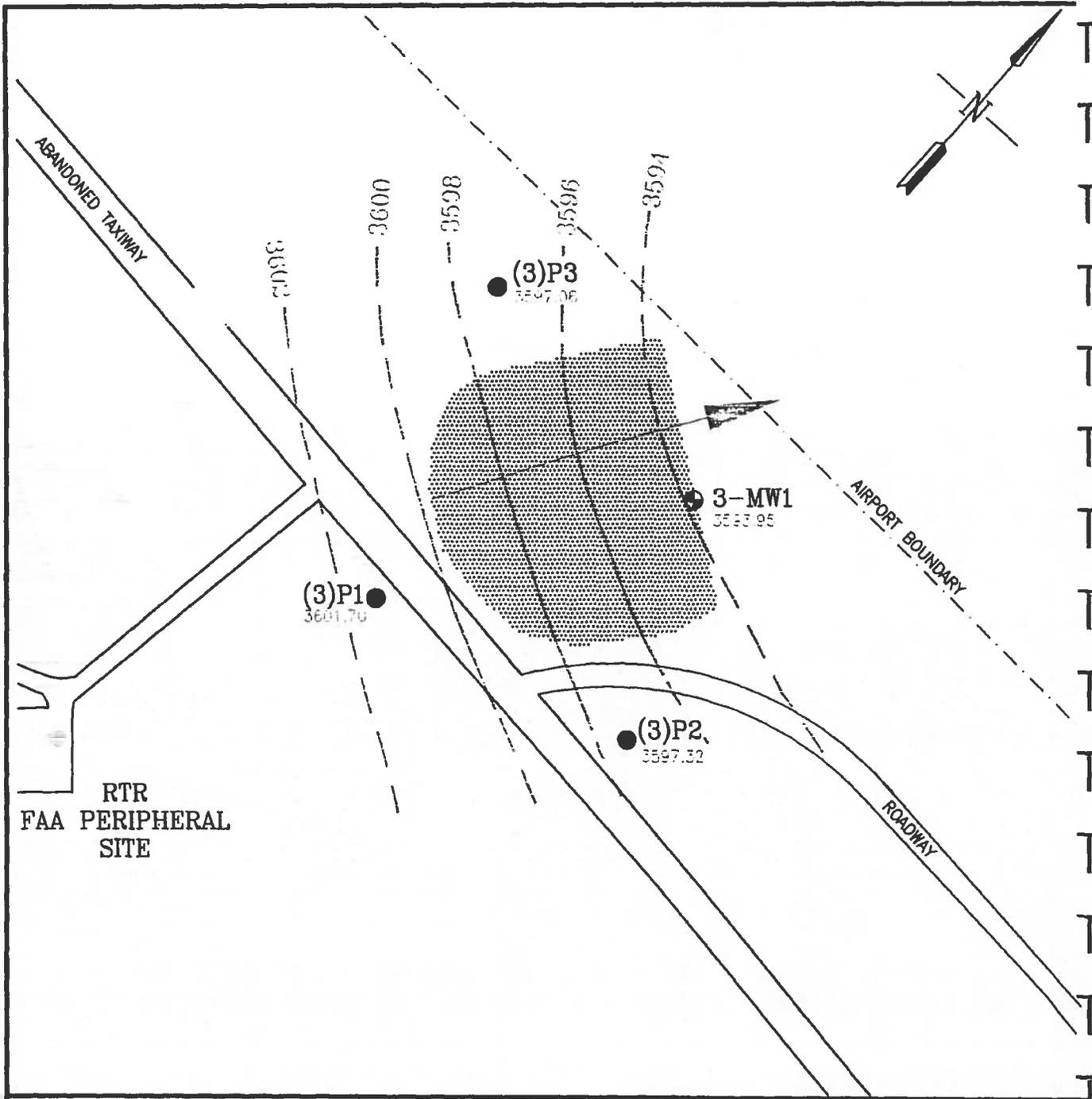
## **2.2 CONFIRMATION SAMPLING RESULTS**

Nine soil samples, along with two duplicate soil samples, were collected at Site 3 for chemical analyses. These samples were collected at depths ranging from one to three and a half feet.

Volatile organics, semivolatile organics, and metals were detected in the analyses run on the Site 3 soil samples. The organic compound and the metals detected and their respective concentrations are shown in Table 2-1. Table 2-1 also presents the analytical results for background samples collected at the base.

Two volatile organic compounds were found in the soil samples collected at Site 3. Acetone was detected in samples at concentrations ranging up to 250 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ). Acetone is a common laboratory and sampling contaminant but is not a common fuel constituent. Toluene was also found in several samples at the site. Acetone and toluene were also present in the background samples.

Phthalates were the only semivolatile compounds detected in the soils from Site 3. Diethylphthalate and butylbenzylphthalate were detected in several samples. Phthalates are common laboratory and sampling contaminants but are not common fuel constituents. The concentration of these phthalates are below the site background concentrations and EPA Region IX Preliminary Remediation Goals (PRGs).



**LEGEND**

- 3-MW1**  
3593.95  
MONITORING WELL LOCATION WITH POTENTIOMETRIC SURFACE (FT. AMSL)
- (3)P1**  
3601.70  
PIEZOMETER LOCATION WITH POTENTIOMETRIC SURFACE (FT. AMSL)
- 3598**  
GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (FT. AMSL) JULY 1999.
- INTERPRETED DIRECTION OF GROUNDWATER FLOW
- APPROXIMATE SITE LOCATION



**120th FW-MONTANA  
AIR NATIONAL GUARD  
GREAT FALLS, MT**

**LOCATION OF MONITORING WELLS  
AND PIEZOMETER - SITE 3**

drawn <b>RAM</b>	checked <b>PJC</b>	approved <b>PJC</b>	figure r
date 08/13/99	date 08/28/99	date 08/28/99	2
job no. 01-1408-04-0438-003		file no. 41891-015-A	

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An Employee-Owned Company

**Table 2-1. Chemical Constituents Detected in Soil  
Site 3: North Disposal and Fire Training Pit  
(Offsite Laboratory Analysis)  
120th Fighter Group, International Airport, Great Falls, Montana**

Chemical	EPA Region IX PRGs (mg/kg) (Industrial)	EPA Region IX PRGs (mg/kg) (Residential)	Background (1)	MANG-3 SB1A-1.5(2)	MANG-3 SB2A-1.5	MANG-3 SB2A-3.5	MANG-3 SB3A-1
<b>Volatile organics (µg/kg):</b>							
Acetone (3)	6,100	1,400	ND-157	ND	ND	ND	ND
Toluene	520	520	ND - 9	4 J	7	ND	ND
<b>Semivolatile organics (µg/kg)</b>							
Diethylphthalate (3)	105,000	44,000	ND	ND	ND	ND	ND
Butylbenzylphthalate (3)	930	930	ND	ND	ND	ND	ND
<b>Metals (mg/kg)</b>							
Arsenic	3	0.38	1.9 - 9.9	7.3	10.2 S	9.2 B	3.4
Barium	100,000	5,200	ND - 1,231	173	665	124	44.7
Chromium	450	210	8.7 - 22.7	14.8 *	17.5 *	12.2 *	6.2 *
Copper	70,000	2,800	3.3 - 19.7	19.3	17.3	13.3	3.9 B
Lead	1,000	400	3.4 - 13.0	9.1	10.5	9.7	3.7 B
Nickel	37,000	150	3.6 - 17.6	16.8	16.2	15	ND
Selenium	9,400	3,700	ND - 0.66	ND	0.46 B	ND	ND
Zinc	100,000	22,000	21.6 - 61.3	51.4	56.8	44.5	24.8
<b>Total Petroleum Hydrocarbons (mg/kg)</b>	-	-	ND	ND	ND	ND	ND

(1) Background the average background concentration +/- two standard deviations.

(2) MANG-3-SB1A-1.5 - Montana Air National Guard, Site 3, soil boring 1A, 1.5 foot depth.

(3) Acetone and phthalate are common laboratory and sampling contaminants.

ND = not detected.

Data qualifiers follow the data. The qualifiers are:

Organics:

J - The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

Metals:

B - Reported value is less than reporting limit but greater than the instrument detection limit.

S - Reported value was determined by the method of standard additions.

• - Duplicate analysis not within control limits set by lab quality assurance/quality control (QA/QC).

**Table 2-1. Chemical Constituents Detected in Soil  
Site 3: North Disposal and Fire Training Pit  
(Offsite Laboratory Analysis)  
120th Fighter Group, International Airport, Great Falls, Montana (Continued)**

Chemical	MANG-3 SB3A-1(D)	MANG-3 SB5A-1.5	MANG-3 SB6-1	MANG-3 SB7-1.5	MANG-3 SB8-1.5	MANG-3 SB9-1.5	MANG-3 SB9(D)-1.5
<b>Volatile organics (µg/kg):</b>							
Acetone (3)	ND	ND	70 J	170	ND	70 J	250
Toluene	ND	ND	ND	ND	5 J	ND	ND
<b>Semivolatile organics (µg/kg)</b>							
Diethyl phthalate (3)	ND	ND	ND	ND	ND	590	110 J
Butylbenzylphthalate (3)	ND	ND	ND	ND	ND	200 J	ND
<b>Metals (mg/kg)</b>							
Arsenic	23.4	6.9	6.9	9.3	2.4	7.3	7.9
Barium	55.7	181	259	202	51	176	37.4
Chromium	7.3 *	20.8 *	23.2	29.9	4.8	15.5	13.8
Copper	21.4	15.5	20.2	21.8	13.4 *	17.6	17.2
Lead	5.2 B	9.9	13.1	13.9	3.5 B	9	8.9
Nickel	ND	16.2	20.2	22.5	ND	9.5	15.7
Selenium	0.32 B	ND	ND	ND	ND	ND	ND
Zinc	33.8	44.9	58.4 *	71.1 *	24 *	46.4 *	66.2
<b>Total Petroleum Hydrocarbons (mg/kg)</b>	ND	ND	ND	ND	ND	ND	ND

(1) Background the average background concentration +/- two standard deviations.  
(2) MANG-3-SB1A-1.5 - Montana Air National Guard, Site 3, soil boring 1A, 1.5 foot depth.

(3) Acetone and phthalate are common laboratory and sampling contaminants.  
ND = not detected.  
Data qualifiers follow the data. The qualifiers are:

**Organics:**  
J - The value reported is an estimated concentration. This is used when the compound is detected at an amount below the reporting limit.

**Metals:**  
B - Reported value is less than reporting limit but greater than the instrument detection limit.  
S - Reported value was determined by the method of standard additions.  
\* - Duplicate analysis not within control limits set by lab QA/QC.

The soil samples collected at Site 3 were also analyzed for total petroleum hydrocarbons (TPH). No TPH contamination was detected at the site.

Metal analysis detected arsenic in soil above the site background concentration and EPA Region IX PRGs. However, the arsenic level in the duplicate sample did not exceed the background concentration. Also, the arsenic levels detected are below the typical State of Montana residential cleanup levels of 100 mg/kg. Typically the residential cleanup levels are more stringent than the industrial cleanup levels. The current and planned future land use for Site 3 is industrial.

Additionally, as part of the SI, three soil borings were drilled and one monitoring well was constructed for the purpose of collecting background samples and establishing a baseline for concentrations of target parameters in natural media. The background borings and monitoring well were located on the south side of the base, upgradient of past and present base operations and in areas where there was no apparent potential for contamination.

### **Groundwater**

One monitoring well was constructed to obtain groundwater samples for evaluation of groundwater quality. The well was located near the edge of the bench downgradient of the most probable location of the site, after groundwater flow direction and gradient were determined using water levels measured in the piezometers. Water levels measured in the well were used in combination with piezometer data to further evaluate groundwater flow direction and gradient.

The well was initially 4 sampled in October 1990, several days after development. A second round of groundwater sampling was performed in February 1991.

The results of the chemical analyses of the groundwater are presented in Table 2-2. The results of groundwater analyses from both rounds of sampling indicate the presence of volatile or semivolatile organic compounds, some TPH (round one only), and several metals.

The TPH concentration in the sample collected during the first round of sampling was 2 mg/L. The background well sampled in October 1990 had a TPH concentration of 1 mg/L. TPH contamination was not confirmed in the second round of sampling.

Metals detected in groundwater at Site 3 were barium (up to 44.2  $\mu\text{g/L}$ ), lead (up to 4.9  $\mu\text{g/L}$ ), and zinc (up to 66  $\mu\text{g/L}$ ).

Groundwater sampling was conducted by SAIC in April and July 1999. The purpose of the groundwater sampling was to confirm the presence or absence of TPH in groundwater at Site 3. Monitoring well 3-MW1 and piezometer 3-P1 were sampled and analyzed for TPH using the Massachusetts method. No detectable concentrations of extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs) were detected. Also, free-phase hydrocarbon was not detected on the water surface in the monitoring wells and piezometers (3-P1, 3-P2, and 3-P3) at Site 3.

**Table 2-2. Chemical Constituents Detected in Groundwater  
Site 3: North Disposal and Fire Training Pit  
(Offsite Laboratory Analysis)  
120th Fighter Group, International Airport, Great Falls, Montana**

Chemical	Round 1 MANG-3 MW1	Round 2 MANG-3 MW1	Background	
			Round 1 MANG-BG MW1	Round 2 MANG-BG MW1
GC volatile organics (µg/L)	ND	ND	ND	ND
Semivolatile organics (µg/L)	ND	ND	ND	ND
Metals (µg/L)				
Arsenic	ND	ND	1.1 JB	ND
Barium	36 BJ	44.2 B	56 JB	62.2 B
Lead	4.9 J	3.3 JN	4.9 J	4.3 JN
Zinc	66 J*	10.4 JB	15 JB*	9.8 JB
Total petroleum hydrocarbons (mg/L)	2	ND	1	ND

ND = not detected.

NA = not applicable.

Data qualifiers follow the data. The qualifiers are:

*Metals:*

- B Reported value is less than reporting limit but greater than the instrument detection limit.
- N Spiked sample recovery not within control limits set by lab QA/QC.
- \* Duplicate analysis not within control limits set by lab QA/QC.
- J The value reported in an estimated concentration. This is used when the compound is detected at less than 10 times the amount in an associated preparation blank, or less than 5 times the amount in an associated field blank.

### 3. RISK EVALUATION

#### 3.1 INTRODUCTION

The potential risks to human health and the environment based on the information presented in previous sections were assessed in the preliminary risk evaluation (PRE) included in the SI report. The PRE was performed using data collected during the SI. The objectives of the PRE were to gather qualitative information on the potential risks to human and environmental receptors posed by the release or threat of release of hazardous substances from the site; to aid in identifying additional data needed to complete a quantitative risk assessment during the remedial investigation (RI); and to provide information for the determination that no further action is required if no risks to human and environmental receptors are identified.

The results of the medium-specific investigations described in the previous sections were used to identify chemical of concern, chemical concentrations, general release characteristics, the affected environmental media, and exposed or potentially exposed human or environmental receptors. The initial objectives of the preliminary risk evaluation for each site were to:

- Select chemicals of potential concern;
- Review the factors that affect migration of selected chemicals through the affected media, and identify and evaluate potential migration pathways;
- Evaluate the potential toxicities associated with exposure of human or environmental receptors to the selected chemicals against appropriate protective criteria; and to
- Identify potential risks to human or environmental receptors that may be affected by the migration of contaminants along identified pathways.

#### 3.2 PRELIMINARY HUMAN HEALTH EVALUATION

The chemicals of concern for each medium at Site 3, their maximum concentrations, and their associated human health criteria are compared in Tables 3-1 through 3-3.

**Table 3-1. Comparison of Groundwater Contaminants Concentrations with Health Criteria for Site 3  
120th Fighter Group, International Airport, Great Falls, Montana**

Exposure Medium	Chemical of Concern	Maximum Release Concentration (mg/L)	Criterion Type Used	Criterion Value (mg/L)	Release Concentration Exceed Criterion?
Groundwater ingestion					
Organics	TPH	2.00E+00	-	-	-
Inorganics	Zinc	6.60E+02	RfD	7.00E+00	No

RfD = reference dose  
mg/L = milligram per liter  
TPH = total petroleum hydrocarbons

**Table 3-2. Comparison of Subsurface Soil Contaminants  
Concentrations with Health Criteria for Site 3  
120th Fighter Group, International Airport, Great Falls, Montana**

Exposure Medium	Chemical of Concern	Maximum Release Concentration (mg/L)	Criterion Type Used	Criterion Value (mg/kg)	Release Concentration Exceed Criterion?
Subsurface soil ingestion Inorganics	Arsenic	9.20E+00	RfD	8.00E+01	No
	Copper	1.33E+01	-	-	-
	Lead	9.70E+00	*	5.00E+02	No
	Nickel	1.50E+01	RfD	1.60E+03	No

\* EPA, 1989

RfD = reference dose

mg/kg = milligram per kilogram

**Table 3-3. Comparison of Subsurface Soil Contaminants  
Concentrations with Health Criteria for Site 3  
120th Fighter Group, International Airport, Great Falls, Montana**

Exposure Medium	Chemical of Concern	Maximum Release Concentration (mg/L)	Criterion Type Used	Criterion Value (mg/kg)	Release Concentration Exceed Criterion?
Subsurface soil ingestion Organics	Toluene	7.00E-03	RfD	1.60E+04	No
Subsurface soil ingestion Inorganics	Arsenic	2.34E+01	RfD	8.00E+01	No
	Barium	6.65E+02	RfD	5.60E+03	No
	Chromium	2.99E+01	RfD	8.00E+04 <sup>a</sup>	No
	Copper	2.18E+01	-	-	-
	Lead	1.39E+01	<sup>b</sup>	5.00E+02	No
	Nickel	2.25E+01	RfD	1.60E+03	No
	Selenium	4.60E-01	RfD	2.40E+02 <sup>c</sup>	No
Zinc	7.11E+01	RfD	1.60E+04	No	

a. Value is for chromium III

b. EPA, 1989

c. Value is for selenious acid

RfD = reference dose

mg/kg = milligram per kilogram

## Groundwater

Only TPH and zinc were retained as chemicals of concern at this site (Table 3-1). Barium and lead were eliminated based on comparison with background concentrations. Zinc did not exceed its criterion value. TPH, analyzed using the Massachusetts method, was not detected in the April and July 1999 sampling events. No human health risks were identified for the TPH components included in the volatile and semivolatile organics analyzed for in this sampling event, since no volatile or semivolatile organic compounds were detected.

## Soils

Soils data at Site 3 were divided into those on surface soils (less than two feet deep) and on subsurface soils (greater than two feet deep) to evaluate different exposure pathways. Exposure to surface soils is currently possible for base personnel. Exposure to surface and subsurface soils is hypothetically possible for future residents, base personnel, construction workers, and non-base personnel.

Arsenic, copper, lead, and nickel were retained as chemicals of concern in subsurface soils (Table 3-2). Arsenic, copper, lead, and nickel did not exceed their criteria.

All detected chemicals were retained as chemicals of concern in surface soils. Criterion values were available for all the organics detected, and none were exceeded. All metal concentrations were less than their respective criteria (Tables 2-1 and 3-3). Because no criteria were exceeded, ingestion of soils probably does not pose a public health concern. However, volatile organic compounds were detected in surface soils and may pose a potential public health concern from inhalation of contaminants.

### 3.3 PRELIMINARY ECOLOGICAL RISK EVALUATION

This ecological risk evaluation used the same general approach as the preliminary human health evaluation, comparing chemical concentrations with appropriate protective criteria. However, more qualitative judgments were made in the ecological evaluation to account for the diverse array of species and the less extensive evaluation methods available for risk determinations. Chemicals of concern were selected based on the results of site sampling. Potential exposure pathways and receptors were identified and the potential toxicity of chemicals of concern was evaluated.

All of the chemicals detected were reviewed in light of potential impacts to ecological receptors. Thus, as with the human health evaluation, every chemical detected in each medium at each site was retained as a chemical of concern if it was detected in excess of background concentrations or was not determined to be a lab contaminant.

A preliminary ecological evaluation was conducted for this site. Ecological toxicity criteria were compared directly with maximum detected chemical concentrations (greater than 10 percent above background levels) at each site, by medium, to evaluate site-specific risks for each receptor group. The following paragraphs describe the results of the risk evaluation for chemicals of concern. The chemicals of concern are compared with environmental criteria in Tables 3-4 through 3-6 and are discussed by medium for the biological groups at risk.

**Table 3-4. Comparison of Surface Soil Contaminants  
Concentrations with Ecological Criteria for Site 3  
120th Fighter Group, International Airport, Great Falls, Montana**

Chemical of Concern	Maximum Release Concentration (mg/kg)	Soil Phytotoxic Concentrations (mg/kg)	Release Concentrations Exceed Criterion?
<b>Organics</b>			
Toluene	0.007		-
<b>Inorganics</b>			
Arsenic	23.4	25-85	No
Barium	665	2,000	No
Chromium	29.9	100-500	No
Copper	21.8	70-640	No
Lead	13.9	1,000	No
Nickel	22.5	50-200	No
Selenium	0.46	10	No
Zinc	71.1	500-2,000	No

mg/kg = milligrams per kilogram

**Table 3-5. Comparison of Subsurface Soil Contaminants  
Concentrations with Ecological Criteria for Site 3  
120th Fighter Group, International Airport, Great Falls, Montana**

Chemical of Concern	Maximum Release Concentration (mg/kg)	Soil Phytotoxic Concentrations (mg/kg)	Release Concentrations Exceed Criterion?
<b>Inorganics</b>			
Arsenic	9.2	25 - 85	No
Copper	13.3	70-640	No
Lead	9.7	1,000	No
Nickel	15	50-200	No

mg/kg = milligrams per kilogram

**Table 3-6. Comparison of Groundwater Contaminants  
Concentrations with Ecological Criteria for Site 3  
120th Fighter Group, International Airport, Great Falls, Montana**

Chemical of Concern	Maximum Release Concentration (mg/L)	Livestock Drinking Water Criteria	Release Concentrations Exceed Criterion?	Irrigation Water Guidelines (mg/L)	Release Concentrations Exceed Criterion?
<b>Organics</b>					
TPH	2	-	-		-
<b>Inorganics</b>					
Zinc	0.066	25	No	2.0	No

mg/L = milligrams per liter

TPH = total petroleum hydrocarbons

## **Soils**

Potential environmental receptors of contaminants of concern in surfaces and subsurface soils sampled at Site 3 are plants and a variety of wildlife species. Available criteria include soil phytotoxic concentrations and agricultural soil guidelines.

Phytotoxic criteria were available for all eight of the inorganic chemicals of concern in surface soils, but not for the organic chemical. None of the criteria were exceeded, indicating a low potential for phytotoxic effects from chemicals of concern in surface soils at Site 3. In subsurface soils, phytotoxic criteria were available for all four inorganic chemicals but none were exceeded, indicating a low potential for phytotoxic effects.

## **Groundwater**

Only TPH and zinc were detected at levels above background concentrations in Site 3 groundwater (Table 3-5). The most likely receptors for groundwater are plants with roots extending to the water table, plants irrigated with groundwater, and livestock or deer and pronghorn that may drink or contact groundwater at the seeps or if the groundwater were pumped to the surface. Criteria available for evaluating risks to environmental receptors include those for zinc in livestock drinking water and in irrigation water. No criteria were exceeded, indicating a low potential for adverse effects to receptors. However, no criteria were available for TPH, precluding an evaluation of its potential adverse effects, but the TPH levels are relatively low and are unlikely to cause potential adverse effects.

#### 4. CONCLUSIONS

The results of the confirmation activities at Site 3 indicated no significant contamination in either soils or groundwater. No TPH contamination was detected in the soil samples. VOC analysis detected acetone and toluene. The concentration of these VOCs are below the EPA Region IX PRGs and the site background concentration. SVOC analysis detected diethylphthalate and butylbenzylphthalate in several samples. The concentration of these phthalates are below the site background concentration and EPA Region IX PRGs.

Metal analysis detected arsenic in soil above the site background and EPA Region IX PRGs. However, the arsenic level in the duplicate sample did not exceed the background concentration. Also, the arsenic levels detected are below the typical State of Montana residential cleanup levels of 100 mg/kg. Typically, the residential cleanup levels are more stringent than the industrial cleanup levels. The current and planned future land use for Site 3 is industrial.

Analyses of groundwater samples taken from the monitoring well at the site indicate low levels of TPH in the October 1990 sampling event. The presence of TPH in the monitoring well at Site 3 was not confirmed in the February 1991, April 1999, and July 1999 sampling events. This, along with the lack of significant contamination in soils, suggests that groundwater has not been impacted by activities conducted at this site.

Site 3 was reportedly used as a fire training area and disposal pit, as discussed previously. The data from the soil borings and the chemical analyses of the soil and groundwater samples from Site 3 provide little indication of residuals from a fire training or disposal area. The laboratory soil and groundwater sample results do not indicate contamination related to past activities at this site.

No potential human health risks from ingestion of contaminants were identified in this evaluation. Also, no ecological receptors were identified as being at risk from chemicals of concern at Site 3.

## 5. RECOMMENDATIONS

Based on the data from the SI and the confirmatory groundwater sampling conducted in April and July 1999, it has been determined that there is no risk to human health and the environment. Therefore, No Further Action is required at Site 3 - North Disposal and Fire Training Pit.

FOR THE CHIEF, NATIONAL GUARD BUREAU

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DAVID C. VAN GASBECK  
Chief of Environmental Division  
Air National Guard

MONTANA DEPARTMENT OF HEALTH AND ENVIRONMENTAL SERVICES

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## 6. REFERENCES

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