

**VOLUNTARY CLEANUP PLAN
MONTANA DEPARTMENT OF TRANSPORTATION
MDOT MAINTENANCE FACILITY HELENA
LEWIS & CLARK COUNTY, MONTANA**

Submitted by:



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List of Acronyms

µg/l	micrograms/liter
µg/kg	micrograms/kilogram
µS/cm	microsiemens per centimeter
ARM	Administrative Rules of Montana
AST	aboveground storage tank
ASTM	American Society for Testing Materials
bgs	below ground surface
CECRA	Comprehensive Environmental Cleanup and Responsibility Act
COPCs	chemicals of potential concern
COCs	chemicals of concern
DAF	dilution attenuation factor
DEQ	Montana Department of Environmental Quality
DO	dissolved oxygen
EP	Extractable Procedure
EPA	US Environmental Protection Agency
ESA	Phase I Environmental Site Assessment
EPH	extractable petroleum hydrocarbons
ERCLs	Environmental Requirements, Criteria, or Limitations
GRO	gasoline range organics
GWIC	Ground Water Information Center
HHS	human health standards
LUST	leaking underground storage tank
MADEP	Massachusetts Department of Environmental Protection
MBMG	Montana Bureau of Mines and Geology
MCA	Montana Code Annotated
MCL	maximum contaminant level
MDA	Montana Department of Administration
MDHES	Montana Department of Health and Environmental Sciences
MODH	Montana Department of Highways
MDT	Montana Department of Transportation
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MTBE	methyl-tert butyl ether
NFA	no further action
NA	not available
NPL	National Priorities List
NRIS	Natural Resource Information System
Olympus	Olympus Technical Services, Inc.
OVA	organic vapor analyzer
OVM	organic vapor monitor
PAH	polynuclear aromatic hydrocarbon
PTS	Petroleum Technical Section
RAGS	Risk Assessment Guidance for Superfund
RBSLs	risk-based screening levels
RSLs	regional screening levels
SVOC	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure
TEH	total extractable hydrocarbons

List of Acronyms, continued

TPH	total petroleum hydrocarbons
USGS	United States Geological Survey
UST	underground storage tank
UCL95	95% upper confidence limit
VCP	Voluntary Cleanup Plan
VCRA	Voluntary Cleanup and Redevelopment Act
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbons
WQB	Water Quality Bureau

1.0 INTRODUCTION

The Montana Department of Transportation (MDT) is submitting this Voluntary Cleanup Plan (VCP) for the MDT Maintenance Facility Helena (Facility) to the Montana Department of Environmental Quality (DEQ) for approval in accordance with the VCP requirements outlined in the Voluntary Cleanup and Redevelopment Act (VCRA) codified in Sections 75-10-730 through 738, Montana Code Annotated (MCA). The Facility, as defined under the Comprehensive Environmental Cleanup and Responsibility Act (CECRA), includes all locations where contamination from the former MDT maintenance facility has come to be located. The VCP addresses soil under this entire Facility, which is located south of and adjacent to the Lewis & Clark County Fairgrounds in Helena, Montana (Figure 1).

This VCP does not address groundwater at the Facility, and the only groundwater analytical results from the Facility investigations that are included in this VCP are those related to discussion regarding potential leachability of identified soil chemicals of concern (COCs) described in Section 5.2. MDT, in conjunction with the property owner (Montana Department of Administration (MDA)) will address groundwater through a separate action. This VCP has been prepared by Olympus Technical Services, Inc. (Olympus) on behalf of MDT. The Facility is currently listed as a high priority facility on the CECRA facility list. This document contains the following:

- an eligibility assessment,
- general VCP information,
- an environmental assessment,
- a remediation proposal, and
- environmental requirements, criteria or limitations.

2.0 ELIGIBILITY ASSESSMENT

As specified in § 75-10-732, MCA, a facility where there has been a release or threatened release of a hazardous or deleterious substance that may present an imminent and substantial endangerment to the public health, safety, or welfare or the environment may be eligible for voluntary cleanup procedures, except for facilities that meet one of the following criteria at the time of application for a VCP:

- a facility that is listed or proposed for listing on the national priorities list (NPL) pursuant to U.S.C. 9601, et seq.;
- a facility for which an order has been issued or consent decree has been entered into pursuant to this part;
- a facility that is the subject of an agency order or an action filed in district court by any state agency that addresses the release or threatened release of a hazardous or deleterious substance;
- a facility where the release or threatened release of a hazardous or deleterious substance is regulated by the Montana Hazardous Waste and Underground Storage Tank Act and regulations under that act; or,
- a facility that is the subject of pending action under this part because the facility has been issued a notice commencing a specified period of negotiations on an administrative order on consent.

The Facility does not meet any of the above criteria, therefore it is considered eligible for the voluntary cleanup program under Section 75-10-732, MCA.

3.0 GENERAL VCP INFORMATION

This section of the document addresses VCP submittal, qualifications of the environmental professionals preparing this VCP, required VCP components, and reimbursement of remedial action costs.

3.1 VCP SUBMITTAL

This VCP is being submitted by MDT for the former Facility in Helena, Montana. Two copies of this document will be submitted to DEQ for review and approval.

3.2 VCP PREPARATION

The DEQ may only accept VCPs under Section 75-10-730 through Section 75-10-738 MCA that are prepared by a qualified environmental professional [Section 75-10-734 (1) MCA].

This VCP was prepared by Olympus, a multi-disciplinary team of engineers, geologists, hydrogeologists, and environmental scientists. Olympus provides technical and field services for all phases of remediation from site investigations to final corrective action. Olympus' technical staff is experienced in a wide variety of remediation projects involving organic and inorganic contaminants in soil, sediment, surface water, and groundwater, including cleanup at numerous CECRA and CERCLA sites. The principal VCP author is Alan Stine, P.G., Principal Hydrogeologist at Olympus. His resume is provided in Appendix A.

3.3 VCP REQUIREMENTS

Section 75-10-733(2), MCA states that a VCP must include the following components.

- A) An environmental assessment of the facility that includes the information required in 75-10-734.
- B) A remediation proposal that includes the information required in Section 75-10-734, MCA and that meets the requirements of Section 75-10-721, MCA.
- C) The written consent of current owners of the facility or property to both the implementation of the VCP and access to the facility by the applicant and its agents and the department [Section 75-10-733 (2)(c), MCA].

An environmental assessment prepared in accordance with Section 75-10-734 MCA is provided in Section 4 of this document. A remediation proposal for the Facility has been prepared to address the requirements in Section 75-10-733, MCA and the proposal is provided in Section 5 of this document.

Pursuant to Section 75-10-733 (2)(c), MCA, MDA hereby consents to implementation of the VCP and grants access to the Facility by the applicant's employees and agents and by the employees, representatives and agents of the DEQ. Consent authorization from a property representative is provided in Appendix B.

3.4 REIMBURSEMENT OF REMEDIAL ACTION COSTS

The MDT agrees to reimburse the DEQ for any remedial action costs that the state incurs in the review or oversight of the VCP for the Facility as required in Section 75-10-733(3),MCA.

3.5 PHASED CLEANUP

Section 75-10-733 (4), MCA, indicates that DEQ may approve a VCP that provides for phases of remediation or that addresses only a portion of a facility. This VCP addresses the Facility as defined in Section 1.0.

4.0 ENVIRONMENTAL ASSESSMENT

4.1 LEGAL DESCRIPTION AND FACILITY MAP

Section 75-10-734, subsection (2) (a), MCA, requires that a VCP include the legal description of the facility and a map identifying the location and size of the facility and relevant features, such as property boundaries, surface topography, surface and subsurface structures, and utility lines.

The Facility occupies a portion of the south $\frac{1}{2}$, south $\frac{1}{2}$, southwest $\frac{1}{4}$ Section 13, Township 10 North, Range 4 West of Lewis & Clark County in the State of Montana as shown in Figure 1. The approximate center of the Facility is at Latitude 46.61662 North and Longitude 112.05743 West. The Facility is located on the northwest side of the Custer Avenue and Henderson Street intersection in Helena, Montana. The Facility occupies approximately nine acres and is enclosed by a gated chain link fence. Ryan Fields Baseball Park is located to the south of the Facility, across Custer Avenue, and Lewis & Clark County Fairgrounds property is located to the west, north, and east of the Facility.

Several buildings are currently located at the Facility and are used by the other Montana state agencies for surplus vehicle and equipment storage. Buildings and other Facility features are shown on Figure 2. Several buried utility lines are present at the Facility, including: natural gas, water, and septic drainfield lines as shown on Figure 3.

4.2 PHYSICAL CHARACTERISTICS

Section 75-10-734 subsection (2)(b), MCA, requires that a VCP include the physical characteristics of the facility and areas contiguous to the facility, including the location of any surface water bodies and groundwater aquifers.

The Facility is located within three air miles from the NOAA weather station (WSO, Helena, MT) located at the Helena Regional Airport. The climate is described as modified continental. A climate data summary provided by the Western Regional Climate Center is provided in

Appendix C. According to the climate data summary, average monthly temperatures range from a low of 19.6 degrees Fahrenheit (F) in January to a high of 69.2 degrees F in July. Precipitation is not abundant in this arid to semi-arid climate. The monthly precipitation average ranges from a minimum of 0.41 inches in February to a maximum of 1.87 inches in June. The average annual precipitation is 11.60 inches. The prevailing wind direction is from the west during each month of the year.

Surface topography at the Facility is generally flat at an elevation of approximately 3860 feet above mean sea level (Figure 1). The Facility property slopes gently towards the northeast at a gradient of approximately 0.02 feet/foot (2%).

The Facility property is fully developed and the ground surface is covered by either buildings or parking and driving areas. The parking and driving areas are generally not paved, although some patches of asphalt pavement are present. Since much of the Facility is covered with buildings or gravel and vegetation is scarce, there is little suitable habitat for most ecological receptors. Although some small mammals may live at and some birds and large mammals may occasionally visit the Facility, these animals would not preferentially search out the Facility.

The Facility is located approximately 4,000 feet southeast of Tenmile Creek, which flows northeast through the Helena Valley and discharges to Lake Helena, which is directly connected to Hauser Lake, a reservoir of the Missouri River. The Facility is not located within the boundaries of the federal Tenmile Creek Superfund facility. Tenmile Creek originates in mountainous terrain west of Helena and drains approximately 200 square miles of mountain and valley land. The nearest US Geological Survey (USGS) gage station (06063000) on Tenmile Creek is located approximately 1.5 miles west-southwest (upstream) of the Facility and has a period of record of daily mean discharge from 1908 to 1954 with seasonal data in 1997 and 1998. Discharge data for this gage station were obtained from the USGS website (USGS, 2009) and they includes 17,260 measurements that range from a minimum daily mean flow of 0 cubic feet second (cfs) to a maximum of 865 cfs. The mean annual streamflow over the period from 1908 to 1954 ranged from 4.38 to 73.5 cfs with an average flow of 27 cfs.

Lake Helena, located approximately seven miles northeast and down gradient of the Facility, is the largest nearby surface water body. Other nearby surface water bodies include the man-made duck pond at the Lewis and Clark County Fairgrounds, Crystal Springs Creek (drains the duck pond), Spring Meadow Lake (a former gravel pit located up gradient and to the southwest of the Facility), and several small ponds located in the Tenmile Creek floodplain (Figure 1). Eleven wetlands in the National Wetland Inventory are located within ¼ mile of the Facility and are shown on Figure 4. Several of the wetlands overlap each other on the map and thus several of the boundaries shown on the map represent multiple wetlands. The Facility is not located in a Federal Emergency Management Agency designated floodplain as noted on the floodplain map provided in Appendix D. The DNRC utilizes FEMA maps for floodplain designation unless they have been modified by local (city or county) regulatory agencies. The Facility area is regulated by the City of Helena and they have not designated the Facility property as a floodplain area as shown on the map in Appendix D.

Geologic conditions near the Facility are characterized by unconsolidated valley alluvium and fluvial and flood deposits from Tenmile Creek. Subsurface geology specific to the Facility was evaluated through logging of soil samples collected during several phases of environmental investigations that included both test pits and hollow stem auger borings. The location of test pits and monitoring well borings are shown on Figure 5 and available soil logs are included in Appendix E. Logs were not available for test pits TP#1 through TP#3, and monitoring well

MW-5, which were from the earlier investigations. Subsurface sediments include sand and gravel throughout the Facility and adjoining areas with occasional clay, silt, and cobbles. In the northwest part of the Facility, peat and black organic and clay rich sand intervals occur from the ground surface to depths of two to four feet below ground surface (bgs). These sediments were likely part of abandoned channel fill and wetland areas related to channel migration of Tenmile Creek. The thickness of the alluvial deposits in this area is unknown.

Groundwater is shallow and unconfined at the Facility. Groundwater occurs in unconsolidated alluvial sediments at depths ranging from approximately 6 to 10 feet bgs. Recharge to the Helena valley-fill aquifer system occurs through infiltration of streamflow, irrigation water, and precipitation, and inflow from fractures in the underlying bedrock (USGS, 1992). The USGS (1992) study indicates that valley-wide, infiltration of precipitation is a minor component of recharge and that the primary mechanisms, in descending order of magnitude, are inflow from fractures in surrounding bedrock, infiltration of excess water applied to irrigated fields, infiltration of streamflow, and leakage from irrigation canals. Since the irrigation water is primarily from surface water sources, the primary source of recharge is ultimately the surface water system. The shallow groundwater quality within the Helena valley aquifer system is largely controlled by the surface water quality of nearby streams. The likelihood that Tenmile Creek recharges the aquifer in this area is indicated by the USGS (1992) study showing Tenmile Creek losing about 8 to 11 ft³/sec to the aquifer system over an approximately 4 mile reach below the confluence with Sevenmile Creek. Although this reach is located downstream from the Facility, the local hydrogeology indicates that Tenmile Creek also recharges the aquifer upstream from the Facility. The USGS topographic map of the area indicates that the Facility is located within the historical floodplain of Tenmile Creek. Together, these data suggest that Tenmile Creek is the primary recharge source for groundwater at the Facility and that the surface and groundwater quality should be similar.

The Woolston well, located to the west of the Facility, is a large diameter shallow water supply well installed by the City of Helena in 1887 as a firefighting water supply. The 1930 Sanborn Fire Insurance Map, shown on Figure 6, shows a steam powered pumping plant was formerly located immediately south of the well and was connected to the City of Helena Water system. More recently, the Woolston well has been used as an irrigation well for the surrounding recreational fields and Fairgrounds property. The well has not been used for drinking water supply.

A system of subsurface drain lines was installed in the late 1800s across the fairgrounds property to artificially drain wetland areas. Subsurface drains located on the north and east sides of the Facility (Figure 3) collect shallow groundwater and discharge to wetlands and a detention pond (Duck Pond) located on the southeast side of the Fairgrounds. The overflow from the Duck Pond enters a branch of Crystal Springs Creek that discharges to Tenmile Creek approximately one mile northeast of the Duck Pond as shown on Figure 1. One 8-inch drain line is located immediately north of the facility fence at a depth of approximately five feet bgs. The construction details for the drainlines on the east side of the Facility are not known; however, it appears that they drain into the drain line on the north side of the Facility. The Fairgrounds drain system likely influences local shallow groundwater flow in the area of the Facility.

Onsite monitoring wells were surveyed for horizontal and vertical location to measure groundwater elevations and hydraulic gradient. Static water level measurements are provided in Table 1, and hydrographs of static water level measurements in the Facility monitoring wells are shown on Figure 7. Potentiometric maps of the water table surface at low and high

groundwater table conditions are shown on Figure 8 and Figure 9, respectively. Groundwater flow direction has been consistent during all measured water level conditions to the north-northeast at a gradient of approximately 0.01 feet/feet. Historical static water level data at the Facility indicate a seasonal water table fluctuation of up to approximately 4.5 feet, although the seasonal fluctuation is typically on the order of 2 to 3 feet.

The Montana Natural Resource Information System (NRIS) was queried for any other impacted facilities, including Federal Superfund, CECRA, leaking underground storage tank (UST), and abandoned mine sites located within ¼ mile of the Facility. The only site that was identified within that search distance was the Joslyn Tailings Facility, which is located approximately ¼ mile southwest of the Facility.

A railroad spur is shown crossing the western portion of the Facility on Sanborn Fire Insurance maps from 1930 (Figure 6), 1951 (Figure 10), and 1951-1958 (Figure 11). While the railroad spur is shown on the Sanborn maps, it appears to have been removed by 1938 as shown on the aerial photograph in Figure 12, which was in the Montana Historic Property Record prepared for the Facility (Montana Historic Society, 2007).

4.3 AREA WELLS

Section 75-10-734, subsection (2)(c), MCA, requires that the VCP provide the location of any wells located on the Facility or on areas within a one-half mile radius of the Facility, and a description of the use of those wells.

The Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC) database has 130 registered wells that are located within a one-half mile radius of the Facility. The list of wells is provided in Appendix F and their approximate locations are shown on Figure 13. The GWIC database lists multiple wells at some of the locations shown on Figure 13. The facility and the Lewis & Clark County Fairgrounds have been supplied with city water since 1952 (Maxim, 1997).

The closest down gradient registered wells are located on Lewis and Clark County Fairgrounds property and the locations were confirmed with Lewis and Clark County Fairgrounds personnel. The nearest down-gradient well is located approximately 2,100 feet north of the Facility as shown on Figure 13. One of the wells located on the Lewis and Clark County Fairgrounds, in the campground area, is listed as a public water supply well. GWIC identified six public water supply wells located within one-half mile of the Facility, although one was identified as a City of Helena water supply well on Fairgrounds and that well is not present at that location. The other well locations appear correct and they are shown on Figure 13. Most of the registered wells are cross gradient to the east of the Facility and are used for domestic water supply. Remaining wells are used for either irrigation, domestic, stockwater, or monitoring purposes. Well use, as identified by GWIC, is included on the list in Appendix F. The registered wells reportedly range in depth up to 334 feet bgs with static water levels ranging up to 98 feet bgs. The minimum well depth and static water levels are not known since the MBMG database reports unknown values as zero. The nearest well to the Facility that is not used solely for monitoring purposes is the Woolston well, which is a large diameter well located less than 100 feet west (cross-gradient) of the Facility. The well is used by Lewis and Clark County Fairgrounds for irrigation purposes.

There are 19 groundwater monitoring wells completed at the Facility. Monitoring well locations are shown on Figure 5. Monitoring wells MW-1 through MW-4 and MW-6 through MW-10 were

installed in 1988 and 1989. Monitoring well MW-5 was an existing 50-foot well that was historically used to test submersible well pumps at the Facility (GeoResearch, 1992). An observation well located near the former underground storage tanks (USTs) in the east part of the Facility was another pre-existing well.

Monitoring wells MW-11, MW-12, and MW-13 were installed in 1994, monitoring wells MW-14 through MW-17 and MW-19 were installed in 2001, and monitoring well MW-20 was installed in 2007. Monitoring well MW-18 was planned in the vicinity of a historical 1,000 gallon capacity UST south of the general storage building, but it could not be completed because of overhead power and was replaced with a test pit (TP-18). Most of the wells were constructed to depths of 15 to 25 feet bgs. Monitoring wells MW-11 and MW-12 were constructed at 11.5 feet bgs in the historical waste dump area.

4.4 GROUNDWATER AND SURFACE WATER USAGE

Section 75-10-734, subsection (2)(d), MCA, requires that the VCP include the current and reasonably anticipated future use of on-site groundwater and surface water. The current onsite groundwater wells are used for monitoring purposes. The Facility is supplied with water by the City of Helena. Groundwater is locally used for turf irrigation. The Woolston water supply well to the west of the Facility is currently used by Lewis and Clark County to irrigate the adjacent recreational sports fields (Ryan and Exchange Fields) and the Fairgrounds property. Future use of groundwater is anticipated to be the same, and groundwater will be addressed separately from this VCP. The groundwater, as defined by ARM 17.30.1006, is Class I because the lowest specific conductivity measured in groundwater samples collected from Facility monitoring wells was less than 1,000 μ Siemens/cm.

There is no onsite surface water; however, an extensive drain system was installed throughout the Fairgrounds area in the late 1800s to drain wetlands. One drain line is located along the north property boundary of the Facility and a drain line in the eastern portion of the Facility discharges into the drain line on the north property boundary. The entire drain system discharges to the Duck Pond located east of the Facility on Fairgrounds property. Overflow from the Duck Pond ultimately feeds back to Tenmile Creek northeast of the Fairgrounds through Crystal Springs Creek. The Tenmile Creek drainage is classified as A-1 in ARM 17.30.610. No surface water is expected to be present in the future and the use of the drainage system for wetlands is anticipated to be the same.

4.5 OPERATIONAL HISTORY OF THE FACILITY

Section 75-10-734, subsection (2)(e), MCA, requires that the VCP describe the operational history of the facility, including ownership, and the current use of the facility, including any readily available aerial photographs from within the state of Montana. The State of Montana owns the property within which the Facility is situated. According to the Montana Historical Society Historic Property Record (Montana Historical Society, 2007), the State of Montana reportedly acquired the Facility, along with surrounding properties, in 1903. Previous to ownership by the State, the Facility was owned by the Daly Bank and Trust Company and H.F.C. Kleinschmidt (Tetra Tech, 2008).

MDT leases the Facility from the State of Montana and the lease is administered by the Montana Department of Administration Facilities Management Bureau. The MDT, formerly known as the Montana Department of Highways (MDOH), has occupied the Facility since the

1920s. Deed records at the Lewis and Clark County Courthouse indicate the parcel was privately owned prior to the State acquiring the fairgrounds parcel, possibly in the late 1800s. The ownership history does not indicate names or company titles, which would be associated with use, generation, or disposal of hazardous materials. The fairgrounds were originally constructed between 1864 and 1872 (Maxim, 1997).

Historically, the Facility was used for MDT maintenance offices, vehicle and equipment maintenance and repair, and bulk fuel and materials storage. Sanborn Fire Insurance Maps dating from 1930, 1951, and 1958, shown on Figure 6, Figure 10, and Figure 11, respectively, indicate that the property was occupied by the Montana State Highway Department for use as a repair shop and storage yard. No other Sanborn Maps showing property use are available. Aerial photographs from 1938 (Figure 12) and 1955 (Figure 14), obtained from the Montana Historic Property Record prepared for the Facility (Montana Historic Society, 2007), show Facility structures consistent with those shown on the Sanborn Maps.

Beginning in the 1970's, MDT maintenance operations were relocated to the current Prospect Avenue location on the east side of Helena. The most recent MDT operations were at the building located in the southwest portion of the Facility, which housed the MDT Core Drill department until 2003.

Several metal buildings and sheds are currently located on the property and are used for storage by the MDT, the Montana Highway Patrol, and the Montana Historical Society. The State Surplus Property Bureau occupies a recently constructed metal building and open lot on the east side of the property for storage, property management, and surplus equipment and vehicle auctions. An aerial photograph, acquired in 1995, of the MDT maintenance shop complex is shown on Figure 15.

The Northern Pacific Railroad Company owned and operated a spur rail line, which bisected the western portion of the Facility and continued on to loading docks at the adjacent Fairgrounds as shown on the 1930 to 1958 Sanborn Maps (Figure 6, Figure 10, and Figure 11). The spur line is identified on fire insurance maps from 1930 through 1958 (Sanborn Map Co., 1930, 1958).

Details of historical waste disposal are provided in a Phase I Facility Investigation report dated July 11, 1988 by the MDOH (MDOH, 1988a). The waste disposal area is delineated on Figure 2. Wastes identified in backhoe test pits completed at the Facility include coal, ash and clinker, equipment parts, metal refuse, asphalt, concrete, paint, and waste petroleum products.

Several above ground storage tanks (ASTs) that contained fuel, road oil, tar, and paint, were historically located mainly in the western part of the Facility. The 1930 Sanborn Map (Figure 6) identified three petroleum ASTs on the south property line of the facility east of the former railroad spur. The 1951 and 1958 Sanborn maps (Figure 10 and Figure 11) show a single 6,000 gallon capacity AST in the same location along with a fuel pump house. MDT file information indicated the location of other ASTs at the facility including a 2,500 gallon capacity diesel AST, a 6,000 gallon capacity road oil AST, and six tar ASTs. In addition, two 10,000 gallon capacity paint ASTs were located to the west of the Main Shop buildings; and an AST (unknown capacity) containing used oil was located on the north side of the Main Garage building. Concrete foundations for the 6,000 gallon AST, the fuel pump house, and two 10,000 gallon paint ASTs remain at the Facility. One railroad fuel fill standpipe present at the south spur line gate was connected to the former fuel pump house via an underground pipe. AST locations are shown on Figure 2. All the ASTs, including the railroad fuel fill standpipe, have been removed from the Facility.

Six USTs are listed in the DEQ files as having been present at the Facility, although location and closure information are only available for five USTs. Various tank capacities have been reported in different reports and DEQ files. The history, size and status of the USTs are summarized in Table 2 using what appears to be the most consistent information in the files. The past locations of five of the USTs are shown on Figure 2. One 1,060 gallon capacity gasoline UST (Tank 1) was located on the south side of the general storage building, and two USTs (2,000-gallon Tank 6 and 4,000 gallon Tank 4) and one diesel UST (10,000 gallon capacity Tank 5) were located on the north side of the new office building. A railroad tank car (unknown capacity, Tank 3) containing used oil was buried along the west fence line of the property. All the USTs have been removed from the Facility. The USTs closed prior to November 1989 were not closed under a DEQ closure permit since they were not in use at that time. USTs closed in 1996 and the piping closed in 2005 were closed under a DEQ UST closure permit.

Two underground storage tank petroleum releases have been reported for the Facility and they have been assigned DEQ leak numbers of 1548 and 3091. Release 1548 was opened in 1988 when petroleum odors were discovered while digging a trench to install a water line on the property; it is not tied to a specific UST. Release 3091 was opened in December 1996 when a release was discovered during closure of UST Tank 5 and the release location is shown on Figure 2. No remedial actions were taken and no impacts to groundwater were observed during closure activities. The DEQ Petroleum Tanks Section (PTS), in 2001, requested that a remedial investigation be conducted for the releases. The remedial investigation was initiated in 2001 and completed in 2002. The results of the investigation (Olympus, 2002), were submitted to DEQ and petroleum hydrocarbons were not detected in soil or groundwater samples at concentrations above DEQ screening levels. Based on these results, the DEQ issued a no further action letter for the releases on September 10, 2003. Additional underground petroleum piping was discovered in 2005 in the vicinity of the historical 15,000 gallon gasoline AST on the south property boundary. The underground piping was removed in August 2005 and although some petroleum odors were reported, closure samples did not contain petroleum hydrocarbon compounds at concentrations above DEQ screening levels. The DEQ PTS issued a memo dated October 20, 2005, indicating that they reviewed the information associated with the suspected release and based on the analytical results have considered it resolved with no need for further investigation or cleanup activities. All petroleum releases associated with the former USTs have been resolved with the DEQ PTS. Although UST features are shown on some of the Figures provided with this VCP, the data related to the investigation of releases from the UST systems is not included in the VCP figures and tables since they were regulated by a separate DEQ action.

4.6 CURRENT AND FUTURE FACILITY USAGE

Section 75-10-734(2)(f), MCA, requires that the VCP include the current and reasonably anticipated future uses of the facility and immediately adjacent properties. The majority of the Facility is under lease by the MDT from the Montana Department of Administration on a month-to-month basis. Other portions of the Facility continue to be used by other State agencies for storage and surplus property auctions. Should the Montana Department of Administration retain the property, then those activities are also the reasonably anticipated future use of the property. Lewis and Clark County has also shown interest in acquiring the property in order to expand the neighboring Lewis and Clark County Fairgrounds. Should Lewis and Clark County purchase the property the use would be recreational in nature.

There is no anticipated change in future use for the Lewis & Clark County Fairgrounds land or the recreational ball fields that are immediately adjacent to the Facility.

4.7 FACILITY CHARACTERIZATION

Section 75-10-734(2)(g), MCA, requires that the VCP include information on the methods and results of investigations concerning the nature and extent of any releases or threatened releases of hazardous or deleterious substances that have occurred at the facility and a map showing general areas and concentrations of hazardous or deleterious substances. Section 75-10-734(2)(h), MCA, requires that the VCP include any sampling results or other data that characterizes the soil, air, groundwater, or surface water on the facility. This section is organized into two primary subsections, one that describes the various phases of investigation that have been conducted at the Facility and another that describes the investigation results for each media (soil gas, soil, and groundwater) investigated.

4.7.1 FACILITY INVESTIGATION HISTORY

In 1988, a contractor for Casne and Associates (Casne) reported the discovery of shallow buried waste in the western part of the Facility during the excavation of a new water line for the Lewis & Clark County Fairgrounds. The water line trench is delineated in Figure 2. Upon notification by Casne, the Montana Water Quality Bureau (WQB) inspected the trench and observed metal debris (oil filters, cables, doors, wheel rims), battery casings, petroleum contaminated soil, and asphalt (WQB, 1988). Waste was observed from three to six feet bgs. Groundwater in the trench had a petroleum odor and a visible sheen on the surface. A barrel storage area to the northwest of the trench contained paint barrels that showed signs of spillage (WQB, 1988).

The area was situated in a low lying swampy part of the Facility and MDOH personnel indicated that the waste pit was backfilled and leveled with approximately 2 to 3 feet of fill when waste dumping ceased in 1964 (WQB, 1988). The waste dump area is shown on Figure 2. The new water line was relocated and several investigations were subsequently conducted at the Facility from 1988 to 2001 to assess potential impacts to soil and groundwater from waste disposal and Facility activities.

Phase I, II, and III Facility Investigations were conducted in 1988 and 1989 by the WQB and the MDOH and results were presented in summary reports dated July 1988 (MDOH, 1988a), September 1988 (MDOH, 1988b), and April 1989 (MDOH, 1989). GeoResearch, Inc. (GeoResearch) conducted a field investigation and performed a review of the Facility Investigations and presented the results in a Report of Remedial Investigation Review submitted to the MDT in January 1992 (GeoResearch, 1992). MSE Inc. collected surface soil samples in 1992 and presented the results in a report dated December 14, 1992 (MSE, 1992). Huntingdon Engineering and Environmental, Inc. (Huntingdon) performed additional Facility investigation and presented the results in a Supplemental Environmental Investigation Report dated August 1994 (Huntingdon, 1994). The MDT continued investigatory work at the Facility and presented the results in an Environmental Status Report submitted to the DEQ in January 1996 (MDT, 1996). In 2001, Olympus conducted investigatory work at the Facility and the results are presented in this VCP. The MDT completed additional soil and groundwater sampling over the period from 2005 to 2008 and the data were submitted to DEQ in a series of investigation reports. Olympus collected surface soil samples across the Facility in 2009 and those results

are presented in this VCP. The historical field investigations and results are described below. Copies of all analytical data collected during the investigations are provided in Appendix G.

Laboratory analytical data was validated for usability and validation review forms are included with the analytical reports in Appendix G. In general, the data are considered valid for use in risk assessment and remedial alternative design. Deviations from this use assessment are indicated where the data are presented in the following sections.

4.7.1.1 WQB AND MDOH INVESTIGATIONS 1988 AND 1989

A sludge sample collected in 1988 from the buried tank car was analyzed for metals and SVOCs and the analytical results are summarized in Table 3. The laboratory reports are provided in Appendix G. The data validation review indicates that they are useable for waste characterization purposes. The sludge contained metals including lead, zinc, and copper, and contained trace concentrations of SVOCs. The tank car and its contents were excavated and removed from the Facility in 1988.

A total of 19 test pits were excavated at and near the Facility in 1988 and 1989 by the MDOH (MDOH, 1988-1989). Test pit locations are shown on Figure 5. Four test pits, TP1 through TP4, were excavated in April 1988 and ten test pits, TP5 through TP14, were excavated in June 1988. Test pit TP15 was a portion of the water line trench that was logged for soil descriptions. In November 1988, test pits were excavated adjacent to TP6, TP9, TP11, and TP13 for the collection of soil samples and those test pits were identified as TP6B, TP9B, TP11B, and TP13B. Soil samples collected from those test pits were analyzed for Extraction Procedure Toxicity (EP Toxicity) analysis for metals, volatile organic compounds (VOCs), SVOCs, and pesticides, and the results are summarized in Table 4, Table 5, Table 6, and Table 7, respectively. The EP Toxicity test was used at that time to assess whether wastes would be considered RCRA Hazardous on a characteristics basis. EP Toxicity analysis has since been replaced by the toxicity characteristic leaching procedure (TCLP). Target analytes were not detected above method detection limits for any of the samples.

Groundwater samples were collected from test pits TP1 and TP4 for laboratory analyses. Since arsenic, cadmium, selenium and some PAHs have been identified as COCs for soil at the Facility, the groundwater analytical results for those compounds are summarized in Table 8. The samples collected from the test pits are only usable for screening purposes because sediment is commonly stirred up in the pits and the sediment can contain metals that may be released during sample digestion.

Groundwater samples collected at the Facility have been analyzed for both total and dissolved metals. The dissolved method differs from the total metals method in that the dissolved samples are filtered at the time of collection. The EPA maximum contaminant levels (MCLs) are based on a total recoverable analysis while HHS are based on a dissolved analysis. MCLs were promulgated to ensure safe drinking water at the tap and the analytical method is based on that premise. However, due to the sporadic nature of sampling from monitoring wells, they often do not achieve the level of development of water supply wells. This is exacerbated by the fact that monitoring wells are often completed in fine-grained formations that would not be utilized as a water source, and it is difficult to fully develop a well in these formations so that it does not produce suspended sediment. This effect occurs at this Facility as evidenced by the fact that wells MW-12 and MW-13 have silted in to the point where they could no longer be used for sampling. Field personnel have also noted that the water produced from the wells is often

turbid. The sediment in the samples can contain metals that may be released into the water sample during the digestion portion of the analysis. Thus, the analytical results indicate higher concentrations of metals than are actually present in the ground water. The total metals results for samples collected from the Facility are up to three orders of magnitude higher than the dissolved analysis. Because the sample integrity is compromised by the suspended sediment, the total metals analysis data for ground water samples collected from monitoring wells are considered suspect and are not suitable to be used for comparison to regulatory levels.

The COCs were not detected in the groundwater samples except for arsenic, which was present in concentrations that exceed the HHS.

A field screening soil gas survey was conducted at the Facility in 1988 and 1989 using a portable photo-ionization detector (PID) and a flame-ionization detector (FID). In 1988, a soil gas survey was conducted at thirteen locations in the historical waste dump area (A through I and 1A through 1D shown on Figure 16), and field screening was performed on test pits (TP4 through TP14) during excavation activities. A more extensive soil gas survey was performed in 1989 at 36 locations in the historical waste dump area (2A through 6E shown on Figure 16). Borings were completed in the waste dump area to a depth of approximately 4.5 feet and organic vapor analyzer (OVA) and PID measurements were recorded in each probe hole. Soil survey locations are shown on Figure 16 and test pit locations are shown on Figure 5.

Field screening results for soil gas surveys conducted in 1988 and 1989 by the MDOH are presented in Table 9. Only minor amounts of organic vapors were measured in open air sampling along the test pit walls. Organic vapors were detected in TP6B and TP9B and measurements peaked at 80 ppm and 20 ppm, respectively. The soil gas data are valid only for screening purposes.

Generally, amounts of organic vapors detected during the soil surveys conducted in 1988 in the waste dump area were minor. More significant were measurements taken during the survey conducted in 1989. There were several probe holes with organic concentrations elevated above the scale limits of the OVA (>1000 ppm). The OVA measurements were higher than the HNu (PID) measurements, suggesting the presence of methane gas. Contours delineating the areas of high organic vapor concentrations are shown on Figure 16.

Monitoring wells MW-1 through MW-10 were constructed in 1988 and 1989 by the MDOH (Figure 5). Groundwater samples were collected in June and November 1988, and May and July 1989 for laboratory analyses. Since arsenic, selenium and some PAHs have been identified as COCs for soil at the Facility; the groundwater analytical results for those compounds are summarized in Table 4 and Table 8. The COCs were not detected in the groundwater samples with the exception of arsenic, which was present at concentrations that equal or exceed the HHS in samples collected from wells MW-4 and MW-9.

4.7.1.2 GEORESEARCH INVESTIGATION 1991-1992

GeoResearch reviewed the field investigations conducted by the MDOH and concluded that soil contamination by petroleum products had been visually identified in two separate areas of the Facility, but had not been confirmed through laboratory analyses, therefore additional sampling was recommended to confirm potential impacts (GeoResearch, 1992).

GeoResearch conducted field screening with an organic vapor monitor (OVM), which is a type of photoionization detector, and a portable gas meter for detecting combustible gases at two locations (G-1 and G-2 shown on Figure 16) in the waste dump area where measurements had previously exceeded the scale limits of the meter (>1,000 ppm). The portable gas meter was calibrated for methane. A probe was driven to a depth of approximately 4 feet bgs and field screening was performed at one-foot intervals. One soil gas sample was collected for laboratory analyses. The field screening results are summarized in Table 9. The data are considered valid for screening purposes only.

Only minor amounts of organic vapor concentrations were detected by GeoResearch in 1991, and minor amounts of combustible gases were detected throughout probe holes G-1 and G-2. The highest measurement of combustible gas was at 3 feet bgs in probe hole G-2. A soil gas sample was collected into a tedlar bag at that location and submitted for methane and total petroleum hydrocarbon analyses. This total petroleum hydrocarbon analysis measured volatile organic compounds and is analogous to a total purgeable hydrocarbons analysis (TPH). Neither methane nor TPH were detected in the sample; however, the concentration of combustible gases in the probe hole had decreased during the collection of the sample (GeoResearch, 1992); thus, the sample was not necessarily representative of worst-case conditions. Laboratory analyses confirmed that a light hydrocarbon, such as methane, was present in the sample; however, sample interference prevented identification of the gas.

4.7.1.3 MSE INVESTIGATION 1992

Surface soil samples HSL-1 through HSL-6 were collected in October 1992 by MSE in response to a waste management compliance evaluation conducted by the Montana Department of Health and Environmental Sciences (MDHES) in August 1992. The soil samples were collected at oil stained or stressed vegetation areas near AST locations around the Facility and submitted for laboratory analyses. The soil sample locations are shown on Figure 5.

Six surface soil samples (HSL-1 through HSL-6) collected in 1992 in the vicinity of ASTs were analyzed for E.P. Toxicity, VOCs, and total petroleum hydrocarbons using a method that is similar to total extractable hydrocarbons (TEH). Because the DEQ currently recognizes a total purgeable hydrocarbons (TPH) analysis for volatile petroleum hydrocarbons (VPH) and TEH for semi-volatile petroleum hydrocarbons, the surface soil total petroleum hydrocarbon results will be herein referred to as TEH.

Chromium and lead were both detected in the EP Toxicity analysis, but at concentrations below those which would classify the soil as hazardous. TEH compounds were detected in each of the six surface soil samples (HSL1 through HSL6). Based on Massachusetts Department of Environmental Protection guidance, when the results from samples HSL-1, HSL-2, and HSL-6 are converted to C11-C22 aromatics compounds, soils do not exceed the residential surface soil RBSL of 400 mg/kg.

The DEQ has developed a ceiling concentration of 2,500 mg/kg for total diesel range fractions in residential soil. The ceiling concentration is exceeded in surface soil samples HSL-3, HSL-4, and HSL-5. MSE, Inc. had recommended in a report to the MDT dated December 14, 1992 that the stained soil be removed (MSE, 1992). Records pertaining to the final disposition of the soil are not available. The area of surface soil samples HSL-3, HSL-4, and HSL-5 was inspected by Olympus and DEQ personnel in 2001. The historical used oil AST was gone and surface staining was no longer visible in this area. Based on these observations, investigation for

existing petroleum hydrocarbon impacts in this area was conducted through the drilling of borings and collection of subsurface samples from the borings in 2001 as described in Section 4.7.1.6. Petroleum hydrocarbon impacted soil was not observed in samples collected from the borings.

4.7.1.4 HUNTINGDON INVESTIGATION 1994

Huntingdon performed an additional Facility investigation in 1994 to assess potential groundwater impacts and evaluate the integrity of Facility monitoring wells. Groundwater samples were collected from all Facility monitoring wells and the Woolston well in June 1994 for laboratory analyses. Huntingdon concluded that the integrity of some wells was questionable due to the method of completion, lack of security, and current monitoring well installation standards (Huntingdon, 1994). Since arsenic, selenium, and some PAHs have been identified as COCs for soil at the Facility, the groundwater analytical results for those compounds are summarized in Table 8.

Arsenic was detected in several of the groundwater samples but the HHS for arsenic was only exceeded in the sample collected from well MW-9. Selenium and PAHs were not detected in any of these groundwater samples.

4.7.1.5 MDT INVESTIGATIONS 1994, 1995, and 1996

The MDT constructed three wells at the Facility in December 1994: MW-11, MW-12, and MW-13. Monitoring well MW-11 was installed in the Ryan Fields ball park area as a background well and monitoring wells MW-12 and MW-13 were installed in the historical waste dump area to further assess impacts to shallow groundwater. Field screening was performed during borehole drilling activities and soil samples were collected from boreholes MW-12 and MW-13. The subsurface soil samples were analyzed for VOCs, SVOCs, and metals and the results are summarized in Table 5, Table 6, and Table 11, respectively. The data validation indicates that they are usable for risk assessment purposes, with the exception of di-n-butylphthalate and methylene chloride results, which were detected as laboratory contaminants.

Arsenic was the only metal detected at concentrations above a screening level. The DEQ applies a risk-based screening level for subsurface soil of 300 mg/kg as long as it can be demonstrated that the arsenic is not leaching to groundwater. That demonstration is provided in 4.7.2.3 and the 300 mg/kg screening level was not exceeded. No SVOCs were detected in the samples and the only VOCs detected were 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene, at concentrations below their respective screening levels.

Groundwater samples were collected from wells MW-11 and MW-12 in January 1995 and analyzed for metals, SVOCs, and VOCs. Monitoring well MW-13 silted in and was not accessible; therefore the well was not sampled. Since arsenic, cadmium, selenium, and some PAHs have been identified as COCs for soil at the Facility, the groundwater analytical results for those compounds are summarized in 8. Arsenic was detected in both groundwater samples but the HHS for arsenic was not exceeded. Selenium, cadmium, and PAHs were not detected in any of these groundwater samples.

The gasoline and diesel USTs located on the north side of the core drill office building were removed in 1996. The UST data are not included in this VCP since the work was regulated by the PTS and all Facility UST releases have been deemed closed by the PTS.

4.7.1.6 OLYMPUS INVESTIGATION 2001

Five additional monitoring wells, MW-14 through MW17 and MW-19, were constructed at the Facility by Olympus in June 2001 to replace wells where the integrity was in question. The completion and installation methods used for constructing Facility monitoring wells MW-1, MW-2, MW-3, MW-5, MW-7, MW-8, and MW-10 were questionable; therefore those wells were not sampled in 2001. The wells were left in place to be used as piezometers for measuring the potentiometric surface of the groundwater.

Well MW-9 had been severely damaged; however, it was located down gradient in a strategic monitoring position, so well MW-14 was installed as a replacement well and well MW-9 was abandoned in 2007. Monitoring well MW-12 did not recharge during a sample attempt in 2001 and may have silted in, as did monitoring well MW-13 located in the same area. Wells MW-12 and MW-13 were important for monitoring in the historical waste dump area; therefore, monitoring well MW-17 was installed as a replacement well. Monitoring wells MW-15 and MW-16 were installed to assess potential impacts to groundwater at historical AST locations. Monitoring well MW-19 was installed to assess potential impacts related to historical USTs. Monitoring well locations are shown on Figure 5.

Two soil borings, B1 and B2, were drilled at the historical used oil AST located north of the wash and garage building to test for petroleum hydrocarbon impacts detected in surface soil samples collected during the 1992 MSE investigation. The ground surface has been disturbed since the 1992 investigation and surface soil staining is no longer visible in the area. Field screening was performed during drilling operations and soil samples were collected from all boreholes at worst case locations or from just above the water table. The installation of a monitoring well (MW-18) was planned at the former gasoline UST area located south of the general storage building, but was not possible due to overhead power lines; therefore, a test pit (TPMW-18) was excavated at the area in November 2001 and a soil sample was collected from just above the water table. Borehole and test pit locations are shown on Figure 5.

The subsurface soil samples were analyzed for VPH and/or EPH screen and the results are summarized on Table 12. Petroleum hydrocarbon data related to well MW-19 and test pit TP-18 are not included in this VCP since they were collected to investigate UST releases that were regulated by the PTS. VPH analytes were not detected and while EPH was detected in several samples, the results were below the DEQ action level of 200 mg/kg, at which additional fractionation is required.

Groundwater samples were collected from Facility monitoring wells in both June and December 2001 for laboratory analyses. Groundwater samples were collected using bailers during the June 2001 groundwater monitoring event and using a bladder pump following a low flow sample method during the December 2001 monitoring event. The samples were analyzed for VPH, EPH, and metals. Since naphthalene, arsenic, cadmium, and selenium are the only of these constituents that have been identified as COCs for soil at the Facility, the groundwater analytical results for those chemicals only are summarized in Table 8. While groundwater samples were analyzed for both total and dissolved metals, only the dissolved results are used for comparison to screening levels as described in Section 4.7.1.1. Arsenic was detected in all of the groundwater samples and dissolved concentrations of arsenic equaled or exceeded the HHS in samples collected from wells MW-4, MW-11, and MW-14. Naphthalene, selenium, and cadmium were not detected in the samples.

4.7.1.7 MDT SOIL AND GROUNDWATER SAMPLING 2005-2008

MDT collected additional soil samples from eight test pits (VCP-TP1 through VCP-TP8) located in three areas in 2005 to further evaluate the background levels of arsenic in soil and groundwater at the Facility. MDT also collected groundwater samples from eleven Facility monitoring wells in July 2005 to further assess arsenic distribution. MDT conducted groundwater monitoring in May 2006 in which samples were collected from eleven Facility monitoring wells and analyzed for VPH, EPH, metals, major ions, organic carbon, and alkalinity.

MDT constructed an additional up-gradient monitoring well on the Ryan Park Ball Field in May 2007. Groundwater samples were also collected from the selected monitoring wells in April, June, and September 2007 and February and April 2008. All of the MDT groundwater monitoring was conducted following low-flow sampling methods. Groundwater samples were variously analyzed for metals, petroleum hydrocarbons, and organic carbon.

Since arsenic and selenium are the only of these constituents that have been identified as COCs for soil at the Facility, the groundwater analytical results for arsenic and selenium only are summarized in Table 8. Arsenic was detected in most of the groundwater samples and arsenic concentrations equaled or exceeded the HHS in samples collected from wells MW-11, MW-14, MW-15, MW-19, and MW-20. Selenium was not detected in the samples.

4.7.1.8 TETRA TECH PHASE I ENVIRONMENTAL SITE ASSESSMENT 2008

Tetra Tech, Inc. (Tetra Tech) performed a Phase I Environmental Site Assessment (ESA) of the Facility in 2008 for Lewis and Clark County. The purpose of the ESA was to develop information to identify current and historical recognized environmental conditions in connection with the property. Lewis and Clark County requested the ESA because they are interested in acquiring the property in order to expand the Lewis and Clark County Fairgrounds. Based on the results of this investigation, Tetra Tech drew the following conclusions.

Historical Recognized Environmental Conditions as defined by ASTM Practice E 1527-05 exist at those Sites that have been remediated. Historical recognized environmental conditions identified by Tetra Tech during the investigation are summarized below:

- Soil staining associated with diesel and road oil ASTs in the northwest portion of the Site was identified in a 1992 letter from the MDEQ Hazardous Waste Program. Soil samples collected of stained areas revealed petroleum contamination. It was recommended that the affected areas be excavated and removed. In 2001, the stained surfaces were no longer present and a subsurface investigation conducted to assess whether the soil had been buried revealed no evidence of the contamination. Therefore, soil staining associated with ASTs in the northwest portion of the Site is a historical recognized environmental condition.
- Hazardous waste compliance issues identified at the Site in 1992 consisted of approximately 150 drums and 80 five-gallon containers of unmarked waste. Drums and containers were opened, consolidated, and sampled and found to contain solid and liquid white and yellow paint and paint mixed with solvents. The liquid and solid yellow paints and white liquid paints were characteristic hazardous waste and were disposed of at an authorized TSD facility. White solid paints were non-hazards and were disposed

of at a Class II landfill. Proper removal and disposal of drums and containers from the Site represents a historical recognized environmental condition.

De Minimis Conditions as defined by ASTM Practice E 1527-05, generally do not present a material risk of harm to public health or the environment and would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. De minimis conditions identified by Tetra Tech at the Site are summarized below.

- The northwest portion of the Site was used for disposal of liquid and solid waste including ash and clinker, car parts, gasoline, diesel, cleaning solvents, and old paint from 1928 through 1963. Several phases of investigation were performed by MDT including drilling and installation of nine monitoring wells, excavation of 14 test pits, a soil gas survey at the test pits and 48 probe holes, and laboratory testing of soil and water samples to determine impacts associated with the former dumping area. Low levels of petroleum hydrocarbon compounds were detected in several samples collected from the Site, but neither groundwater standards nor risk-based screening levels were exceeded. Based on the data collected during the numerous investigations at the Site, and concurrence from MDEQ that no further investigation is needed, the former dumping area on the northwest portion of the Site represents a de minimis condition.
- During UST removal activities at the Site in 1996, soil samples from the tank excavation revealed concentrations up to 460 ppm total extractable hydrocarbons, signifying a petroleum release had occurred. Soil and groundwater samples from nearby monitoring well did not reveal petroleum hydrocarbon concentrations above laboratory method detection limits. MDEQ determined that overexcavation of the tank basin to remove the petroleum-impacted soil was not necessary and in September, 2003 issued a “no further corrective action required” letter. Therefore, residual contamination associated with this petroleum release represents a de minimis environmental condition.
- The asphalt floor in the Vehicle Storage building was significantly stained with waste oil. Since the waste oil appears to have been contained by the asphalt surface, it represents a de minimis environmental condition. Oil-stains observed on concrete floors of several other buildings at the Site, also represent de minimis conditions.
- A small area of paint-stained gravel observed on the west portion of Site appeared to be surficial and therefore, represents a de minimis environmental condition.

Recognized Environmental Conditions as defined by ASTM Practice E 1527-05, are the presence or likely presence of any hazardous substances of petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release into the ground, groundwater or surface water of the property. Recognized environmental conditions, as defined in the ASTM standard, identified by Tetra Tech during this investigation are summarized below:

- Arsenic levels in groundwater at the Site are elevated above MDEQ-7 water quality standards. Groundwater is not being addressed by this VCP but will be addressed by MDT as a separate action.
- A number of floor drains are located in the various shop buildings on the Site. These drains were reportedly filled with concrete in around 1995. It is unknown whether shop

wastes were placed in the floor drain systems during the 50+ years some were in use prior to being filled. Historical maps of the Site indicate there are at least four drain fields and one septic system in the central portion of the Site connected to the various shop facilities. Drain fields located north of the Wash/Garage/Stall building serve that building and the General Storage building; the two oldest structures on the Site where vehicle maintenance was performed. Groundwater data from monitoring wells MW-9 and MW-14, located upgradient from the drain fields, indicate no impacts from petroleum constituents, dissolved metals, or semi-volatile organic compounds (the only constituents analyzed). Drain fields that may have received waste from floor drains in the associated buildings represent a potential recognized environmental condition

The groundwater investigations conducted at the Facility have not identified impacts that may have been associated with the floor drains. The floor drains were historically plugged with concrete and no longer discharge to the drainfields.

4.7.1.9 OLYMPUS SURFACE SOIL INVESTIGATION 2009

A VCP was submitted to DEQ in December 2008 and in order to address a data gap an investigation was performed of the surface soil in the vicinity of an abandoned railroad spur. The abandoned railroad spur samples were collected in May 2009. The area of the abandoned railroad spur was divided into four subareas (RR-1 through RR-4) as shown on Figure 17. Two five-point composite surface soil samples were collected from each of the four subareas, one from the interval of 0 to 6 inches below ground surface and one from the interval of 6 to 24 inches below ground surface. The five sub-samples were distributed evenly throughout each sample area, to the extent that the underground utilities allowed. Actual subsample locations are shown on Figure 17. The samples were collected from test pits excavated at each subsample location. The sampling and analysis was conducted in accordance with a sampling and analysis plan (Olympus 2009a).

The soil samples were analyzed variously for VPH, EPH Screen and PAHs, metals, herbicides, and pesticides and the results are summarized in Table 13, Table 14, Table 15, Table 16, and Table 17, respectively. Pesticides were not detected in any of the samples. Herbicides were not detected in any of the samples, although the laboratory experienced equipment contamination by 2,4-D from samples they had received from another source, which resulted in increased detection limits for 2,4-D. EPH screen concentrations exceeded the DEQ fractionation screening level (200 mg/kg) in four of the samples and those samples were further analyzed for PAHs. The RBSLs were exceeded for several constituents in some of the samples, including benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. The VPH method detection limits for benzene and methyl tertiary butyl ether (MTBE) exceed their respective RBSLs. Due to laboratory instrument limitations, it is technically infeasible to bring the method detection limits down to the level of the RBSLs for benzene and MTBE. Based on the MADEP VPH method, laboratories use a practical quantitation limit of 0.050 mg/kg for benzene and 0.10 mg/kg for MTBE with slight adjustments on a sample to sample basis due to soil moisture content. The residential soil RBSLs are 0.04 mg/kg for benzene and 0.08 mg/kg for MTBE. In cases where the standard method detect limit exceeds the RBSL, a non-detect value in a sample is considered to not exceed the RBSL. Naphthalene was the only VPH compound detected and it was observed in two samples at estimated concentrations that exceed the SSL, but not the RBSL. Both the SSL and RBSL are based on leaching of naphthalene to groundwater. When an RBSL and SSL are both available for a compound, the RBSL is used by the DEQ for comparison purposes. The metals arsenic,

barium, cadmium, chromium, lead, and selenium were detected in the samples, but only concentrations of arsenic and selenium exceeded any screening level and the selenium only exceeded the EPA SSL for potential leaching of soil to groundwater.

Based on these results, additional Facility-wide surface soil sampling for arsenic and PAHs analysis was conducted. A surface soil sampling and analytical plan (Olympus, 2009b) was prepared and the sampling was completed in June 2009. Eight sample areas (SS-1 through SS-8) were selected across the Facility as shown on Figure 17. Sample procedures for these areas were similar to the railroad spur investigation in which 5-point composite samples were collected from each area over the depth intervals of 0 to 6 inches below ground surface and 6 to 24 inches below ground surface. Samples were collected with a direct-push drill rig using a continuous core sampler. The samples were analyzed for PAHs and/or arsenic and the analytical results are summarized in Table 14 and Table 15, respectively. The DEQ screening level for arsenic was exceeded in one sample and the RSLs for various PAHs were exceeded in several of the samples. Arsenic and PAH exceedances are addressed in Section 4.7.2.4.

4.7.2 FIELD INVESTIGATION RESULTS

4.7.2.1 SOIL GAS SURVEYS

Field screening results for soil gas surveys conducted in 1988 and 1989 by the MDOH are presented in Table 9. Only minor amounts of organic vapors were measured in open air sampling along the test pit walls. Organic vapors were detected in TP6B and TP9B and measurements peaked at 80 ppm and 20 ppm, respectively.

Generally, amounts of organic vapors detected during the soil surveys conducted in 1988 in the waste dump area were minor. More significant were measurements taken during the survey conducted in 1989. There were several probe holes with organic concentrations elevated above the scale limits of the OVA (>1000 ppm). The OVA measurements were higher than the HNu (PID) measurements, suggesting the presence of methane gas. Contours delineating the areas of high organic vapor concentrations are shown on Figure 16.

Only minor amounts of organic vapor concentrations were detected by GeoResearch in 1991, and minor amounts of combustible gases were detected throughout probe holes G-1 and G-2. The highest measurement of combustible gas was at 3 feet bgs in probe hole G-2. A soil gas sample was collected into a tedlar bag at that location and submitted for methane and total petroleum hydrocarbon analyses. This total petroleum hydrocarbon analysis measured volatile organic compounds and is analogous to a total purgeable hydrocarbons analysis (TPH). Neither methane nor TPH were detected in the sample; however, the concentration of combustible gases in the probe hole had decreased during the collection of the sample (GeoResearch, 1992). This decrease could indicate that higher concentrations of organic vapors may have been present in soil gas generated during purging, but that was not submitted to a laboratory for analysis. Laboratory analyses confirmed that a light hydrocarbon, such as methane, was present in the sample; however, sample interference prevented identification of the gas.

4.7.2.2 SURFACE SOIL ANALYTICAL RESULTS

Six surface soil samples (HSL-1 through HSL-6) collected in 1992 in the vicinity of ASTs were analyzed for E.P. Toxicity, VOCs, and total petroleum hydrocarbons using a method that is similar to total extractable hydrocarbons (TEH). Because the DEQ currently recognizes a total purgeable hydrocarbons (TPH) analysis for volatile petroleum hydrocarbons (VPH) and TEH for semi-volatile petroleum hydrocarbons, the surface soil total petroleum hydrocarbon results will be herein referred to as TEH. AST and soil sample locations are shown on Figure 5 and analytical results are summarized in Table 4 and Table 10. DEQ Tier 1 risk-based screening levels (RBSLs) (DEQ, 2009) based on residential exposure scenarios, EPA regional screening levels (RSLs) (EPA, 2008) based on residential exposure, and EPA soil screening levels (SSLs) for leaching to groundwater are provided on the tables for comparison purposes. The SSLs have been recalculated to levels based on Montana guidelines of leaching to concentrations less than HHS, using a dilution attenuation factor of 10. These various screening levels are not necessarily cleanup levels, but are used to evaluate whether additional investigation is needed. The only VOCs detected were toluene (0.017 mg/kg) and xylene (0.006 mg/kg) in sample HSL-1, which are both below their respective RBSLs, RSLs, and SSLs.

TEH compounds were detected in each of the six surface soil samples (HSL1 through HSL6) collected in 1992. Based on MADEP guidance, when the results from samples HSL-1, HSL-2, and HSL-6 are converted to C11-C22 aromatics compounds, soils do not exceed the residential surface soil RBSL of 400 mg/kg. The DEQ has developed a ceiling concentration of 2,500 mg/kg for total diesel range fractions in residential soil. The ceiling concentration is exceeded in surface soil samples HSL-3, HSL-4, and HSL-5. MSE, Inc. had recommended in a report to the MDT dated December 14, 1992 that the stained soil be removed (MSE, 1992). MDT has reviewed their files regarding historical activities at the Facility and no records were found pertaining to the final disposition of the soil. The area of surface soil samples HSL-3, HSL-4, and HSL-5 was inspected by Olympus and DEQ personnel in 2001. The historical used oil AST was gone and surface staining was no longer visible in this area. It is believed that the soil was removed shortly after the original analytical results were received, although disposal documentation cannot be found. Based on these observations, investigation for existing petroleum hydrocarbon impacts in this area was conducted through the drilling of borings and collection of subsurface samples from the borings. As described in Section 4.7.2.3, petroleum hydrocarbon impacted soil was not observed in the borings.

Surface soil samples were collected from locations RR-1 through RR-4 and SS-1 through SS-8 in 2009. Composite samples from 2 depth intervals, 0 to 6 inches BGS, and 6-24 inches BGS, were collected from each area. The soil samples collected at locations RR-1 through RR-4 were analyzed variously for VPH, EPH Screen and PAHs, metals, herbicides, and pesticides and the results are summarized in Table 13, Table 14, Table 15, Table 16, and Table 17, respectively. Herbicides and pesticides were not detected in any of the samples. EPH screen concentrations exceeded the DEQ fractionation screening level (200 mg/kg) in four of the samples and those samples were further analyzed for PAHs. The RBSLs were exceeded for several constituents in some of the samples, including benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Naphthalene, toluene, and xylenes were the only VPH compounds detected. Toluene and xylenes were detected in one sample (RR4-D) at concentrations below their respective screening levels. Naphthalene was observed in two samples at estimated concentrations that exceed the SSL, but not the RBSL. When an RBSL and SSL are both available for a compound, the RBSL is used by the DEQ for comparison purposes. The concentrations of volatiles measured in these samples were the highest measured at the Facility and thus

represent the greatest potential for vapor intrusion. As described in Section 4.8.4.5, these concentrations of volatile organics do not warrant further vapor intrusion evaluation at the Facility. The metals arsenic, barium, cadmium, chromium, lead, and selenium were detected in the samples, but only concentrations of arsenic and selenium exceeded any screening level and the selenium only exceeded the EPA SSL for potential leaching of soil to groundwater.

Based on these results, the additional Facility-wide surface soil sampling for arsenic and PAHs was conducted in 2009. Eight sample areas (SS-1 through SS-8) were selected across the Facility as shown on Figure 17. Sample procedures for these areas were similar to the railroad spur investigation in which 5-point composite samples were collected from each area over the depth intervals of 0 to 6 inches below ground surface and 6 to 24 inches below ground surface. The samples were analyzed for PAHs and/or arsenic and the analytical results are summarized in Table 14 and Table 15, respectively. The DEQ screening level for arsenic was exceeded in one sample and the RSLs for various PAHs were exceeded in several of the samples. The potential for these constituents to impact groundwater at the Facility is discussed in Section 4.7.2.4.

4.7.2.3 SUBSURFACE SOIL ANALYTICAL RESULTS

Subsurface soil samples collected in November 1988 from four test pits (TP6B, TP9B, TP11B, and TP13B) were analyzed for E.P. Toxicity, VOCs, SVOCs, and pesticides/herbicides. Test pit locations are shown on Figure 5 and analytical results are presented in Table 4, Table 5, Table 6, and Table 7. The samples were collected from a variety of depth interval from 0 to 4.5 feet below ground surface, as indicated on the tables. Resource Conservation and Recovery Act (RCRA) limits for hazardous waste characterization are provided on Table 4 and available RSLs, SSLs, and RBSLs are provided on Table 5, Table 6, and Table 7 for comparison purposes. Target analytes were below detection limits for all of these analyses.

Subsurface soil samples collected in 1994 from boreholes located in the historical waste dump area (MW-12 and MW-13) were analyzed for VOCs, SVOCs, petroleum hydrocarbons as diesel, and metals. Borehole locations are shown on Figure 5 and analytical results are presented in Table 5, Table 6, and Table 11, along with RSLs, adjusted SSLs, RBSLs, and the DEQ screening level for arsenic (DEQ, 2008). Trace concentrations of 1,2-dichlorobenzene, methylene chloride, and di-n-butylphthalate were detected in the sample collected from monitoring well MW-12 and trace concentrations of 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, methylene chloride, di-n-butylphthalate, and di-n-octyl phthalate were detected in the sample collected from MW-13. Methylene chloride, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and di-n-butylphthalate were detected in the method blank and following EPA functional guidelines for organic data review (EPA, 2005) the practical quantitation limits for these compounds were raised to 5 times the concentration detected in the blank. The results of those compounds in the natural samples were less than 5 times the concentration in the blank and they are qualified as non-detect. Detected concentrations of the organic constituents were below their respective RSLs and RBSLs.

Inorganic constituents of arsenic, cadmium, lead, selenium, chromium and barium were detected in the subsurface soil samples collected from MW-12 and MW-13. Analyte concentrations detected in the samples were below their respective RSLs and SSLs with the exception of arsenic and selenium. Arsenic was present at concentrations of 19 and 68 mg/kg. The RSL for arsenic is 0.39 mg/kg and the DEQ has developed a background screening level of 40 mg/kg for arsenic in surface soil (DEQ, 2005a). While DEQ has not developed a screening

level for arsenic in subsurface soil, they have used an excavation scenario like that included in Montana's Risk-Based Corrective Action Guidance for Petroleum Releases to calculate a risk-based level for arsenic of 300 mg/kg in subsurface soil that is protective of typical construction/utility workers (DEQ, 2008b). This level may be appropriate for use at facilities where it can be demonstrated that groundwater is not being impacted by arsenic (DEQ, 2008b). A comparison of soil and groundwater arsenic concentrations demonstrating that elevated arsenic concentrations in groundwater are not related to arsenic present in the soil is provided in Section 4.7.2.4. A selenium concentration of 10 mg/kg was detected in the sample collected from monitoring well MW-13, which exceeds the SSL of 2.6 mg/kg. Cadmium was detected in two of the soil samples and the concentration in one sample (4.1 mg/kg) exceeded the SSL (3.8 mg/kg). The cadmium, arsenic, and selenium exceedance is addressed in Section 4.7.2.4.

Subsurface soil samples collected from boreholes MW-15 through MW-17 and borings B1 and B2 during the Olympus 2001 investigation were analyzed for volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH). Borehole locations and test pit locations are shown on Figure 5, and analytical results are presented in Table 12. Petroleum hydrocarbon data related to well MW-19 and test pit TPMW-18 are not included in this VCP since they were collected to investigate UST releases. The petroleum impacted media associated with the historical USTs at the Facility has been regulated by the DEQ Petroleum Release Section, which was the predecessor to the PTS. Hereinafter, the Petroleum Release Section will be referred to as the PTS. All petroleum releases associated with the former USTs have been resolved with the DEQ PTS. VPH analytes were not detected in the soil samples. EPH analytes were detected in borehole MW-17 at 30 ug/g; however, concentrations were below the DEQ investigatory action level of 200 ug/g.

Subsurface soil samples were collected by MDT in August 2005 from eight test pits VCP-TP1 through VCP-TP8 as shown on Figure 5. The samples were collected from a depth of approximately 7 feet bgs, at the top of the water table in undisturbed alluvial sediments, and analyzed for metals. The results are summarized on Table 11. Cadmium, mercury, selenium, and silver were not detected at concentrations exceeding method detection limits. Arsenic concentrations ranged from 14.5 to 135 mg/kg, barium concentrations ranged from 28 to 117 mg/kg, chromium concentrations ranged from 6.9 to 12.5 mg/kg, and lead concentrations ranged from 13.2 to 96.9 mg/kg. The concentrations were below screening levels, with the exception that some of the arsenic concentrations exceed the RSL, SSL, and DEQ surface soil background screening level of 40 mg/kg. The arsenic concentrations are below the DEQ risk-based level for subsurface soil of 300 mg/kg arsenic that can be used where it can be demonstrated that groundwater is not being impacted by arsenic in the soil. A comparison of soil and groundwater arsenic concentrations demonstrating that elevated arsenic concentrations in groundwater are not related to arsenic present in the soil is provided in Section 4.7.2.4.

One subsurface soil sample was collected from boring MW-20 during the MDT 2007 investigation. The boring location is shown on Figure 5. The sample was analyzed for RCRA metals and the results are summarized on Table 11. Four metals were detected, including arsenic (16.6 mg/kg), barium (38.6 mg/kg), chromium (16.1 mg/kg), and lead (29.9 mg/kg). The arsenic concentration exceeded the RSL and SSL but not the DEQ action levels for surface and subsurface soil. A comparison of soil and groundwater arsenic concentrations demonstrating that elevated arsenic concentrations in groundwater are not related to arsenic present in the Facility soil is provided in Section 4.7.2.4.

4.7.2.4 SOIL LEACHING ASSESSMENT

A number of organic and inorganic constituents have been detected in surface and subsurface soil samples at concentrations that exceed screening levels and are designated as Facility COCs, as described in Section 5.2. These constituents include TEH (EPH screen and DRO), naphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, and selenium. This section provides an assessment of the potential for these constituents to leach to groundwater at the Facility at concentrations that would exceed groundwater screening levels. The assessment was completed by reviewing groundwater analytical results from the Facility for those constituents. These groundwater analytical results are summarized in Table 8, along with the applicable HHS and MCLs.

Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and selenium were not detected in any of the groundwater samples collected from at the Facility. While the concentrations of PAHs in the soil samples exceeded RBSLs based on direct contact, they do not exceed the RBSLs based on leaching to groundwater, as shown on Table 6 and Table 14. One soil sample collected from the water table surface in MW-13 contained cadmium and selenium at concentrations that exceed their SSLs. Although no groundwater samples have ever been collected from well MW-13, cadmium and selenium have not been detected in groundwater samples collected from the nearest down-gradient monitoring well (MW-2). Dissolved cadmium was detected in one groundwater sample from MW-17; however, the concentration did not exceed the HHS. These data indicate that those constituents should have leached to groundwater by now, or, they are leaching to groundwater but are not impacting groundwater at the Facility at detectable concentrations.

Naphthalene was detected in 2 of the 39 soil samples collected from the Facility, and in both instances the concentrations was estimated since it was below the practical quantitation limit of the analytical method. The concentrations of naphthalene estimated in those 2 samples were less than the RBSL, which is based on leaching to groundwater, but above the SSL. When an RBSL and SSL are both available for a compound, the RBSL is used by the DEQ for comparison purposes. Naphthalene was detected in three of the 76 groundwater samples collected from the Facility that were analyzed for naphthalene. None of the three detected concentrations exceed the HHS or MCL, both of which are 100 micrograms/liter ($\mu\text{g}/\text{l}$). Two of the samples (1420/A Pit #1 and 1015/A Pit #4) were collected from test pits rather than monitoring wells. Groundwater samples collected from test pits typically contain fine-grained sediments where target analytes tend to concentrate. This results in increased concentrations of analytes that are not representative of actual groundwater conditions. Although the data are reported here to provide the complete data set collected from the Facility, the data quality of groundwater samples collected from the test pits are inadequate for use in comparison to groundwater standards. A total of 7 ground water samples collected from well MW-4 were analyzed for naphthalene and it was detected in only one of those, at a concentration of 3 $\mu\text{g}/\text{l}$, which is nearly two orders of magnitude below the HHS and MCL. These data indicate that naphthalene is not leaching to groundwater at concentrations that would exceed the HHS or MCL.

Arsenic was detected in all of the 34 soil samples collected at the Facility that were analyzed for arsenic at concentrations that exceed the SSL for arsenic. The soil samples were primarily collected from undisturbed native sediments. Groundwater samples collected at the Facility have been analyzed for both total and dissolved arsenic. The dissolved analysis differs from the total metals analysis in that the dissolved samples are filtered at the time of collection. MCLs

are based on a total recoverable analysis while HHS for ground water are based on a dissolved analysis. MCLs were promulgated to ensure safe drinking water at the tap and the analytical method is based on that premise. However, due to the sporadic nature of sampling from monitoring wells, they often do not achieve the level of development of water supply wells. This is exacerbated by the fact that monitoring wells are often completed in fine-grained formations that would not be utilized as a water source, and it is difficult to fully develop a well in these formations so that it does not produce suspended sediment. This effect occurs at this Facility as evidenced by the fact that wells MW-12 and MW-13 have silted in to the point where they could no longer be used for sampling. Field personnel have also noted that the water produced from the wells is often turbid. The sediment in the samples can contain metals that may be released into the water sample during the digestion portion of the analysis. Thus, the analytical results may indicate higher concentrations of metals than are actually present in the ground water. The total metals results for samples collected from the Facility are up to three orders of magnitude higher than the dissolved analysis. Although DEQ generally does not require total metals analysis of monitoring well samples, DEQ may require total metals analysis as necessitated by special situations on a case-by-case basis, such as comparing background monitoring well results to drinking water well results.

Arsenic was detected in 50 of the 65 groundwater samples collected from at the Facility that were analyzed for dissolved arsenic and it was detected at concentrations exceeding the HHS and MCL in 31 of those samples. Groundwater samples collected upgradient of the Facility from wells MW-11 and MW-20 contained arsenic at concentrations that exceed the HHS and MCL, indicating that an up-gradient source of arsenic is causing the arsenic concentrations in groundwater at the Facility to exceed the HHS and MCL. Because arsenic is already present in groundwater at the Facility, the potential for leaching of arsenic from surface and subsurface soil to the aquifer at the Facility can best be evaluated by comparing the spatial distribution of arsenic in soil and groundwater. All of the arsenic concentrations measured in Facility soil and the highest dissolved arsenic concentration measured in groundwater at each well are shown on Figure 18 along with isopleths of the potentiometric surface of the groundwater table. The same arsenic data, along with dates, soil sample depths, and former Features, including ASTs and USTs are shown on Figure 19. These data show that the highest concentration of arsenic in subsurface soil is located in an area coincident with the lowest concentrations of arsenic in groundwater. In addition, soil samples contain arsenic concentrations less than 40 mg/kg in areas where the arsenic in groundwater concentration exceeds the HHS or exceeds the concentrations of arsenic measured in groundwater samples collected from the up-gradient wells. The concentrations of arsenic in soil in contact with the groundwater are on the same order of magnitude as those samples collected from above the water table and the highest concentration of arsenic in soil measured at the Facility is in a soil sample collected from the top of the water table. The nearest down-gradient groundwater samples, relative to the highest arsenic in soil concentration, did not contain arsenic at concentrations above the HHS. These data indicate that any impacts from leaching would be observed immediately and that the arsenic concentrations in groundwater are not reflecting increased concentrations immediately down-gradient of the highest concentrations of arsenic in soil at the water table interface. Finally, the lowest concentrations of arsenic measured in groundwater are in the vicinity of the historical waste disposal area, indicating that the waste disposal practices did not result in leaching of arsenic to the groundwater. Together, these data indicate that the arsenic in Facility groundwater is not attributed to the local concentrations of arsenic in the soil, but rather are representative of up-gradient conditions.

DRO compounds were detected in groundwater samples collected from well MW-5 (3,000 µg/L), MW-8 (1,000 µg/L), MW-10 (2,000 µg/L), MW-12 (1000 µg/L), and the Woolston well (800 µg/L)

during groundwater sampling events in 1994 and 1995 (Table 8). These samples were analyzed following a total extractable hydrocarbon analytical method that has been replaced by other methods. The follow-up groundwater monitoring indicates petroleum hydrocarbons are no longer present in the groundwater at the Facility. Well MW-9 was found to have damaged casing in 2001 and the well was replaced by well MW-14. Petroleum hydrocarbons were not detected in the sample collected from well MW-14 during the June and December 2001 monitoring events. Due to the top of screen placement below the water table, well MW-8 was deemed unsuitable for sampling and sampling from well MW-4 was completed as a substitute for well MW-8. Petroleum hydrocarbons were not detected in groundwater samples collected from well MW-4. Well MW-10 was resampled in May 2006 and the sample did not contain detectable concentrations of extractable petroleum hydrocarbons. Well MW-12 had silted in and was replaced by well MW-17 in 2001 and petroleum hydrocarbons were not detected in the groundwater samples collected from well MW-17 during the subsequent June and December 2001 and May 2006 sampling events (Table 8). While previous samples indicated the presence of petroleum hydrocarbons, the more recent sampling results depict that the petroleum has naturally degraded over time.

4.8 HUMAN AND ENVIRONMENTAL EXPOSURE

Section 75-10-734(2)(i), MCA, requires that the VCP include a description of the human and environmental exposure to releases or threatened releases of hazardous or deleterious substances at the Facility based upon the current use of the Facility and adjacent properties and any reasonably anticipated future uses of the Facility.

Conceptual site models (CSMs) are effective tools for defining site dynamics, streamlining risk assessments, establishing exposure hypotheses, and developing appropriate corrective actions. CSMs are useful for identifying completed exposure pathways between physical media affected by site-related contamination and potential human or ecological receptors. A CSM for the current and reasonably anticipated future use of the Facility includes potentially impacted media, transport mechanisms, exposure routes, and potential receptors (Figure 20).

The first step in developing a CSM is to characterize a site with respect to site conditions, contaminant characteristics, and the current and anticipated future land uses at and near the site. Understanding site conditions and land use aids in the identification of potential receptors under current and future exposure scenarios. The final step in developing CSMs is to identify which potential receptor exposure pathways are (or may be) completed and which are (and are likely to remain) incomplete. An exposure pathway is not considered to be completed unless all four of the following elements are present:

- a source and mechanism for chemical release;
- an environmental transport/exposure medium;
- a receptor exposure point; and
- a receptor and a likely route of exposure at the exposure point.

A general description of sources, release mechanisms, and affected media; land use scenarios; potential receptors; and potential exposure pathways at the Facility is provided in the following subsections.

4.8.1 SOURCES, RELEASE MECHANISMS, AND AFFECTED MEDIA

The COCs in soil found at the Facility, as described in Section 5.2, and associated with the historical above-ground petroleum storage tanks and the historical waste disposal area are potential sources of contamination at the Facility investigated for this exposure assessment. Historical releases from the former underground storage tanks fall under the regulatory jurisdiction of the PTS, and are not considered for this evaluation of potential exposures. All petroleum releases associated with the former USTs have been resolved with the PTS (Section 4.7.2.2). Chemical release/transport mechanisms may include direct discharge from the historical waste disposal area, leaching, volatilization, dissolution into and migration with groundwater, surface runoff, stream flow, generation of fugitive dust and wind dispersion, and assimilation into biota.

Contaminants may be discharged directly into environmental media from the source into soil, and contaminants may leach from soil into groundwater by infiltrating precipitation or direct contact with groundwater. Once in solution, these chemicals may migrate via groundwater transport and discharge to surface water via the drain line. VOCs may volatilize into soil gas or the atmosphere. Nonvolatile chemicals sorbed to surface soil may become entrained in the air as particulates in fugitive dust. Chemicals in soil may be available for uptake by plants.

Specific site conditions will influence chemical release mechanisms and contaminant migration pathways. For example, surface topography, hydrology, vegetation, and impermeable surfaces such as pavement may influence surface runoff, leaching, and the generation of fugitive dust. Climate, soil type, and depth-to-groundwater also affect contaminant leaching. Hydrogeological characteristics, groundwater geochemistry, and chemical-specific characteristics affect the vertical and horizontal extent and rate of dissolved contaminant plume migration. As environmental media at a site become contaminated, they may serve as secondary sources of contamination by acting as reservoirs of chemicals that slowly are released into other media. Potentially affected media include soil, groundwater, air, surface water, and/or biota.

4.8.2 LAND USE SCENARIOS

According to 75-10-701(18), MCA, "Reasonably anticipated future uses" means likely future land or resource uses that take into consideration:

- (a) local land and resource use regulations, ordinances, restrictions, or covenants;
- (b) historical and anticipated uses of the facility;
- (c) patterns of development in the immediate area; and
- (d) relevant indications of anticipated land use from the owner of the facility and local planning officials.

Currently, there are no local land or resource use regulations, ordinances, restrictions of covenants on the Facility. The Facility has historically been used by MDT as a maintenance complex and is currently used by the MDA for storage of surplus equipment. Should the Montana Department of Administration retain the property, then those activities are also the reasonably anticipated future use of the property. Lewis and Clark County has also shown interest in acquiring the property in order to expand the neighboring Lewis and Clark County Fairgrounds.

Property to the south of the Facility is owned by Lewis and Clark County and has long been used as baseball fields. The ballfields were recently upgraded and that is the anticipated future use of the property.

Property to the north, east, and west of the Facility is owned by Lewis and Clark County and it is used as the county fairgrounds. The Fairgrounds has been in existence since 1869, A new Long Range Plan was recently drafted for the fairgrounds and it states that the future use of the property will be as a fairgrounds.

While a commercial or recreational exposure scenario is the most likely long-term use for the Facility, a residential exposure scenario is used in this exposure assessment to evaluate the need for land use restrictions on the Facility.

4.8.3 POTENTIAL RECEPTORS

Potential receptors are defined as human and nonhuman organisms (i.e., ecological receptors) that may contact (i.e., be exposed to) site-related contaminants in environmental media. Consistent with USEPA (1989 and 1995) guidance, current and reasonably anticipated future land use will be considered when selecting potential receptors. Potential human receptors for the Facility are as follows:

- current and future non-intrusive (industrial commercial) workers;
- current and future intrusive (construction) workers;
- current and future visitors/trespassers;
- current and future off-site recreators; and,
- future residents.

Ecological receptors include wildlife and plants at the Facility as well as aquatic organisms in down-gradient wetlands. Plants and soil invertebrates are identified as secondary exposure media (i.e., as food) for wildlife.

4.8.4 POTENTIAL EXPOSURE PATHWAYS

As defined by USEPA (1989), an exposure pathway is: "the course a chemical or physical agent takes from a source to an exposed organism. An exposure pathway describes a unique mechanism by which an individual or population is exposed to chemicals or physical agents at or originating from a site. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, a transport/exposure medium (e.g., air) or media (in cases of intermediate transfer) also is included."

A review of potential exposure pathways (provided in the following subsections) links the sources, locations, and types of environmental releases with receptor locations and activity patterns to determine the significant pathways of concern.

4.8.4.1 LEACHING OF CHEMICAL CONSTITUENTS FROM SOIL TO GROUNDWATER

As shown in Section 4.7.2, the concentrations of target analytes in soil samples collected from the Facility do not exceed generic Tier 1 RBSLs, RSLs, and SSLs, adjusted for Montana HHS, a dilution attenuation factor (DAF) of 10, with the exception of:

- the SSLs for arsenic, cadmium, naphthalene, and selenium,
- the RSL and DEQ background screening level for surface soil for arsenic; and
- the RBSLs for benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

These compounds have been identified in Section 5.2 as COCs for the Facility. RBSLs have been included because there are petroleum hydrocarbons at the Facility that are not associated with USTs. With the exception of arsenic, none of the COCs have been detected in groundwater samples collected during the Facility investigations at concentrations that exceed screening levels, indicating that they do not pose a leaching risk. Arsenic is present in groundwater at concentrations exceeding the HHS up-gradient of the Facility, at the Facility, and down-gradient of the Facility. As shown on Figure 18 and described in Section 4.7.2.4, there is no direct relationship between arsenic concentration in soil and groundwater, which indicates that leaching of arsenic from Facility soil is not a complete exposure pathway.

4.8.4.2 MIGRATION OF CHEMICAL CONSTITUENTS TO SURFACE WATER

There are no surface water resources on the Facility and thus runoff of surface soil to surface water is not a complete exposure pathway. The only exposure pathway to surface water would be the discharge of groundwater from drainlines that run at and adjacent to the Facility that discharge to the Duck Pond. As shown in Section 4.7.2.4, HHS, generic Tier 1 RBSLs, and DEQ standards, constituents of concern in soil are not leaching to groundwater at the Facility. RBSLs have been included because there are petroleum hydrocarbons at the Facility that are not associated with USTs. The migration of chemical constituents to surface water is an incomplete pathway for this assessment.

4.8.4.3 SURFACE SOIL INGESTION/DERMAL CONTACT BY HUMANS

Ingestion of and dermal contact with surface soil is a potentially complete exposure pathway since the concentrations of five PAHs in Facility surface soil are above applicable RBSLs and RSLs for some individual soil samples and the concentrations of arsenic exceed the RSL and DEQ background screening level in some individual soil samples. RBSLs have been included because there are petroleum hydrocarbons at the Facility that are not associated with USTs.

Because naturally occurring background concentrations of arsenic in soil often exceed the RSL and SSL, the DEQ has calculated a mean, generic background concentration for surface soil in Montana (DEQ, 2005). The background data set used by DEQ includes 209 native soil samples with arsenic concentrations ranging from 0.94 to 187 mg/kg. The background concentration was developed by calculating the 95% upper confidence limit (UCL95) of the mean for the background data set using ProUCL 3.0 (EPA, 2004a), which is a statistical software package developed by EPA. The EPA guidance (EPA, 2007) for the ProUCL program states that a background mean concentration should be compared to site mean concentrations and not individual concentrations. A UCL95 of the mean was calculated for arsenic in Facility surface soil using EPA ProUCL 4.00.04 (EPA, 2009), a more recent version of the same statistical

software package used in calculating the UCL95 of the mean for the state-wide background data set. The ProUCL worksheet is provided in Appendix H. The calculated UCL95 of the mean for Facility surface soil is 28.8 mg/kg, which is below the DEQ screening level. Thus, the arsenic concentration in Facility surface soil is within the range of naturally occurring background conditions in Montana and further risk assessment is not warranted.

The RSLs and RBSLs for PAHs are based on a carcinogenic risk level of $1e-06$ while DEQ considers a cumulative carcinogenic risk level of $1e-05$ as protective of human health. The cumulative risk from these PAHs was assessed by calculating the direct contact carcinogenic risk for each PAH and summing the results. Site wide Facility exposure was based on the UCL95 of the mean for each PAH except where the software package used to calculate the UCL recommended that a 99% UCL (UCL95) of the mean should be used. The UCL95 and UCL99 of the means were calculated using EPA ProUCL 4.00.04 (EPA, 2009) and the worksheets are provided in Appendix H. The UCL95 or UCL99 of the means for each PAH are summarized in Table 18. When RSLs and RBSLs are both available for a chemical, the DEQ applies the RBSL in risk calculations. The RBSLs for the PAHs with both residential and commercial exposure scenarios are included in Table 18 along with the cumulative carcinogenic risk. The cumulative carcinogenic risk based on a residential exposure scenario is $2.2e-05$, which exceeds the DEQ protective risk limit of $1e-05$. The cumulative carcinogenic risk based on a commercial exposure scenario is $3.9e-06$, which is within the DEQ protective risk limit of $1e-05$.

While the DEQ ceiling concentration of 2,500 mg/kg total extractable hydrocarbon level was exceeded in three surface soil samples (HSL-3, HSL-4, and HSL-5) collected in 1992, that soil can no longer be found at the Facility and it is believed to have been removed at some point in the past. Soil samples collected in 2001 from the area where the ceiling concentration was exceeded did not show evidence that the soil was still in place. Should the soil still be present, the 16-year old data would not accurately represent current conditions because petroleum compounds may degrade over time. In addition, the 2,500 mg/kg ceiling concentration is based on beneficial use (i.e. odors) rather than a specific health risk. Soil concentrations that do not exceed generic Tier I RBSLs or RSLs for direct contact do not represent risks that DEQ considers unacceptable.

4.8.4.4 SUBSURFACE SOIL INGESTION/DERMAL CONTACT BY HUMANS

Ingestion of and dermal contact with subsurface soil was identified as a potentially complete exposure pathway since the concentrations of arsenic exceed the RSL and DEQ background screening level in some individual soil samples. The DEQ has developed a risk-based screening level for arsenic in subsurface soil of 300 mg/kg that can be used where it can be demonstrated that groundwater is not being impacted by arsenic in the soil. A comparison of soil and groundwater arsenic concentrations demonstrating that elevated arsenic concentrations in groundwater are not related to arsenic present in the soil is provided in Section 4.7.2.4. This demonstration indicates that the 300 mg/kg risk based level for subsurface soil is applicable to this Facility and the arsenic concentrations in subsurface soil do not exceed that level.

4.8.4.5 INHALATION OF VOLATILIZED CONTAMINANTS AND INGESTION OF WIND BLOWN PARTICULATES

The generic Tier 1 direct contact residential RBSLs and RSLs are protective of outdoor vapor and particulate exposure. The surface soil samples collected at the Facility did contain some

PAHs at concentrations that exceed the residential RBSLs and RSLs but that do not exceed the commercial RSLs or RBSLs. In addition, contaminants were not detected in samples collected during the soil gas survey that were laboratory analyzed. This indicates that this exposure pathway is incomplete.

The vapor intrusion pathway for volatile organics in the soil was assessed using the EPA 2004 Vapor Intrusion Model (EPA, 2004b). Volatile organic compounds detected in Facility soil include naphthalene, toluene, and xylenes. The highest concentrations of these volatile organic compounds measured in Facility soil were input to the EPA Vapor Intrusion Model, which calculated the potential risk from vapor intrusion. The model input and results are provided in Appendix I. The modeling results indicate that the highest hazard quotient for any of these compounds is 1.1e-04, which is four orders of magnitude below what may be considered to be a potential health threat. These model results, combined with a lack of a defined source area, the extensive sampling that has been conducted at the Facility, and the proposed remedy (restricting residential use) indicate that further vapor intrusion evaluation at the Facility is not necessary.

4.8.4.6 ECOLOGICAL RECEPTOR EXPOSURE TO FACILITY-RELATED CHEMICAL CONSTITUENTS

Potential ecological receptors at the Facility that may come into contact with Facility soil include, but are not limited to ground squirrels and other rodents, skunks and other members of the weasel (Mustelidae) family, insects, plants, song birds, and birds of prey. Primary exposure routes for the ecological receptors include incidental ingestion, inhalation and dermal exposure to impacted soil. The primary exposure occurs in surface and shallow subsurface (<5 feet) soils. According to the Montana Natural Heritage Program (NHP), there are three animal species of concern located at or within 5 miles of the Facility (Appendix J), including Lewis's Woodpecker, Brewer's Sparrow, and the Gray Wolf. The NHP has identified two plant species of concern observed on properties within 5 miles of the Lewis & Clark Fairgrounds, including wedge-leaved saltbush, and small yellow lady's-slipper.

The Facility property is fully developed, that is either paved, covered with road mix, or is occupied by buildings. Since much of the Facility is covered with buildings or gravel and vegetation is scarce, there is little suitable habitat for most ecological receptors. Although some small mammals may live at and some birds and large mammals may occasionally visit the Facility, these animals would not preferentially search out the Facility. Although contaminants in surface soil exceed residential screening levels, there is no complete pathway from runoff to surface water and the Facility setting is not suitable habitat for long-term ecological exposure. No populations of designated federal or Montana species of concern or threatened or endangered species have been observed near the Facility. Since there are no significant ecological resources at the Facility, conducting an ecological risk assessment (ERA) is not warranted.

4.9 REGULATORY AND COMPLIANCE HISTORY

Section 75-10-734(2)(j), MCA, requires that the VCP include readily available information on the environmental regulatory and compliance history of the facility, including all environmental permits. The regulatory and compliance history of the Facility includes the investigation of potential impacts from the historical waste pit and ASTs, which is addressed in this VCP, and the permitting and investigation of potential impacts from releases from the USTs.

Six underground storage tanks (USTs) are listed in the DEQ files as having been present at the Facility, although location and closure information are only available for five USTs. Various tank capacities have been reported in different reports and DEQ files. The history, size and status of the USTs are summarized in Table 2 using what appears to be the most consistent information in the files. The past locations of five of the USTs are shown on Figure 2. One 1,060 gallon capacity gasoline UST (Tank 1) was located on the south side of the general storage building, and two USTs (2,000-gallon Tank 6 and 4,000 gallon Tank 4) and one diesel UST (10,000 gallon capacity Tank 5) were located on the north side of the new office building. A railroad tank car (unknown capacity, Tank 3) containing used oil was buried along the west fence line of the property. All of the USTs have been removed from the Facility.

Three of the USTs (Tanks 1, 2, & 3) were reportedly removed in 1987 and 1988, before DEQ closure permits were required. Tanks 4, 5, and 6 were removed in 1996 under a DEQ closure permit. Additional underground petroleum piping discovered in 2005 in the vicinity of the historical 15,000 gallon gasoline AST on the south property boundary was closed in August 2005 under a DEQ closure permit.

Two underground storage tank petroleum releases have been reported for the Facility and they have been assigned DEQ leak numbers of 1548 and 3091. Release 1548 was opened in 1988 when petroleum odors were discovered while digging a trench to install a water line on the property. Release 3091 was opened in December 1996 when a release was discovered during the closure of UST Tank 5. No remedial actions were taken and no impacts to groundwater were observed during closure activities. The DEQ PTS, in 2001, requested that a remedial investigation be conducted for the releases. The remedial investigation was initiated in 2001 and completed in 2002. The results of the investigation (Olympus, 2002), were submitted to DEQ and petroleum hydrocarbons were not detected in soil or groundwater samples at concentrations above DEQ screening levels. Based on these results, the DEQ issued a no further action letter for the releases on September 10, 2003. Additional underground petroleum piping was discovered in 2005 in the vicinity of the historical 15,000 gallon gasoline AST on the south property boundary. The underground piping was removed in August 2005 and although some petroleum odors were reported, closure samples collected at the time did not contain petroleum hydrocarbon compounds at concentrations above DEQ screening levels. The DEQ PTS issued a memo dated October 20, 2005, indicating that they reviewed the information associated with the suspected release and based on the analytical results have considered it resolved with no need for further investigation or cleanup activities. All petroleum releases associated with the former USTs have been resolved with the DEQ PTS.

5.0 REMEDIATION PROPOSAL

5.1 PROPOSED CLEANUP PLAN

Section 75-10-734, subsection (3)(a), MCA, requires that the VCP include a detailed description of the components of the remediation proposal. Based on the available information, Facility surface soil contains five PAHs at concentrations that exceed a cumulative carcinogenic risk level of 1e-05 for a residential exposure scenario but not for a commercial exposure scenario. Based on the alternatives analysis in Section 5.5, institutional controls were selected as the most cost-effective remedy for the soil portion of the Facility. The proposed institutional control is placement of a declaration of restrictive covenants to prevent future residential development

at the Facility. A copy of the declaration of restrictive covenants that will be placed on the property is provided in Appendix K.

5.2 PROPOSED CLEANUP LEVELS

Section 75-10-734 (3)(a)(i) MCA, requires that the VCP include proposed cleanup levels. The DEQ generally follows EPA risk assessment guidance for superfund (RAGS) criteria (EPA, 1989) for selecting chemicals of potential concern (COPCs) at a Facility. The RAGS criteria include chemicals that were: 1) positively detected in at least one sample in a given medium; 2) detected at levels significantly elevated above levels of the same chemicals detected in associated blank samples; 3) detected at levels significantly elevated above naturally occurring levels of the same chemicals; 4) only tentatively identified but may be associated with the site based on historical information; and/or 5) transformation products of chemicals demonstrated to be present.

COPCs detected in Facility soil are listed in Table 19 along with the highest concentration of the COPC measured in Facility soil and generic screening levels, including RBSLs (DEQ, 2009), RSLs (EPA, 2009), SSLs (EPA, 2009), and DEQ background level for arsenic (DEQ, 2005). The SSLs have been adjusted to a DAF of 10. While surface soil samples HSL-3, HSL-4, and HSL-5 contained TPH concentrations that exceeded the TEH RBSL screening level of 2,500 mg/kg, it appears that the soil represented by those samples has been removed from the Facility. Subsequent soil samples collected from that area did not contain concentrations of TEH above method detection limits. Thus, samples HSL-3, HSL-4, and HSL-5 are not included in Table 19. Those COPCs for which the generic screening levels are exceeded are identified as COCs for the Facility. The COCs include benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, cadmium, and selenium. Further risk assessment and/or cleanup is required to address COCs and proposed cleanup levels for the COCs are provided in Table 20. Supporting evidence for the proposed cleanup levels is provided below.

The concentration of arsenic in some individual Facility soil samples exceeds the RSL, SSL, and DEQ background level. As demonstrated in Section 4.7.2.4, arsenic is not leaching from Facility soil into groundwater at the Facility at concentrations that would cause an exceedance of the HHS for arsenic. Thus, the proposed cleanup level for arsenic in surface soil is the DEQ background screening level of 40 mg/kg. The proposed cleanup level for arsenic in subsurface soil is the DEQ risk based level for a construction worker scenario of 300 mg/kg.

The concentrations of naphthalene in some individual soil samples exceed the SSLs (0.0055 mg/kg), but not the RBSLs (9.32 mg/kg) based on leaching to groundwater. DEQ utilizes RBSLs rather than SSLs for evaluating leaching potential where the RBSLs are available. The concentrations of cadmium and selenium in one soil sample (MW-13) exceed their SSLs (3.8 mg/kg and 2.6 mg/kg, respectively) based on leaching to a HHS concentration with a dilution attenuation factor of 10. As demonstrated in Section 4.7.2.4, naphthalene, cadmium, and selenium are not leaching from Facility soil into groundwater at the Facility at concentrations that would cause an exceedance of their respective HHS. Thus, the proposed cleanup levels for these compounds are the RSLs for cadmium and selenium and the RBSL for naphthalene, which are not exceeded at the Facility.

Five PAHs, including benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, are present in some individual soil

samples at concentrations that exceed their respective RSLs. As demonstrated in Section 4.8.4.3, the cumulative carcinogenic risk for these chemicals does not exceed 1e-05 under a commercial exposure scenario. The proposed cleanup alternative involves placing a declaration of restrictive covenants on the Facility property that would prevent future residential development. The cleanup levels in Table 20 are the 2009 RBSLs for commercial property, the Montana background screening level for arsenic, the DEQ risk based arsenic level for a construction worker scenario, and the April 2009 RSL screening levels.

5.3 CLEANUP REQUIREMENTS

Section 75-10-734 (3)(a)(ii) MCA requires a detailed description of the manner in which the remediation plan satisfies the cleanup requirements of Section 75-10-721 MCA. The requirements of a voluntary remedial action for a site, as described in Section 75-10-721 (1), (2)(a) and 2(b) MCA consist of:

1. Protectiveness – The proposed remedy must be demonstrated to be protective of public health, safety and welfare, and the environment.
2. Compliance – The proposed remedy must comply with applicable and relevant state or federal environmental requirements, criteria, or limitations.
3. Mitigation The proposed remedy must be demonstrated to mitigate exposure to risks to public health, safety and welfare, and the environment to allowable levels.
4. Effectiveness and Reliability - The proposed remedy must be effective and reliable in the short and long term.
5. Practicability and Implementability - The proposed remedy must be practicable and implementable.
6. Applicable Technology - The proposed remedy must be chosen in consideration of treatment and resource recovery technologies, giving due consideration to engineering controls.
7. Cost-Effectiveness - The proposed remedy must be cost-effective relative to the risk reduction it would achieve.

The remedial action at the Facility consists of institutional controls to prevent exposure to Facility soil. The manner in which the proposed remedial action meets the cleanup requirements is discussed in Section 5.5 of this VCP.

5.4 SAMPLING OR TREATABILITY STUDIES

Section 75-10-734(3)(a)(iii), MCA, requires that the remediation proposal include identification of sampling or treatability studies. The proposed remedial action does not include sampling or treatability studies.

5.5 COMPARISON OF REMEDIATION PROPOSAL TO ALTERNATIVES

Section 75-10-734 (3)(b), MCA, requires a brief comparison of the remediation proposal to reasonable alternatives based on the remedy selection criteria specified in Section 75-10-721, MCA. Based on the information available about the facility and knowledge and experience with remedies for other similar facilities, four remedial alternatives have been identified as the most reasonable alternatives for the facility. The proposed remedial action (Alternative 4) is to implement institutional controls that would place a declaration of restrictive covenants on the property to prevent residential development.

Alternative 1: No action.

Alternative 2: Excavate all soil impacted by COCs, including all soil and wastes in the historical waste dump area. Dispose of at a municipal landfill. Backfill excavation with clean soil and revegetate.

Alternative 3: Capping of the historical waste dump area.

Alternative 4: Institutional controls that would place a declaration of restrictive covenants on the property to prevent residential development.

Each alternative has been evaluated in regards to the criteria required by Section 75-10-721, MCA. A summary of the results of the evaluation process is provided in Table 21 and each remedial technology is described in more detail in the following discussion.

5.5.1 ALTERNATIVE 1: NO ACTION

The no action option would leave the facility in its present condition without further remediation, monitoring, or institutional controls for soil.

Protectiveness – This alternative is not protective of public health, safety, and welfare related to soil impacts at the Facility since the concentrations of PAHs in surface soil exceed a cumulative risk level of $1e-05$ for a future residential exposure scenario. The VCP does not address public health, safety, and welfare related to arsenic in groundwater at the Facility.

Compliance – The no further action alternative does not comply with the ERCLs for soil identified in Appendix L.

Mitigation – Comparison of soil quality data to applicable generic Tier 1 RBSLs, ceiling concentrations, and/or site-specific risk-based concentrations, and the exposure pathways analysis presented in Section 4.8.4, indicate that the remaining risks do require mitigation.

Effectiveness and Reliability – The no action alternative is neither effective nor reliable in the short and long term because soil conditions at the Facility are not protective of reasonably anticipated future use.

Practicability and Implementability – The no action alternative is practicable and implementable as it does not require any further action.

Applicable Technology – The no action alternative does not employ treatment or resource recovery technologies or engineering controls.

Cost-Effectiveness – The no action alternative has no remediation cost and no risk reduction is achieved. Although this alternative is the least costly alternative, it is not protective of human health and is rejected.

5.5.2 ALTERNATIVE 2: WASTE REMOVAL AND DISPOSAL IN AN OFFSITE LAND DISPOSAL FACILITY

This alternative involves excavation, hauling, and disposal of residually impacted soil at an offsite land disposal facility. To accomplish this, all soil within the boundaries of the former waste disposal area would be removed to a depth of approximately 5 feet and the soil beneath the railroad spur would be excavated to a depth of approximately 2 feet. An estimated 10,000 to 15,000 cubic yards of soil and waste would need to be excavated, hauled, and disposed.

Protectiveness – This alternative is protective of public health, safety, and welfare related to soil impacts at the Facility. This VCP does not address public health, safety, and welfare related to arsenic in groundwater at the Facility.

Compliance – This alternative would comply with all applicable and relevant ERCLs for soil described in Appendix L.

Mitigation – This alternative mitigates exposure risks by reducing contaminant concentrations remaining at the Facility.

Effectiveness and Reliability – This alternative is effective and reliable in the short- and long-term because it would reduce contaminant levels at the Facility and the contaminated soil would be transferred to a permitted, off-site, waste disposal facility. Excavation involves some short-term risks associated with the potential for accidents and injury during remediation. However, the excavation would be performed in accordance with a Health and Safety Plan. This alternative would also involve short-term risks to on-site workers and the public as the waste is transported to the off-site waste disposal facility.

Practicability and Implementability – This alternative is practicable and implementable because the technology exists to remove and dispose of the impacted materials. However, excavation would potentially cause some temporary disruption of activities in the immediate area. A gas line is currently buried in the removal area and the line would need to be disconnected during the removal.

Applicable Technology – This alternative does not involve treatment or resource recovery technologies; it does make use of available engineering controls that would be employed offsite.

Cost-Effectiveness – This alternative would cost approximately \$400,000 to \$700,000 to implement. A cost estimate is provided in Appendix M.

5.5.3 ALTERNATIVE 3: CAPPING ONSITE

This alternative involves capping the historical waste dump area. To accomplish this, an asphalt cap, approximately 115,000 square feet in area, would be placed over the historical

waste dump and railroad spur areas. Institutional controls would be required to prevent disturbance of the cap. Long-term operation and maintenance of the cap would be required.

Protectiveness – This alternative is protective of public health, safety, and welfare related to soil impacts at the Facility. This VCP does not address public health, safety, and welfare related to arsenic in groundwater at the Facility.

Compliance – This alternative would comply with all applicable and relevant ERCLs for soil described in Appendix L.

Mitigation – This alternative mitigates exposure risks by reducing exposure to contaminant concentrations remaining at the Facility.

Effectiveness and Reliability – This alternative is effective and reliable in the short- and long-term because it would reduce exposure to contaminant levels at the Facility. Capping involves some short-term risks associated with the potential for accidents and injury during remediation. Capping also requires long-term maintenance because of cracking. However, the capping would be performed in accordance with a Health and Safety Plan. This alternative would also involve short-term risks to on-site workers and the public as cap material is transported to the Facility.

Practicability and Implementability – This alternative is practicable and implementable because the technology exists to cap the impacted materials. However, capping would potentially cause some temporary disruption of activities in the immediate area. Capping would not be effective or reliable for the long term as there could be a need to access utilities such as the gas line in the future.

Applicable Technology – This alternative does not involve treatment or resource recovery technologies; it does make use of available engineering controls that would be employed onsite.

Cost-Effectiveness – This alternative would cost approximately \$300,000 to implement. A cost estimate is provided in Appendix M.

5.5.4 ALTERNATIVE 4: INSTITUTIONAL CONTROLS

The institutional controls option would place a declaration of restrictive covenants on the property to restrict residential development. The implementation of the institutional controls would be confirmed by annual inspections for a period of 100 years.

Protectiveness – This alternative is protective of public health, safety, and welfare related to soil impacts at the Facility since the concentrations of PAHs in surface soil are acceptable for a commercial exposure scenario but not a residential exposure scenario.

Compliance – The institutional controls alternative complies with the ERCLs for soil identified in Appendix L.

Mitigation – This alternative mitigates risks by preventing exposure via a residential scenario.

Effectiveness and Reliability – The institutional controls alternative is effective and reliable in the short and long term because it places permanent restrictions on residential property development.

Practicability and Implementability – The institutional controls alternative is practicable and readily implementable.

Applicable Technology – Although the institutional controls alternative does not employ treatment or resource recovery technologies or engineering controls, these technologies are not necessary to meet the other evaluation criteria.

Cost-Effectiveness – The institutional controls alternative would cost approximately \$12,000. A cost estimate is provided in Appendix M.

5.5.5 SUMMARY OF ALTERNATIVES COMPARISON

Based on the above analysis, Alternative 4, institutional controls, is the proposed remedy for the Facility. This alternative is sufficiently protective of reasonably expected current and future uses of the Facility. The low concentrations of hydrocarbons remaining at the Facility do not pose an unacceptable risk to public health, safety and welfare, and the environment under all but residential exposure scenarios. The remediation proposal is more practicable, cost effective, and easily implementable than the other alternatives. Alternatives 2 and 3 also meet the evaluation criteria; however, the additional costs associated with these options do not provide a correspondingly greater level of incremental risk reduction than that of Alternative 4 given the reasonably anticipated future use of the property as commercial. This evaluation is summarized in Table 21.

5.6 PROJECT SCHEDULE

Section 75-10-734, subsection (3)(c), MCA, requires a timetable for implementing the proposal and for any necessary monitoring of the Facility after the proposed measures are completed. The only action required under the proposed alternative is to record the declaration of restrictive covenants with the county recorder. This will be accomplished within three months of DEQ approval of the VCP.

5.7 HEALTH AND SAFETY

Section 75-10-734, subsection (3)(d), MCA, requires that the VCP include a statement that applicable health and safety regulations will be met during implementation of the remediation proposal. Because no further action is required to address Facility soil, no health and safety regulations will be triggered by this VCP.

5.8 MINIMIZATION OF SHORT-TERM DISTURBANCES

Section 75-10-734, subsection (3)(e), MCA, requires that the VCP include a description of how short-term disturbances during implementation of the remediation proposal will be minimized. Because no further action will be conducted, no short-term disturbances will occur.

5.9 REQUIRED PERMITS

Section 75-10-734, subsection (3)(f), MCA, requires that a VCP identify any permits necessary to conduct the proposed remedies. There are no permits required by the State of Montana.

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- Table 1. Static Water Levels (Feet Above Mean Sea Level)**
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**VOLUNTARY CLEANUP PLAN CONSENT AGREEMENT
MDT MAINTENANCE SHOP COMPLEX
HELENA FAIRGROUNDS
HELENA, MONTANA**

75-10-730 to 738, Montana Code Annotated (MCA) authorizes voluntary cleanup plans to be submitted for remedial actions on a site. The Montana Department of Transportation is submitting this voluntary cleanup plan for the Helena Fairgrounds MDT maintenance shop complex (Facility) located in Helena, Montana.

75-10-733 MCA requires in Section 7, part 2(c) that voluntary cleanup plans must include: "The written consent of current owners of the facility or property to both the implementation of the voluntary cleanup plan and access to the facility by the applicant and its agents and the department." The following letter agreement has been developed to satisfy this requirement.

As a property owner on the Facility, I, the Montana Department of Administration, provide consent for the implementation of the voluntary cleanup plan proposed for the Facility and further grant access to the Facility to the Montana Department of Environmental Quality, its agents and the department.

Montana Department of Administration
P.O. Box 200101
Helena, MT 59620-0101

Signature

Name/Title Please Print

Date

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