July 20, 2009

Ms. Denise Martin
Remediation Division
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901

Subject: **Submittal of the Voluntary Cleanup Plan for the Former Petroleum Refining Company Refinery, Shelby, Montana**

Dear Ms. Martin,

The City of Shelby is pleased to submit three copies of a Voluntary Cleanup Plan (VCP) for the former Petroleum Refinery Company (PRC) Refinery in Shelby, Montana (Facility). The VCP has been revised to incorporate the Montana Department of Environmental Quality comments dated June 18, 2009. The PRC Refinery is listed in the Voluntary Cleanup and Redevelopment Act (VCRA) registry under the Montana Comprehensive Environmental Cleanup and Responsibility Act (CECRA). The Facility is the former location of a petroleum refinery.

The contact person is:

Lorette Carter
Economic Development Coordinator
City of Shelby
112 1st Street South
Shelby MT, 59474
(406) 424-8799

The owner of the Facility is the City of Shelby.

This VCP addresses the soil contamination at the Facility. The following areas of concern have been identified:

- The south sludge pit,
- South tank farm and process area,
- North tank farm,
- North sludge pit, and
- West tank farm.

The remediation proposed in the following VCP will be completed during the summer and fall of 2009. It is anticipated to require approximately one month to implement.

If you have any question please call Lorette Carter at the City of Shelby (406) 424-8799 or me at (406) 442-5588.

Sincerely,

Chris Reynolds
Geochemist

VOLUNTARY CLEANUP PLAN
PETROLEUM REFINING COMPANY REFINERY
SHELBY, MONTANA

Prepared for:

City of Shelby
112 1st Street South
Shelby, Montana 59474

Prepared by:

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana 59601

July 2009

CONTENTS

CONTENTS (Continued)

Appendices

A Resumes of Tetra Tech Staff
B Written Consent of Property Owner for Voluntary Cleanup and Access
C Federal Emergency Management Agency Flood Hazard Boundary Map
D Montana Natural Heritage Program Sensitive Species Report
E Montana Bureau of Mines and Geology – Ground Water Informations Center Wells Reports for Township 15 North, Range 18 East, Sections 14, 22, 23, 26, And 27
F Well Logs
G City of Shelby Zoning Regulations
H Institutional Controls
I Confirmation Sampling and Analysis Plan and Operation and Maintenance Plan
J Environmental Requirements, Criteria, or Limitations
K Remedial Alternative Cost Estimates
L Weed Management Plan
M Soil Gas Sampling Work Plan

FIGURES

TABLES

LIST OF ACRONYMS

amsl	Above mean sea level
ARM	Administrative Rules of Montana
AST	Above-ground storage tank
bgs	Below ground surface
BN	Burlington Northern Railroad Company
BTEX	Benzene, toluene, ethylbenzene, and toluene
CECRA	Comprehensive Environmental Cleanup and Responsibility Act
COC	Contaminants of concern
COPC	Contaminant of potential concern
DAF	Dilution attenuation factor
1,2-DCA	1,2-dichloroethane
DEQ	Montana Department of Environmental Quality
DEQ-7	Circular DEQ-7 Montana Numeric Water Quality Standards
DNRC	Montana Department of Natural Resources and Conservation
DRO	Diesel range organics
EDB	Ethylene dibromide
EPA	U.S. Environmental Protection Agency
EPH	Extractable petroleum hydrocarbons
ERA	Ecological risk assessment
ERCL	Environmental requirement, criteria, or limitation
FCEM	Facility conceptual exposure model
FEMA	Federal Emergency Management Act
ft/ft	Feet per foot
gal/ft	Gallons per foot
gpm	Gallons per minute
GWIC	Ground-Water Information Center
LWC	Land and Water Consulting
MBMG	Montana Bureau of Mines and Geology
MCA	Montana Code Annotated
MCL	Maximum contaminant level
MNHP	Montana Natural Heritage Program
mph	Miles per hour
MPM	Montana Principle Meridian
MSCA	Montana Salinity Control Association
MSE	MSE Technology Applications Inc.
mg/kg	Milligrams per kilogram
µg/l	Micrograms per liter
mg/L	Milligrams per liter
µs/cm	MicroSiemens per centimeter

LIST OF ACRONYMS (Continued)

NOAA	National Oceanic and Atmospheric Administration
NPL	National priorities list
NRCS	U.S. Natural Resources Conservation Service
PAH	Polynuclear aromatic hydrocarbons
PLP	Potentially liable party
PRC	Petroleum Refining Company
PVC	Polyvinyl chloride
RBCA	Risk-based corrective action
RBSL	Risk-based screening level
RDG	Reclamation and development grant
RSL	U.S. Environmental Protection Agency Regional Screening Levels
SMCL	Secondary maximum contaminant level
SSL	Soil screening level
SVOC	Semi-volatile organic compound
TCLP	Toxicity characteristic leaching procedure
TEH	Total extractable hydrocarbons
TT	Tetra Tech Inc.
VCP	Voluntary cleanup plan
VCRA	Voluntary Cleanup and Redevelopment Act
VOC	Volatile organic compound
VPH	Volatile petroleum hydrocarbons
WRCC	Western Region Climate Center

1.0 INTRODUCTION

The City of Shelby, Montana has tasked Tetra Tech Inc. (TT) to prepare a voluntary cleanup plan (VCP) for the Petroleum Refining Company (PRC) Refinery in the City of Shelby, Toole County, Montana (Figure 1-1). The property upon which the refinery resides covers 32 acres of open land with a few dirt roads and dirt bike trails and is mainly vegetated with grass and a few scattered trees. The western portion of the property consists of a large hill that slopes steeply to the east. The eastern portion of the property (Facility), where the refinery was located, is relatively flat with a gentle slope to the east-southeast and is approximately 11 acres in size (Figure 1-2). A truck washing facility is located to the south and a warehouse facility is to the north of the Facility. Front Street and the Burlington Northern Rail line border the eastern side of the Facility. The property is currently owned by the City of Shelby. Activities proposed in this VCP are designed to support a Montana Department of Natural Resources and Conservation (DNRC) Reclamation and Development grant (RDG) and U.S. Environmental Protection Agency (EPA) Brownfields grant to perform waste removal activities on the Facility.

Five investigations have been completed at the Facility. In addition, groundwater samples have been collected from Facility wells semiannually from December 2006 to July 2008. This VCP has been prepared to address soil contamination at the Facility. Contaminated groundwater is not addressed by this VCP.

This VCP meets the requirements of the Voluntary Cleanup and Redevelopment Act (VCRA) §§ 75-10-730 through 738, Montana Code Annotated (MCA).

2.0 ELIGIBILITY ASSESSMENT

Section 75-10-732(1), MCA, provides that 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, of welfare or the environment may be eligible for voluntary cleanup procedures under VCRA. Contamination has been detected at the PRC Facility at concentrations above Montana Risk-Based Corrective Action Guidance for Petroleum Releases (RBCA) residential standards.

Section 75-10-732(1), MCA, specifies the types of facilities that are not eligible to be addressed under VCRA. The PRC Facility is not:

(a) Listed or proposed for listing on the National Priorities List (NPL) pursuant to 42 U.S.C. 9601, et seq.;

(b) A facility for which an order has been issued into or consent decree has been entered into pursuant to the Comprehensive Environmental Cleanup and Responsibility Act (CECRA);

(c) 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;

(d) A facility where the release or threatened release of a hazardous or deleterious substance is regulated by the Montana Hazardous Waste Act and regulations under that act;

(e) 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.

Since the PRC Facility meets the eligibility requirements for VCRA and does not meet any of the disqualifying criteria of VCRA, the PRC Facility is eligible for remediation under VCRA.

The proposed remedial actions for the PRC Facility described in Section 5.0 are appropriate for VCRA. All remedial construction activities and confirmation sampling will occur in less than two years. No post construction monitoring will be required. All of the remedial actions will address soil contamination at the Facility.

3.0 GENERAL VCP INFORMATION

This section describes the components of § 75-10-733, MCA, and describes where these components are located within the VCP. This section also describes the qualifications of TT, reimbursement of remedial action costs, and that contaminated soil is the only media at the Facility that is addressed by this VCP.

3.1 VCP SUBMITTAL

This VCP is submitted to the Montana Department of Environmental Quality (DEQ) by the City of Shelby. The City of Shelby currently owns the Facility and is a potentially liable party (PLP) under section 75-10-715, MCA.

3.2 VCP PREPARATION

The VCP was prepared by TT for the City of Shelby. TT is a consulting company with over 6,000 environmental professionals in hundreds of offices nationwide and across the world. Preparation of the VCP was supervised by Mr. Chris Reynolds of the TT Helena office. Mr. Reynolds has a Bachelor of Arts (B.A.) in geology, a Master of Science (M.S.) in environmental geochemistry, and over 19 years experience completing environmental investigations and remedial actions. The engineering for this project was completed by Ms. Kathie Roos, Montana Registered Professional Engineer No. 1171 1PE, 1994. Ms. Roos has over 19 years experience in the environmental field. Additional technical support for this project was provided by Dr. J. Edward Surbrugg, Ph.D. Resumes for these staff are included in Appendix A.

3.3 VCP COMPONENTS

This VCP contains all the required components. Section 4 contains an environmental assessment of the Facility. Section 5 contains the remediation proposal for surface and subsurface soil portions of the Facility listed above. Appendix B contains the written consent of the current property owners for implementation of this VCP and access to the Facility by the City of Shelby and its agents and DEQ.

3.4 REIMBURSEMENT OF REMEDIAL ACTION COSTS

The City of Shelby will reimburse DEQ for any remedial action costs the state incurs in review and oversight of this VCP.

3.5 PHASED CLEANUP

This VCP addresses the contaminated soil at the Facility and excludes groundwater within the Facility. A VCP was prepared for Falcon Construction, the previous owner of the Facility, in December 1997. The VCP was never approved by DEQ and is only used as a reference for historical analytical data.

4.0 ENVIRONMENTAL ASSESSMENT

This environmental assessment presents a comprehensive description of the information available for the Facility including legal description and Facility map, physical characteristics, area wells, groundwater and surface water usage, operational history of the Facility, current and future Facility usage, soil and groundwater screening criteria, Facility characterization, human and environmental exposure, and regulatory and compliance history.

4.1 LEGAL DESCRIPTION AND FACILITY MAP

The Facility encompasses approximately 11 acres located west of Front Street approximately 1 mile southeast of the center of Shelby in Toole County, Montana (Figure 1-1). The Facility is located in Township 32 North, Range 2 West, Montana Principal Meridian (MPM), Toole County, Montana, Section 27: that portion of the N½SW¼SE¼ lying west of Burlington Northern Railroad Company (BN) right of way within the corporate city limits of the City of Shelby, Toole County, Montana. The approximate latitude is 48º 29’ 50” north and approximate longitude is 111º 50’ 54” west. A Facility map is provided in Figure 1-1 that shows the boundary and topography of the Facility. Figure 1-2 shows the former locations of surface and subsurface structures.

4.2 PHYSICAL CHARACTERISTICS

The physical characteristics of the Facility are described below.

4.2.1 Physical Description

The Facility is located in an area of agricultural and light industrial activities west of a BN branch line. The Facility is bounded on the south by a truck washing facility; on the west by undeveloped agricultural land; on the north by vacant land and the Neda Warehouse; and on the east by Front Street. A grain elevator and the BN railroad right-of-way are located east of Front Street. DEQ records at http://deq.mt.gov/rem/InteractiveMaps.asp including the Controlled Allocation of Liability Act sites, State Superfund sites, Water Quality Act sites, VCRA sites, Brownfields sites, petroleum releases, Montana Bureau of Mines and Geology (MBMG) and DEQ abandoned mine sites, Federal Superfund sites (Cerclis and toxic release inventory) crude oil pipelines, and Core of Engineers 404 permits were queried on October 10, 2008 and no sites were found within one quarter mile of the Facility. Air photographs were examined to identify impacted facilities within ¼ mile of the Facility. Also, a near Facility reconnaissance was completed to identify impacted facilities. No impacted facilities were identified.

The land parcel that contains the Facility also includes the land located in Township 32 North, Range 2 West, Montana Principal Meridian (MPM), Toole County, Montana, Section 27 N½ SW¼. The land in the SW¼ of Section 27 was never used for refining activities and is located topographically higher and upgradient of all refinery operations (Figure 1-1). Sampling completed to date indicates that there is no contamination extending uphill from the location of the refinery (Section 4.8.1). The Facility only includes the portion of the land parcel located in Section 27 N½ SE¼.

The Facility was once used as an oil refinery. All of the buildings, above ground storage tanks, and other equipment have been removed from the property. The Facility was once used for motorcycle recreation, however once the City of Shelby acquired the property they erected a fence to restrict access. A few bottoms of fuel storage tanks comprosed of sheet iron and other miscellaneous debris like excavated iron piping are located on the Facility.

The utilities present at the Facility include the City of Shelby water line that runs along Front Street on the eastern side of the Facility (Figure 4-1). The waterline was installed in 1979 and there was no recorded evidence the contamination was encountered.

4.2.2 Topography

The City of Shelby and the project area are located on a glaciated part of the northern Great Plains physiographic province. The area is characterized by rolling hills and the canyon of the Marias River, which is located approximately 6 miles to the south. The topography of the Facility slopes from west to east. The elevation of the Facility ranges from approximately 3,250 feet above mean sea level (amsl) along the east side to 3,300 feet amsl along the west side of the refinery. Further to the west the land surface slopes steeply up to a bench with an elevation of approximately 3,400 feet amsl. The portion of the land parcel that includes the Facility located in the SW quarter section of Section 27 is completely uphill of all areas known to have been affected by refinery operations. The Facility only includes the portion of the land parcel located in Section 27 N½ SE¼.

There are no surface water drainages or streams present at the Facility. The primary surface water feature is an intermittent drainage located more than 600 feet to the east of the Facility. This drainage flows south and into the Marias River approximately 6.5 miles downstream. A second intermittent drainage is located approximately 1,200 feet south of the facility. The second intermittent drainage joins the first more than 2,000 feet south of the Facility.

The Federal Emergency Management Agency (FEMA) flood plain map for Shelby, Montana does not extend to the Facility (Appendix C). A Flood Insurance Administration Flood Hazard Boundary Map for the City of Shelby does not show any special flood hazard areas but does not extend to the facility. An evaluation of the topography near the Facility suggests that the facility is not within a 100-year floodplain.

4.2.3 Stratigraphy

Exposed bedrock in the vicinity of the Facility is sedimentary in nature and consists of Cretaceous shale of the Kevin Member of the Marias River Formation (MBMG 2002). The Kevin Member of the Marias River Formation contains medium-dark-gray to brownish gray, calcareous, fissle shale. The Kevin Member is 620 feet thick on the Kevin-Sunburst Dome. The thickness of the member is unknown near Shelby. Above the Kevin Member of the Marias River Formation are unconsolidated alluvium and colluvium. Below the Kevin Shale Member are the Ferdig Member of the Marias River Formation, the lower to upper Cretaceous Blackleaf Formation, the lower Cretaceous Kootenai Formation, the upper and middle Jurassic Ellis Group, and the upper Mississippian Madison Group.

Soils at the facility have been mapped as Ferd Series which are fine, montmorillonitic, frigid Glossic Eutroboralfs (US Natural Resources Conservation Service [NRCS] 2007). Investigations completed on the Facility indicate that the surface soil is primarily composed of brown silt with sand and gravel. There are selected locations where sand with gravel predominate. The typical soil profile is brown silt with sand and gravel underlain by dark brown compact clay with silt, sand and gravel to between 2 to 20 feet below ground surface (bgs) and very dark brown silty clay starting at depths ranging from 10 to 20 feet bgs. The silty clay grades into shale with depth and is likely composed of weathered bedrock from the Kevin Member of the Marias River Formation.

4.2.4 Structural Geology

The sedimentary rocks in the area of Shelby are relatively flat. The main structural feature is the Great Falls Tectonic Zone dominated by northeast-striking basement faults. The valley containing the Facility appears to have been formed by erosion and no significant structural features have been observed at the Facility.

4.2.5 Hydrology

There are no surface water features present on the Facility. Surface water from storm events or snowmelt will drain from west to east across the Facility in small rivulets and as sheet flow. The primary surface water feature is an intermittent drainage located more than 600 feet to the east of the Facility. This drainage flows south and into the Marias River approximately 6.5 miles downstream. A second intermittent drainage is located approximately 1,200 feet south of the facility. The second intermittent drainage joins the first more than 2,000 feet south of the Facility.

At this time, there are no wastewater discharge points or surface water intakes present on the Facility.

4.2.6 Hydrogeology

There are no utilized groundwater aquifers present under the Facility. A review of the Ground-Water Information Center (GWIC) records for Township 32 North, Range 2 West, Sections 21, 22, 23, 26, 27, 28, 33, 45, and 35 revealed two domestic or stock water supply wells. Both wells are located near permanent surface water bodies and are installed on the benches topographically above the City of

Shelby. The wells are 35 and 40 feet deep; the bottoms of the wells are above the surface elevation at the Facility.

There is shallow groundwater present below the Facility in the fractures of the weathered shale of the Kevin Member of the Marias River Formation. Five monitoring wells (PRC-MW01 through PRC-MW05) have been installed at the Facility (Figure 4-2). The depth to groundwater at the Facility ranges from approximately 7 feet bgs at monitoring well PRC-MW03 to 17 feet bgs at PRC-MW01. Depth to groundwater measurements were completed every time the wells were sampled. The shallow groundwater has a gradient between 0.003 to 0.004 feet per foot (ft/ft) to the south/southeast (Figure 4-2). This gradient is an average gradient from monitoring well PRC-MW01 (located at northern property boundary) to monitoring well PRC-MW04 (located southeast of the process area).

No aquifer tests have been completed on the monitoring wells at the Facility. Slug tests and pumping tests were not completed because of the very slow recharge rates for the wells. The wells were monitored bi-annually from December 2006 to July 2008. All well monitoring events included measurement of the depth to the water table. Depth to groundwater measurements were completed at each well on December 6 and 7, 2006. The monitoring wells were developed on December 6 and sampled on December 7. During development each well was drawn down then allowed to recover prior to sampling on December 7. Table 4-1 presents the water levels measured prior to well development on December 6 and sampling on December 7. The data show that none of the wells completely recovered overnight. Monitoring wells PRC-MW01 and PRC-MW02 almost completely recovered while monitoring wells PRC-MW03, PRC-MW04, and PRC-MW05 did not recover to within 5 feet of the predevelopment water level. During development and sampling monitoring well PRC-MW02 recovered almost completely.

The recovery and pumping data indicate that the sand, silt, and clay that compose the surficial geology at the Facility have very low hydraulic conductivity.

Specific conductivity measurements collected in July 2008 indicate that the shallow groundwater at the Facility meets the specific conductance standard for Class III groundwater with specific conductivities ranging from 9,330 to 17,280 microSiemens per centimeter (µs/cm). Class III groundwaters must be maintained so that these waters are at least marginally suitable for (i) irrigation of some salt tolerant crops; (ii) some commercial and industrial purposes; (iii) drinking water for some livestock and wildlife; and (iv) drinking, culinary and food processing purposes where the specific conductance is less than 7,000 µs/cm. Near the Facility, the shallow groundwater has not and is currently not used for consumption, stock watering, recreation, or irrigation. The Facility is located within the City of Shelby and the City requires that all residences, commercial enterprises, and industrial facilities within the City limits connect to the City water supply system. The public water supply has the capacity to serve the anticipated residential or commercial development in the area.

4.2.7 Climate

The climate of the Shelby area can be characterized as continental and semiarid. The data presented below are for 1950 through 2007 at the Shelby weather station (Western Regional Climate Center [WRCC] 2008). The mean maximum daily temperature ranges from 30.8º F in January to 84.3º F in July with an annual average of 57.1º F. The average annual amount of precipitation is 11.52 inches. Most of the precipitation falls in the summer (May to August, 7.1 inches). Minor amounts of precipitation fall in the winter (November to February, 1.45 inches) with the remainder falling in the spring and fall.

In 2007, the wind direction in Cut Bank, Montana (the nearest weather station recording wind speed) was primarily from the southwest. The average daily wind speed ranged from 9.1 miles per hour (mph) in July to 17.2 mph in January (National Oceanic and Atmospheric Administration [NOAA] 2008).

4.2.8 Ecology

Vegetation present at the Facility is primarily mixed native and introduced grasses, with some weeds. Deer, small mammals, raptors, and song birds are present in the area. There are no wetlands, areas with shrubs and trees, or any other areas that contain a habitat of special concern. The Montana Natural Heritage Program (MNHP) database (as of December 1, 2008) does not contain any records of a species of special concern within Township 32 North, Range 2 West (MNHP 2008; Appendix D).

4.3 AREA WELLS

A list of wells in the MBMG –GWIC Wells database for Township 32 North, Range 2 West, Sections 21, 22, 23, 26, 27, 28, 33, 34, and 35 is included in Appendix E. There are a total of 35 listed wells in these nine sections. Twenty-four of the wells were installed and are owned by the Montana Salinity Control Association (MSCA). The depth of the MSCA wells ranges from 7 to 20 feet bgs. Four of the reported wells are geotechnical boreholes that were completed as wells (GWIC identification numbers 159444, 162891, 162892, and 162886). Five wells (GWIC identification numbers 199763, 125369, 125370, 231179, and 139130) appear as monitoring wells with depths ranging from 16 to 25 feet bgs. There are two domestic or stock water supply wells in the GWIC database (GWIC identification numbers 88811, and 88812). Of the listed wells, two monitoring wells (231179 and 139130) and one MSCA well

(173736) may be within ½ mile of the Facility. The surface elevation for the monitoring wells and MSCA well is approximately the same as the Facility.

There are 5 monitoring wells on the Facility constructed in December 2006.. Figure 4-2 shows the location of the monitoring wells on the Facility. Well logs for the wells within a ½ mile of the Facility (off-Facility monitoring wells 88811 and 88812, MSCA well 173736, and the Facility monitoring wells) are located in Appendix F. Figure 4-3 shows the approximate location of the wells within a ½ mile of the Facility.

4.4 GROUNDWATER AND SURFACE WATER USAGE

The Facility is located on an alluvial bench composed of silty sandy clay alluvium over weathered shale. There is no perennial surface water present on or near the Facility. The closest perennial surface water is the Marias River more than 6 miles away. Ephemeral surface water present at the Facility during storm runoff or snowmelt is not immediately used or accumulated and stored for future use.

Five monitoring wells were installed on the Facility in December 2006. Depth to water measurements collected during each sampling event indicate that groundwater is present at the Facility. There are no groundwater production wells installed within one mile of the Facility at elevations below the elevation of the Facility. The Kevin Member of the Marias River Formation which underlies the Facility is composed of shale. The upper portion of the formation has been weathered and fractured permitting groundwater to exist below the Facility. The amount of groundwater is very small and the potential production rates for water supply wells are very low. In addition, the groundwater has specific conductivity at levels (9,330 to 17,280 µs/cm) that cause the groundwater to be Class III water. The City of Shelby obtains its water from wells installed in the Marias River alluvium approximately 6 miles south of the Facility. The public water supply has the capacity to serve the anticipated residential or commercial development in the area.

4.5 OPERATIONAL HISTORY OF FACILITY

The following sections present information on the land ownership and operational history of the Facility.

4.5.1 Land Ownership

The Petroleum Refining Company Refinery was built in 1940 for the purpose of refining crude oil obtained from the nearby Kevin-Sunburst oil field northwest of Shelby, Montana. The City of Shelby Plat Book shows the land ownership to be:

- Unknown to March 22, 1924 – C. P. Schanil
- March 22, 1924 to February 12, 1940 – Arnold and Emma Houdek
- February 12, 1940 to July 30, 1946 – Petroleum Refining Corporation
- July 30, 1946 to February 18, 1947 – J.A. and Ada Lee Charbonneau
- February 18, 1947 to June 12, 1952 – E. A. Wight, Northstar Refining Company
- June 12, 1952 to October 1, 1957 – Modern Oil Company
- October 1, 1957 to June 23, 1958 – John Wight, Incorporated
- June 23, 1958 to July 18, 1958 – The Solar Oil and Refining Company
- July 18, 1958 to October 22, 1963 – North Star Refining Company
- October 22, 1963 to October 21, 1976 – John Wight, Inc.
- October 21, 1976 to December 27, 1978 – John and Theora Wight
- December 27, 1978 to May 18, 1981 – Wight Oil and Refining Company
- May 18, 1981 to September 21, 1982 – Northwestern Union Trust Corporation
- September 21, 1982 to September 2, 1986, John Wight Trustee
- September 2, 1986 to January 30, 1990, Estate of John Wight
- January 30, 1990 to June 25, 2007, Theora Wight Trustee
- June 25, 2007 to present – City of Shelby

Petroleum Refining Company, Northstar Refining Company, Modern Oil Company, John Wight, Inc., Solar Oil and Refining Company, North Star Refining Company, John Wight Inc, and Wight Oil and Refining Company no longer exist and the principles of all the firms are deceased.

The plant reopened sometime in the late 1960s or early 1970s under the name North Star Refinery for the purpose of producing jet fuel for the Glasgow Air Force Base. The refinery location has been abandoned since the early 1970s.

A buy/sell agreement for the property was reached in May of 1995 between the Wright Trust and Falcon Construction and Steven and Tracy Williamson in which the Quit Claim Deed for the property would be held in escrow pending receipt of a “no action” or a “no further action” letter from the Department of Health and Environmental Sciences, Superfund section. No letter was received, and Falcon Construction and Steven and Tracy Williamson never possessed the deed to the land. The City of Shelby has now taken possession of the property.

4.5.2 Operational History

The Petroleum Refining Company, a subsidiary of Pacific National Oils, was built in 1940 for the purpose of refining crude oil obtained from the nearby Kevin-Sunburst oil field northwest of Shelby, Montana. Crude oil was processed into gasoline. The refinery was designed to be a small operation (500 barrel capacity). The refinery operated from 1941 to 1945 before closing for a lack of market (Ashley 1998, Tetra Tech 2007 and 2008). In 1947 the name was changed to Northstar Refining Company and the refinery operated sporadically until 1953 (Ashley 1998). The name was changed again to Modern Oil Company and operated from 1953 to 1954. According to newspaper records, the plant was reactivated in 1952 and changed ownership in 1954. It was temporarily shut down again in 1954 so that company officials could identify new marketing strategies and sources of crude oil. No records could be found indicating how long the refinery operated under the new owners. The plant reopened sometime in the late 1960s or early 1970s under the name North Star Refinery for the purpose of producing jet fuel for the Glasgow Air Force Base (DEQ 2006a). During its operation, the Petroleum Refining Company had a process area, several ASTs in the south tank farm (Figure 1-2), as well as a cluster of additional tanks in the north tank farm (Figure 1-2). Aerial photographs and photographs taken prior to dismantling the refinery (available in DEQ's files) show that the structure immediately adjacent to the northeastern edge of the South Tank Farm may be a truck loading rack. Examination of the historical aerial photos from the Toole County FSA office in Shelby dated 1941, 1951, and 1966, did not identify anything that appeared to be related to loading or off-loading of petroleum at the rail line and it appears that the rail line across Front Street was vacant during the time period 1941-1951 when the refinery was sporadically in operation.

The refinery location has been abandoned since the early 1970s. In approximately 1991, the tanks and known piping were removed (DEQ 1995) except for several bottoms of tanks and some piping. Also in 1991, a grass fire consumed many of the buildings on the Facility. Several buildings remained on the Facility including the tetraethyl lead building (Figure 1-2), a building containing asbestos and 55-gallon drums of sodium carbonate, and a laboratory building containing various chemicals. From 1991 to 1993 the chemicals remaining on Facility were sampled and shipped off-Facility for disposal. SRM Inc. sampled the chemicals and arranged for their disposal. Habets Construction removed and disposed of the asbestos material. The remaining refinery structures were demolished and removed by Falcon Construction in 1995; however, four partial crude oil storage tank bottoms remain on the Facility. The tank bottom remains include three American Petroleum Institute standard 500-barrel above-ground storage tanks (AST) and one 50-barrel AST. The top of each tank was cut at approximately 16 inches above ground and the steel scrapped by Highline Salvage Company in 1995. In 1995 approximately 1,000 feet of additional underground piping was removed from the Facility under permit 96-0417.

Two sludge pits were also located on the property – one to the south of the south tank farm and one to the north of the north tank farm. It is believed that the southern sludge pit contained bottom sediment from crude oil and/or refined petroleum storage tanks (Land and Water Consulting (LWC) 1997) and there is no information on the types of waste that were disposed of in the north sludge pit.

Although a comprehensive list of chemicals used at the Facility is not available, contaminants at the Facility likely include petroleum compounds associated with crude oil refining, tetraethyl lead, and other petroleum additives. SRM completed an inventory of the chemicals at the Facility and found: fuel, oil, Perco gas sweetener with lead and cadmium, sodium bicarbonate, sodium carbonate, asbestos, gasoline dye, sulfur, acidic oxidizer, insulation, methanol/sodium carbonate or sodium hydroxide solution, naphtha solvent, anhydrous calcium sulfate, nitric acid, xylene naphtha benzene solvent, and acid. It is probable that other chemicals were used at the Facility but there are no records that provide a comprehensive list of chemicals. Samples collected at the Facility have been analyzed for volatile organic compounds (VOC), semivolatile organic compounds, metals, and petroleum constituents. Other than petroleum related compounds no VOCs, SVOCs, or metals were identified as at the Facility. Specific contaminants have been identified by previous environmental investigations (see Section 4.8) and have provided additional information on the types of materials once used at the Facility.

4.5.3 Cultural Resources

A cultural resource inventory of the Facility was completed in February 2007 by Gar C. Wood and Associates (Wood 2007). The only potential cultural resource found at the Facility was the former refinery. The cultural inventory observations include: (1) the Facility lacks any integrity; (2) the ground has been disturbed to such an extent it is impossible to tell where the tanks, cracking tower, and auxiliary buildings were located; (3) no materials remain at the refinery; (4) no workmanship is present; and (5) the refinery is not associated with significant historical people. The conclusions of the cultural resource inventory are that no critical elements, features, or artifacts remain and that there is no basis whatsoever to consider this site as eligible for listing on the National Register of Historic Places under any criteria.\

4.6 CURRENT AND FUTURE FACILITY USAGE

The current land use at the Facility is as vacant property. There may be recreational trespassers on the Facility. The area is currently zoned as general industrial. A copy of the zoning regulations is in Appendix G. There are no other current land use regulations, ordinances, restrictions, or covenants. Institutional controls comprised of a Declaration of Restrictive Covenants on Real Property will be placed on the property to prevent future residential use, including those limited and temporary residential uses allowed by the current general industrial zoning regulations. The proposed institutional controls are provided in Appendix H. The current plan for future use of the Facility is to move the HiLine Redi-Mix concrete batch plant from its' current location in a residential area to the Facility.

MCA § 75-10-701(18) defines reasonably anticipated future use and should 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. Based on these criteria the anticipated future use of the adjacent properties to the north, east, and south is commercial or industrial. This determination is made based on: (a) area zoned industrial; (b) historic and anticipated use is industrial; (c) development of immediate area is industrial; and (d) the City anticipates that the area will be industrial. The property to the west may be used for residential development because it is: (a) area zoned residential, (b) the area has been agricultural but is anticipated to become residential; (c) the area is uphill of the Facility and is accessed from a residential area; and (d) the City anticipates that the area will be residential.

4.7 SOIL SCREENING CRITERIA

Screening criteria for contaminant concentrations in soil samples were obtained from published standards and guidance. There are no historic surface water samples from the Facility and groundwater is not included in the VCP. Therefore, no screening levels for water are necessary. The screening levels used in the evaluation for soil follow the DEQ soil screening process for direct exposure and leaching to groundwater. Arsenic was the only metal identified for background evaluation. Arsenic concentrations at the Facility range from 0.6 to 16.8 mg/kg. DEQ identified samples SS-1, PRC-SS-01, PRC-SS-04, PRC-SS-20, MW-01 and PRC-SB-27 as potential background sampling locations. The concentrations of arsenic in the background samples ranged from 0.6 to 11.6 mg/kg with an average of 7.5 mg/kg and a standard deviation of 3.3 mg/kg. The mean plus two times the standard deviation equals 14.1 mg/kg and may be used as a screening concentration for background arsenic concentrations. For the other metals the concentrations were compared to the RSL for residential soil. For petroleum compounds the sample concentrations were compared to the RBCA master table RBSL values for direct contact residential (surface soil only) and direct contact excavation (subsurface soil). Some of the older diesel range organics (DRO) and total extractable hydrocarbons (TEH) data were screened against the residential RBSL for C_{11} - C_{22} Aromatics. The concentrations of the remaining detected organic compounds were compared to the RSL residential soil. Carcinogenic compounds were compared directly to the residential RSL while non-carcinogenic compounds were compared to 0.1 times the residential RSL. Lead is a non-carcinogenic compound however; the site concentrations were screened using the RSL because the risk from lead is not additive with the risk from other non-carcinogenic metals or organic compounds.

For metals, the concentrations were compared to the RSL soil screening levels (SSL) corrected for a dilution attenuation factor (DAF) of 10. The SSL for zinc and diethyl phthalate were adjusted to take into account the difference between the DEQ-7 numerical standard and the tap water RSL. For petroleum compounds the sample concentrations were compared to the RBCA master table RBSL values for leaching 0-10 feet to groundwater. The concentrations of the remaining detected organic compounds were compared to the RSL SSL corrected for a DAF of 10.

4.8 FACILITY CHARACTERIZATION

A number of investigations have been completed at the Facility. Information, reports, and the raw data are available in the DEQ Facility files. Section 4.8.1 presents a summary of each investigation and Section 4.8.2 presents an interpretation and summary of the data from all the investigations.

4.8.1 Previous Investigations

In October and November 1988, the Facility was investigated by MSE Technology Applications Inc. (MSE) on behalf of the Montana DEQ to obtain data to perform a hazard ranking for the Facility and to 1) characterize contaminants in the on-Facility sludge pit; 2) characterize soils by sampling in areas of staining or stressed vegetation; and 3) determine if the groundwater is contaminated by refinery wastes and identify any contaminants present in groundwater. Three soil samples and two sludge samples were collected and analyzed for VOCs, SVOCs, and metals. No significant data quality assurance/quality control (QA/QC) issues were identified during data validation (MSE 1989). Methylene chloride, 2-methylnaphthalene, arsenic, and mercury were detected at concentrations greater than the screening levels (Table 4-2, Figure 4-4). Asbestos and sodium carbonate were also found in buildings. The MSE investigation report recommended removal of sludge pits, drums, and asbestos to eliminate direct contact hazards (MSE 1989). As a result of the investigation, DEQ listed the Petroleum Refining Company Facility under the state CECRA program (LWC 1997).

In October 1991, a grass fire overtook the Petroleum Refining Company Facility and damaged several buildings. A local Shelby firefighter was hospitalized for three days. In November 1991, a DEQ inspector visited the Facility to determine if measures were needed to control Facility access and contain hazardous chemicals. DEQ determined that chemicals found in the laboratory building should be removed and Facility access should be controlled. The DEQ inspector felt that a remedial investigation was needed as well (LWC 1997).

From 1991 to 1993, some of the chemicals at the Facility were shipped off Facility for disposal. Kevin Sweeney, an attorney who represented the Wright Trust, retained SRM, Inc. to conduct the work and oversee fencing of the Facility. SRM, Inc. was contracted to characterize, quantify, containerize, and arrange for the disposal of the chemicals found at the Facility. Chemicals removed from the Facility include 100 pounds of "waste oxidizer, solid, N.O.S. (oxidizer) 5.1 UN1479, PGII", 30 pounds of "waste corrosive solid, N.O.S. (sodium hydroxide, methanol) 6, UN1759, PGIII.", 13 gallons of "hazardous waste, liquid, N.O.S. (cadmium, lead) 9 NA3082, PGIII RQ = 1lb. (D008)", 13 gallons of "waste flammable liquid, N.O.S. (lead, xylene) 3, UN1993, PGII, RQ=1lb (D008), 30 gallons of "material not regulated by DOT", 300 pounds of "non-regulated material, solid (dye), 500 pounds of "waste white asbestos (chrysatile) 9, UN2590, PGIII, RQ = 1lb. (asbestos)", 2,800 pounds of "waste corrosive solid, N.O.S. (sodium carbonate, sodium bicarbonate) 8, UN1759, PGIII", 400 pounds of "waste sulfur, 9, NA1350, PGIII", and 120 pounds of (non-regulated waste, solid (insulation, calcium sulfite)"(information from waste disposal manifests in DEQ files) A separate contractor, Habets Construction, was responsible for removing the asbestos. Chemicals remaining on Facility after 1993 were petroleum sludge and 55-gallon steel drums containing sodium carbonate (LWC 1997).

In February 1995, a DEQ inspector visited the Facility and collected samples from the remaining sludge to determine if it would need to be classified as hazardous waste for disposal purposes. Six samples were collected from the tank bottoms and the sludge pits and analyzed for volatile organics, arsenic, cadmium, and lead by the toxicity characteristic leaching procedure (TCLP). No analytes were detected above the laboratory practical quantitation limits (Table 4-3, Figure 4-4, LWC 1997). All spike percent recovery data were within acceptable limits. No other laboratory quality control data are available in DEQ files.

In November 1995, Falcon Construction Company removed the underground and partially aboveground piping, the material in the southern sludge pit, and approximately sixteen 55-gallon drums of material assumed to be sodium carbonate. The tops of the ASTs were cut to approximately 16 inches above ground and the steel scrapped along with the piping by Highline Salvage of Cut Bank, Montana. A 20 by 20 foot area in the south sludge pit was excavated to a depth of 6 feet at the center. Approximately 80 cubic yards of material were removed from the pit and disposed of at the Shelby Class II Landfill, where it was landfarmed. Soil at the base of the excavation showed no visual sign of petroleum (LWC 1997).

In June 1997, LWC prepared a VCP (LWC 1997) for Falcon Construction. As part of the report, four samples from around the former tetraethyl lead building were analyzed for total lead (Figure 4-4). The QA/QC data available for the lead analysis includes a duplicate, matrix spike (MS), and laboratory control sample (LCS). The relative percent difference (RPD) for the duplicate was acceptable and the percent recoveries for the matrix spike and laboratory control sample were acceptable. Lead concentrations were not found to be greater than screening levels (Table 4-4). Four additional samples were collected from the location of the removed piping and analyzed for DRO and TEH. The QA/QC data available for the DRO and TEH analysis include surrogate spikes, three continuing calibration check (CCC) standards, two LCS, MS, and matrix spike duplicate (MSD). All percent recoveries for the surrogate spikes, CCC, LCS, and MS/MSD were within acceptable limits and the RPD for the MS/MSD was acceptable. The samples were analyzed outside of holding times due to laboratory error. Results showed concentrations of DRO and TEH greater than the residential soil RBSL in the area of the southern tank farm (Table 4-4), where a transfer pump used to operate. LWC estimated, based on this investigation, that approximately 915 cubic feet of petroleum-based sludge were contained in the tank bottoms and that approximately 90 cubic yards of petroleum-affected soil existed on the ground around the tanks and below the former transfer pump location.

In April 2000, LWC collected two composite surface soil samples (297064-C-101 & 297064-C-102) from the ground surface around the north tank basin and one sludge sample from one of the tank bottoms. The composite soil samples were analyzed for benzene, toluene, ethylbenzene, xylene (BTEX) and EPH. The C_{11}-C_{22} aromatic compound concentrations exceeded DEQ RBSLs. A carbon scan performed on the sludge sample showed a small peak in the diesel range (C_{10}-C_{22}), but most of the hydrocarbons in the sludge were greater than C28 (Table 4-5)(PBS&J 2005).

In May 2000, LWC again visited the Facility and collected four additional composite soil samples from the bottom of the south sludge pit (297064-C-111), below tank 1 in the south tank farm (297064-C-112), the south end of the south tank farm (297064-C-113), and the north sludge pit (297064-C-116) and analyzed them for EPH. No laboratory QA/QC data are available in DEQ files. The analytical results are presented in Table 4-5. Sample 297064-C-116, collected from the north tank farm, was the only composite sample that contained petroleum constituents (C_{11} – C_{22} Aromatics) at a concentration (470 milligrams per kilogram [mg/kg]) above the direct contact residential (458 mg/kg) and leaching 0 to 10 feet to groundwater (380 mg/kg) RBSLs. In addition to the composite soil samples, LWC installed 18 test pits throughout the northern portion of the southern tank farm and around the former location of the petroleum processing facilities (Figure 4-4). Petroleum-impacted soils were observed in 10 of the test pits at depths ranging from 3 to 4 feet bgs to approximately 8 to 11 feet bgs (Table 4-6). Two soil samples were collected from test pit T-7. Sample 297064-G-114 was collected at a depth of 9 to 10 feet bgs from petroleum stained soil and sample 297064-G-115 was collected at a depth of 12 to 13 feet bgs from soil that was not stained. Subsurface soil sample 297064-G-114 contained petroleum constituents (C_{11} – C_{22} Aromatics) at concentrations above the RBSLs (Table 4-5). Based on the investigation completed in 2000, LWC estimated that approximately 8,333 cubic yards of contaminated soil is in place on the Facility (PBS&J 2005).

In November and December 2006, TT, under contract to DEQ, installed 25 borings at the Facility (Figure 4-4). Five of the borings were converted into monitoring wells (PRC-MW01 thru PRC-MW05). Twenty-three of the borings were drilled using a rotosonic drill rig and two of the borings were installed using a hand auger, due to lack of access in the southern sludge pit (PRC-SB28 and PRC-Sludge Wall). The borings are numbered sequentially however, several numbers in the sequence were skipped (no boring assigned number) including SB-12, SB-13, SB-19, SB-22, and SB-25. Each soil boring was logged during drilling and head space readings were collected at regular intervals from the surface down to the groundwater table. The soil interval with the highest headspace reading from each soil boring was selected for laboratory analysis. If headspace readings were nondetect, the interval showing visual or olfactory signs of contamination was selected for laboratory analysis. In absence of elevated headspace readings or any obvious sign of contamination, the soil interval immediately above the groundwater table was selected for sampling. Details for soil boring depths, sample intervals, and headspace readings are shown in Table 4-7. All soil samples were sent to Energy Laboratories in Helena, Montana for volatile petroleum hydrocarbon (VPH) Massachusetts Method, EPH Massachusetts Method, VOCs including 1,2-dichloroethane (1,2-DCA) using method SW8260B, ethylene dibromide (EDB) using method SW8011, SVOCs including tetraethyl lead using method SW8270C, and the metals arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver using Method SW6010B. Soil samples submitted for EPH analysis were fractionated if the detected EPH screen concentration exceeded 50 mg/kg. Data validation reports are in DEQ files.

<u>VOCs – Subsurface Soil</u>

VOCs were detected in one borehole soil sample (PRC-SB07) (Figure 4-4). In total, two VOC analytes (total xylenes and o-xylene) were detected. Both analytes were detected at estimated concentrations of 0.12J mg/kg (Table 4-8). Neither concentration exceeded soil RSLs or RBSLs for these analytes. VOCs were not detected in soil samples from any other location.

<u>SVOCs – Subsurface Soil</u>

SVOCs were detected in samples from seven boring locations (PRC-MW05, PRC-SB06, PRC-SB07, PRC-SB08, PRC-SB15, PRC-SB16, and PRC-SB18) (Figure 4-4). In total, four SVOC analytes (bis[2-ethylhexyl]phthalate, diethyl phthalate, di-n-butyl phthalate, and phenanthrene) were detected

(Table 4-9). All detected SVOC concentrations were estimated values below the laboratory detection limit and below RSLs. Tetraethyl lead was not detected in any soil sample.

VPH – Subsurface Soil

VPH constituents were detected in samples from seven soil boring locations (PRC-SB07, PRC-SB08, PRC-SB14, PRC-SB18, PRC-SB20, PRC-SB21, and PRC-Sludge Wall) (Figure 4-4). C_9-C_{10} aromatics were detected at concentrations exceeding RBSLs in the soil samples from PRC-SB21 (7 to 9 feet bgs) at a concentration of 52 mg/kg and the PRC-Sludge Wall (2 feet bgs) at a concentration of 12 mg/kg (Table 4-10). All other detected concentrations were below RBSLs for VPH constituents in soil.

EPH – Subsurface Soil

EPH constituents were detected in samples from nine soil boring locations (PRC-MW03, PRC-SB07, PRC-SB14, PRC-SB18, PRC-SB21, PRC-SB23, PRC-SB28, PRC-SB29, and the PRC-Sludge Wall) (Figure 4-4). EPH screen results exceeded the RBSL of 50 mg/kg for total extractable hydrocarbons in samples collected at six borehole locations (Table 4-10). Three of the samples also had fractionation concentrations that exceeded RBSLs. The sample from boring PRC-SB14 (9 to 12 feet bgs) had a concentration of 390 mg/kg for C_{11} to C_{22} aromatics, which exceeds its RBSL of 100 mg/kg. The samples from boring PRC-SB28 (12 feet bgs) and the PRC-Sludge Wall (2 feet bgs) had concentrations that exceeded RBSLs for all EPH fractions. Both samples were collected from the southern sludge pit. Black staining was noted at both locations and a strong diesel and sewage odor was noted at PRC-SB28.

Metals – Subsurface Soil

Five metals were detected (arsenic, barium, cadmium, chromium, and lead) in soil samples collected from boreholes (Figure 4-4)(Table 4-11). Mercury, selenium, and silver were not detected in any subsurface soil sample. Arsenic concentrations ranged from 8.1 mg/kg to 14.1 mg/kg, exceeding the RSL for residential soil (0.39 mg/kg) and leaching to groundwater (2.9 mg/kg) but below the DEQ's generic action level for arsenic of 40 mg/kg (DEQ 2005). Based on the levels of arsenic in all samples and regional arsenic levels, the detected arsenic levels are considered to be background levels and not due to contamination (see Section 4.7 above). No other metals exceeded RSLs for residential soil or leaching to groundwater with a DAF of 10.

In July 2007, DEQ collected surface soil samples from 19 locations. At each location samples were collected from 0 to 0.5 feet bgs and 0.5 to 2.0 feet bgs. Duplicate samples (SS-06 and SS-05) were collected at two locations (SS02 and SS04, respectively). Each sample was analyzed for EPH using the Massachusetts Method and the metals arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver using Method SW6010B. Soil samples submitted for EPH analysis were fractionated if the detected EPH screen concentration exceeded 200 mg/kg. Data validation reports are in DEQ files.

EPH – Surface Soil

EPH constituents were detected in all but one surface soil sample. Only four samples (PRC-SS02 0.5-2, PRC-SS06 0-0.5, PRC-SS06 0.5-2, and PRC-SS11 0-0.5) contained EPH at concentrations above the 200 mg/kg screening level and required fractionation (Table 4-12). The EPH fractions were analyzed for using the Massachusetts Method and the polynuclear aromatic hydrocarbons (PAH) were analyzed for using SW8270C. None of the EPH fractions exceeded the RBSLs and no PAHs were detected.

Metals – Surface Soil

Five metals were detected (arsenic, barium, cadmium, chromium, and lead) in surface soil samples (Figure 4-4)(Table 4-13). Mercury, selenium, and silver were not detected in any surface soil sample. Arsenic concentrations ranged from 5.5 mg/kg to 16.8 mg/kg, exceeding the RSL for residential soil (0.39 mg/kg) and leaching to groundwater (2.9 mg/kg) but below the DEQ's generic action level for arsenic of 40 mg/kg (DEQ 2005). Based on the concentration of arsenic in all samples and regional arsenic concentrations, the detected arsenic levels are considered to be background levels and not due to contamination (see Section 4.7 above). Four samples (PRC-SS12 0-0.5 = 21.6 mg/kg; PRC-SS12 0.5-2 = 21.2 mg/kg; PRC-SS13 0.5-2 = 21.0 mg/kg; and PRC-SS14 0.5-2 = 39.0 mg/kg) contained chromium at concentrations greater than the RSL SSL for chromium VI at a DAF of 10 (21 mg/kg). It is very unlikely that chromium is present in Facility surface soils as chromium VI. The facility has not operated for 50 years and the half-life of chromium VI in soils is measured in hours, not years. Hexavalent chromium can be reduced to trivalent chromium under normal soil pH and reduction/oxidation conditions (McLean and Bledsoe, 1992). The generic SSL for chromium III is 990,000,000 mg/kg (DAF of 10), far above the maximum detected concentration of chromium of 39 mg/kg. No other metals exceeded RSLs for residential soil or leaching to groundwater with a DAF of 10.

Five monitoring wells were installed at the Facility during the investigation by TT in December 2006. Monitoring well PRC-MW01 is the upgradient monitoring well and was the first monitoring well to be drilled. Due to very slow groundwater flow rates in the Facility clays, the groundwater table was not immediately obvious during the drilling of PRC-MW01. Therefore, the boring was drilled to a depth of 90 feet. One day after drilling PRC-MW01, the boring still did not contain water. It was decided to set a screen from 10 to 40 feet bgs in formation clays that showed more moisture during the drilling than the formation at depth. The remaining wells are considered downgradient monitoring wells (PRC-MW02 through PRC-MW05) and were drilled to 27 feet with screens set from 5 to 25 feet bgs with 2 foot sumps from 25 to 27 feet bgs. All wells were cased and screened using 2-inch diameter polyvinyl chloride (PVC). A monitoring well construction summary is in Table 4-14. Well completion forms are located in Appendix F.

The monitoring wells have been sampled in December 2006, July 2007, December 2007, and July 2008. In December 2006, the samples were analyzed by Energy Laboratories in Helena, Montana for VPH using the Massachusetts Method, EPH using the Massachusetts Method, VOCs using method SW8260B (including 1,2-DCA), EDB using method E504.1, SVOCs using method SW8270C (including tetraethyl lead), and metals using method E200.8 (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver). Samples submitted for EPH analysis were fractionated if the detected EPH screen concentration exceeded 300 micrograms per liter (µg/l). The samples collected in July 2007, December 2007, and July 2008 were analyzed for EPH using the Massachusetts Method, VPH using the Massachusetts Method, and metals using method E200.8 (same list as in December 2006). Samples submitted for EPH analysis were fractionated if the detected EPH screen concentration exceeded 500 µg/l (DEQ's trigger concentration for fractionation changed from 300 ug/l to 500 ug/l in June 2007).

4.8.2 Data Interpretation and Summary

Figure 4-5 shows surface and subsurface sampling locations where sample analytical data and field observations indicate that contamination is present at concentrations that may (there is uncertainty in visual observations and headspace measurements) and do exceed screening criteria. The organic contaminants of concern have been narrowed down to petroleum constituents since no other VOCs or SVOCs have been detected at concentrations greater than the RSL for residential soil. The metals that have been detected in soil at concentrations above a screening level include arsenic, chromium, and mercury. Arsenic was detected in every soil sample at concentrations greater than the RSLs for residential soil and SSL. However, it was never detected at concentrations greater than the Montana action level of 40 mg/kg (DEQ 2005) and was below the site-specific background concentration of 14.1

mg/kg (see Section 4.7). Chromium was detected in four samples from three locations (21 to 39 mg/kg) at concentrations greater than the generic RSL SSL for chromium VI at a DAF of 10 (21 mg/kg). It is very unlikely that chromium is present in Facility surface soils as chromium VI. The facility has not operated for 50 years and the half-life of chromium VI in soils is measured in hours, not years. Hexavalent chromium can be reduced to trivalent chromium under normal soil pH and reduction/oxidation conditions (McLean and Bledsoe, 1992). The generic SSL for chromium III is 990,000,000 mg/kg (DAF of 10), far above the maximum detected concentration of chromium of 39 mg/kg. Mercury was detected in one sample collected by MSE in 1988 at a concentration (18.6 mg/kg) greater than the generic RSL SSL for a DAF of 10 (5.7 mg/kg); however, it was not detected in any surface soil, subsurface soil, or groundwater sample collected during the comprehensive investigations completed in 2006 through 2008.

Petroleum constituents have been characterized through the collection of surface and subsurface soil samples and analysis for DRO, TEH, VPH and EPH. Specific areas of concern include (Figure 4-6):

- The south sludge pit,
- South tank farm and process area,
- North tank farm,
- North sludge pit, and
- West tank farm.

<u>South Sludge Pit</u>

The activities that have been completed at the south sludge pit include sampling, a removal action, and additional sampling. Approximately 80 cubic yards of petroleum contaminated soil was removed from the south sludge pit in 1995 making all previous sample results non-representative of the current distribution of contamination. Unfortunately, during the 1995 removal action no confirmation samples were collected. Since 1995, the south sludge pit has been sampled by LWC (one composite soil sample [Table 4-6]) and by TT in 2006 (Tables 4-7 and 4-10). The locations of the sample aliquots collected by LWC are unknown. The LWC 1997 composite sample and the 2006 VOC and SVOC analytical results were all nondetect. Two hand borings were installed in the south sludge pit in 2006. The recovered soil samples were stained black and smelled like petroleum (Table 4-7). PRC-SB28 was drilled in the bottom of the sludge pit and sample PRC-SB28-SS01 was collected at a depth of approximately 14 inches. The bottom of the sludge pit is approximately 6 feet bgs and the pit will be completely backfilled after remediation so the sample results are compared to the excavation screening level. The sample contained EPH at a concentration of 6,070 mg/kg, however, it did not contain any petroleum fraction at concentrations greater than the RBSLs for direct contact excavation or leaching 0 to 10 feet to groundwater. Sample PRC-Sludge Wall was collected from the side of the excavation and contained EPH (300,000 mg/kg) and petroleum fractions at concentrations greater than the RBSLs. The data and visual observations indicate that there is petroleum contamination present at the south sludge pit that will require excavation and disposal. Sludge sample SL-08 collected by DEQ in 1995 and analyzed for TCLP showed that the sludge present in the south sludge pit is not a characteristic hazardous waste.

South Tank Farm and Process Area

Most of the historic investigation activities have focused on the south tank farm and process area. The tanks, underground piping, and tank sludge were removed from the Facility in 1995. There is no record of confirmations samples being collected during the removal action. Several samples have contained concentrations of DRO and TEH, and EPH fractions above screening levels. Sample E97064-110, located in the center of the southern tank farm, contained DRO (1,640 mg/kg) and TEH (2,560 mg/kg) at concentrations above the RBCA criteria for analysis of EPH fractions. No fractionation of the sample was completed. Sample 297064-G-114, collected at a depth of 9 to 10 feet bgs from stained soil in test pit T-7, contained C_{11}-C_{12} aromatics at a concentration (1,000 mg/kg) greater than the RBSL for leaching to groundwater 0 to 10 feet bgs (380 mg/kg). Sample PRC-SB14, collected at a depth of 9 to 12 feet bgs, also contained C_{11}-C_{12} aromatics at a concentration (390 mg/kg) greater than the RBSL for leaching to groundwater 0 to 10 feet bgs (380 mg/kg). There are other visual and olfactory indications of contamination. Soil borings PRC-SB20, PRC-SB21, PRC-SB23, and PRC-SB24 all contained soil that had a perceptible petroleum odor (Table 4-7). The soil samples from these borings did not contain EPH or VPH fractions at concentrations greater than the RBSL. Ten of the test pits installed in 2000 contained visibly petroleum-impacted soil (Table 4-6). The only two samples collected from the test pits (297064-G-114 and 2970964-G-115) suggest that the field personnel were able distinguish between contaminated and uncontaminated soil. The sample collected from the petroleum-impacted soil (297064-G-114) contained EPH fractions above screening levels while the sample collected below the petroleum impacted soil (297064-G-115) did not contain EPH at a concentration that required fractionation (Table 4-5). The visual and olfactory observations from the test pits suggest that the area under the northern part of the southern tank farm and the process area has petroleum contaminated soil at depths from 3 to 13 feet bgs. The soil samples from borings PRC-SB20, PRC-SB21, and PRC-SB23 have contaminant concentrations below RBSLs suggesting that the entire south tank farm and process area may not contain petroleum contaminated soil that require removal.

North Tank Farm

The north tank farm is located west of the process area (Figure 4-6). No sample collected in the north tank farm has contained petroleum constituents at concentrations greater than the RBSLs (Tables 4-4, 4-5, 4-10, and 4-12). Low concentrations of TEH (12 mg/kg) were detected in soil below the removed piping joint (sample E97064-112) and no constituents were detected in the soil sample from PRC-SB11. In addition, no stained soil or odors were observed during the drilling of borehole PRC-SB11 (Table 4-7). No test pits or soil borings have been installed in the center of the north tank farm indicating that the subsurface soil in the tank farm area may not be fully characterized.

North Sludge Pit

The north sludge pit is located on the west side of the process area (Figure 4-6). One composite surface soil sample has been collected in the north sludge pit (297064-C-116). The sample contained C_{11}-C_{22} aromatics at a concentration (470 mg/kg) greater than the RBSL for leaching to groundwater 0 to 10 feet bgs (380 mg/kg) and the RBSL for direct contact residential (458 mg/kg). Two sludge samples were collected from the tank bottoms and analyzed for TCLP (SL-04 and SL-05). No TCLP compounds were detected in either sample (Table 4-4). No soil borings or test pits were installed in the area so the depth of the contamination is unknown.

West Tank Farm

The west tank farm is located west of the process area (Figure 4-6). Three subsurface soil (PRC-SB06, PRC-SB07, and PRC-SB08) and three surface soil samples (PRC-SS09, PRC-SS14, and PRC-SS16) have been collected in the west tank farm area. A strong gasoline odor was noted in boring PRC-SB07 (Table 4-7), however, no petroleum constituents were detected in soil samples at concentrations greater than the RBSL. The West tank Farm is of concern due to its large size and the limited amount of investigation that has been completed.

4.9 HUMAN AND ENVIRONMENTAL EXPOSURE

The concentrations of petroleum constituents and several metals exceed the residential RSL or generic SSL (DAF = 10). Section 4.9.1 presents the Facility conceptual exposure model (FCEM) and a summary of how the contaminants of potential concern (COPC) were screened to select the contaminants of concern (COC); Section 4.9.2 discusses the human health risk assessment; and Section 4.9.3 presents ecological risk assessment. Table 4-15 lists the COPCs for surface and subsurface soil.

4.9.1 Facility Conceptual Exposure Model and Contaminants of Concern

The Facility is currently vacant and fenced to prevent trespassers. The objective for the remedial project is to clean up the Facility for future redevelopment as an industrial enterprise. Future on-Facility residents are not included in the evaluation because the Declaration of Restrictive Covenants will prevent all residential use of the Facility, including those limited or temporary uses allowed by the current general industrial zoning regulations. Potential human receptors include:

- Current and future off-Facility residents,
- Current and future off-Facility commercial/industrial workers,
- Future on-Facility commercial/industrial workers,
- Current and future on-Facility trespassers, and
- Future on-Facility construction workers.

Figure 4-7 presents the human health FCEM. There are no complete exposure pathways for current and future off-Facility residents or for current and future off-Facility commercial/industrial workers. The samples collected to date show that the contamination does not extend beyond the property boundary. The nearest current residences are over 1,100 feet away and the nearest commercial operation is over 300 feet away from the nearest area of concern. Existing analytical data demonstrate that contaminant concentrations are greater than the residential direct contact RBSLs and therefore the current and future on-Facility trespassers and future on-Facility commercial/industrial workers exposure pathways may be complete. The future on-Facility construction worker exposure pathway may be complete due to the measured contaminant concentrations in surface and subsurface soil. The exposure of potential receptors to contaminated surface water and outdoor air are minor exposure pathways due to the limited existence of surface water and low potential for the generation of fugitive dust (the Facility is vegetated and fenced to prevent trespassers from riding motor vehicles on the Facility). Due to the detections of VPH contamination in the soil the indoor air pathway may become complete if structures are built during site redevelopment. The exposure of construction workers to outdoor vapors may occur if VPH contaminated soil is encountered during excavation activities.

Potential ecological receptors include plants, invertebrates, small mammals, deer, song birds, and raptors that may feed on food resources present at the Facility. There are no wetlands or other ecologically sensitive populations present at the Facility. At this time the exposure pathways may be complete due to the presence of contaminated surface soil however, the Facility will be redeveloped as an industrial facility indicating that the future ecological exposure pathway will not be complete.

COPCs become COCs if they pose an unacceptable risk to human health, environmental receptors, or groundwater. The COPCs for surface soil include all analytes that exceed (1) 0.1 times the residential RSL for non-carcinogenic contaminants, (2) the residential RSL for carcinogenic contaminants, (3) residential direct contact RBSL, (4) RSL SSL for a DAF of 10, (5) the 0-10 feet to groundwater leaching RBSL, or (6) the RBSL for residential beneficial use. The COPCs for subsurface soil include all analytes that exceed (1) 0.1 times the residential RSL for non-carcinogenic contaminants, (2) the residential RSL for carcinogenic contaminants, (3) excavation direct contact RBSL, (4) RSL SSL for a DAF of 10, (5) the 0-10 feet to groundwater leaching RBSL, or (6) the RBSL for excavation beneficial use. A summary of the identified COPCs and selection of COC for surface soil and subsurface soil are presented in Table 4-15. The only COCs identified are $C_{11} – C_{22}$ aromatics and mercury in surface soil and $C_{11} – C_{22}$ aromatics, $C_9 – C_{18}$ aliphatics, and $C_{19} – C_{36}$ aliphatics in subsurface soil.

4.9.2 Human Health Risk Assessment

To assess whether the existing contamination may pose an unacceptable risk to future industrial users of the facility the data for each COC in surface soil were compared to 0.1 times the industrial RSLs for non-carcinogenic contaminants, the industrial RSL for carcinogenic contaminants, and direct contact commercial RBSLs. For subsurface soil the data for each COC were compared to 0.1 times the industrial RSLs for non-carcinogenic contaminants, the industrial RSL for carcinogenic contaminants, and direct contact excavation RBSLs (Table 4-16). Groundwater is not included in the evaluation since this VCP does not address groundwater.

In surface soil no COCs were present at concentrations greater than 0.1 times the industrial RSLs or commercial direct contact RBSL. The available data suggest that there is not a risk to human health from exposure to surface soil. Arsenic was detected at concentrations greater than the screening level for the protection of groundwater. The arsenic concentrations are considered background (Section 4.7). A sample collected from the north sludge pit by LWC contained C_{11} –C_{22} aromatics at concentrations greater than the screening level for the protection of groundwater.

The subsurface soil sample collected from the south sludge pit (PRC-Sludge Wall) contained C_{11} –C_{22} aromatics, C_9 –C_{18} aliphatics, and C_{19} –C_{36} aliphatics at a concentration greater than the direct contact excavation RBSLs. The available data suggest that the contamination remaining in the south sludge pit may pose an unacceptable risk to construction workers. Arsenic was detected at concentrations greater than the screening level for the protection of groundwater. The arsenic concentrations are considered background (Section 4.7). The subsurface soil sample collected from the south sludge pit (PRC-Sludge

Wall) contained C_{11} –C_{22} aromatics, C_9 –C_{18} aliphatics, and C_{19} –C_{36} aliphatics at a concentration that is also greater than the screening level for the protection of groundwater.

4.9.3 Ecological Risk Assessment

The primary ecological receptors at the Facility are plants, invertebrates, small mammals, deer, song birds, and raptors. No significant ecological resources have been identified at the Facility. Some small mammals may live on the Facility property and some birds and large mammals may occasionally visit the Facility; however, these animals would not preferentially seek out contaminated portions of the Facility. Exposure to contaminants is thus expected to be limited for these animals. With industrial redevelopment of the Facility significant portions of the ecological habitat will be eliminated. There are no designated wetlands within one-half mile of the Facility and no populations of designated federal or Montana species of concern or threatened or endangered species have been observed near the Facility (MNHP 2008)(Appendix D). Therefore, cleanup levels that are protective of human health will likely be protective of any ecological receptors' limited exposure. Since there are no significant ecological resources at the Facility, conducting an ecological risk assessment is not warranted.

4.10 REGULATORY AND COMPLIANCE HISTORY

There are no active permits for the Facility. On November 20, 1991, DEQ sent a letter to Mrs. Theora A Wight, Successor Trustee of the John Wight Irrevocable Trust, notifying the recipient that it had been identified as a potentially liable person and that immediate action should be undertaken to remove the chemicals in the laboratory building, piles of process chemicals, and barrels of process chemicals and to fence the sludge pits. DEQ permit #96-0417 was issued on December 1, 1995 for the removal of the underground piping. The underground piping was removed before June 1997 when the confirmation samples were collected. The permit was closed on December 12, 1997. There is no litigation associated with the Facility. There are no Controlled Allocation of Liability Act actions at this Facility.

5.0 REMEDIATION PROPOSAL

Remedial action has been proposed for the identified areas of concern including:

- The south sludge pit,
- South tank farm and process area,
- North tank farm,
- North sludge pit,
- West tank farm, and
- Potential sludge pit.

If other areas of soil contamination are discovered during remedial action, they will be addressed in the same manner as other contaminated soils identified in this VCP.

5.1 PROPOSED CLEANUP PLAN

Section 5.5 presents a detailed analysis of potential remedial alternatives for the areas of concern. Table 5-1 presents the estimate volume of soil requiring removal at each area of concern. The preferred remedial alternatives for each area are:

- South Sludge Pit: Excavation and off-Facility disposal of the petroleum contaminated soil.
- South Tank Farm and Process Area: Excavation and off-Facility disposal of the petroleum contaminated soil.
- North Tank Farm: Install test pit in center of tank farm. Excavation and off-Facility disposal of the petroleum contaminated soil.
- North Sludge Pit: Install test pit in center of sludge pit. Excavation and off-Facility disposal of the petroleum contaminated soil.
- West Tank Farm: Install test pit near location of soil boring PRC-SB07. Excavation and off-Facility disposal of the petroleum contaminated soil.
- Tank Bottoms and Miscellaneous Debris: The tank bottoms will be removed from the Facility and recycled or placed in the City of Shelby landfill. All remaining debris will be consolidated and transported to the City of Shelby Landfill.
- Potential Sludge Pit: Install test pit in center of potential sludge pit. Collect soil sample from 0 to 6 inches bgs for EPH and VPH analysis. If evidence of contamination (staining, odor, or head space detection) is observed at any depth of the test pit, that depth interval will be sampled for EPH and VPH analysis. If contamination above screening levels is found, excavate and dispose of off-Facility petroleum contaminated soil.
- Soil Gas: Elevated concentrations of volatile contaminates may be present in soil gas near each area of concern. A soil gas work plan that describes the sample locations, sample collection methods, analytical methods, and data evaluation procedures is attached as Appendix M. If contaminants in soil gas are not present above screening levels calculated as described in the soil gas sampling work plan, it is not anticipated that further remedial action will be necessary to address soil gas. If contaminants are present in soil gas above the screening levels then an evaluation of the effects of remedial action included in this VCP on soil gas will be conducted. If soil gas cannot be remediated to below site-specific risk-based screening levels using the remedy outlined in this VCP, additional alternatives will be considered, including, but not limited to, restrictive covenants that restrict the location of type of building, or further remedial action. The calculation of the site-specific risk-based screening levels, the comparison of sampling data to those screening levels, as well as the evaluation of remedial alternatives for addressing soil gas and the remedial alternative selected for soil gas, if necessary, requires DEQ review and approval and will be presented to DEQ in an addendum to this VCP, if possible, or through a new VCP.

Since the area of contamination is poorly defined in most of the areas of concern, a test pit will be dug in the area suspected of containing the highest concentrations of contaminants. If contamination is encountered it will be removed and the test pit will turn into a remedial action. If no obvious contamination is found the test pit will be extended until DEQ concurs that there is no contamination. All test pits will be subjected to the confirmation sampling procedures defined below. A confirmation sampling and analysis plan and an operation and maintenance plan are included in Appendix I.

For each of the areas of concern the following remedial action is proposed:

- Excavate the petroleum contaminated soil until cleanup levels are met or if excavation cannot be completed due to excessive depth. All contaminated soil within 10 feet of the ground surface will be removed.
- Transport contaminated soil to the City of Shelby Landfill.
- Backfill the excavation with clean fill obtained from City of Shelby Landfill or stockpiled clean overburden. The origin of all backfill and analytical results will be provided to DEQ for review and approval prior to use as backfill.
- Revegetate disturbed area with Regreen a fast growing seed mix of annual grasses.
- Implement institutional controls comprised of a Declaration of Restrictive Covenants on Real Property.

The following samples will be collected during the remedial action:

- Confirmation soil samples will be collected from the sides and bottom of the excavation and analyzed for EPH and VPH. One sample will be collected from the walls of the excavation for every 625 square feet of surface area. Samples will be collected from the bottom of the excavation for every 25 foot by 25 foot or equivalent (625 square foot) area. The EPH and VPH samples will be five point composite samples. Compositing of the samples will be completed at the laboratory.
- A sample will be collected from the soil removed from the excavation and judged in the field to be below standards. The field judgment will be based on the presence of staining and odor, non-detect head space analysis, and available laboratory results for soil with similar characteristics. One sample will be collected for each 500 cubic yards of stockpiled soil and from each distinct pile and analyzed for EPH and VPH. The EPH and VPH samples will be five point composite samples. Compositing of the samples will be completed at the laboratory.
- One composite sample will be collected from every 2,000 cubic yards of soil transported to the Facility for use as backfill and analyzed for arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury. A composite subsample will be collected from one in every five truckloads of soil. When the volume of soil represented by the subsamples equals 400 cubic yards the subsamples will be combined, homogenized, and sent to the laboratory.
- All confirmation sample results and associated QA/QC will be provided to DEQ for review and approval prior to backfilling of the excavation.
- Soil removal will continue until all confirmation sample concentrations fall below the cleanup levels or depth prevents further excavation (estimated to be between 15 and 20 feet below ground surface).
- A soil sample will be collected from 0 to 2 feet bgs from the location of the potential sludge pit and analyzed for EPH and VPH.

- Soil gas samples with corresponding soil samples will be collected as defined in the work plan attached as Appendix M.

5.1.1 Waste Management

There are no known listed or characteristic hazardous wastes present at the Facility. Soil that is contaminated with petroleum hydrocarbons will be generated during remedial action. To be considered a hazardous waste the soil would have to fail a TCLP test for benzene. Benzene has not been detected in any of the soil samples collected at the Facility; it is unlikely the waste soil would fail a TCLP analysis for benzene. No other TCLP constituents have been detected in the soil at concentrations that would result in the soil failing the TCLP test (Tables 4-2, 4-4, 4-8, 4-9, 4-10, 4-11, 4-12, and 4-13). In February 1995, a DEQ inspector visited the Facility and collected samples from the remaining sludge to determine if it would need to be classified as hazardous waste for disposal purposes. Six samples were collected from the tank bottoms and the sludge pits for analysis of volatile organics, arsenic, cadmium, and lead by the TCLP. No analytes were detected above the laboratory practical quantitation limits (Table 4-3, Figure 4-4)(LWC 1997). Furthermore, no TCLP constituents have been detected in the groundwater at concentrations greater than the TCLP criteria (Table 4-14).

Excavated soil will be disposed of at the City of Shelby Landfill. No additional sampling or analysis is required to assess the toxicity characteristic of the excavated soil. The waste will be stockpiled on a liner prior to loading into trucks. The need for dust control will be determined using a hand held dust meter to monitor peak and 8 hour time weighted averages at the downwind edge of the construction area. If dust levels exceed a peak of 50 milligrams per cubic meter dust control will be implemented. If necessary, dust control will be completed by wetting of the excavation area and stockpiled contaminated soil. All waste will be transported to the landfill in lined and covered trucks to prevent the discharge, dumping, spilling, or leaking from the transport vehicle in accordance with Administrative Rules of Montana (ARM) 17.50.523. If side dump trailers are used no liner will be required because there is no bottom opening that may leak contaminated soil during transport.

5.1.2 Reclamation

The excavation areas will require reclamation and revegetation. The revegetation will be completed to temporarily stabilize the soil at the Facility prior to redevelopment for industrial use by the HiLine Redi-Mix concrete batch plant. Remedial actions will result in a disturbed area of approximately 1 acre. Soil removal will not impact any surface water bodies. After soil removal, the excavations will be backfilled with clean fill. Areas with contaminated soil are located on gently sloping or flat land; the excavations will be filled to original grade with soil. The soil will be obtained from soil that was stockpiled during the construction of the City of Shelby Landfill or clean overburden from the excavation. The area will be broadcast seeded with 5 pounds per acre of Regreen. ReGreen is a sterile hybrid of barley and wheatgrass which sprout and grow quickly and will provide short term surface cover that prevents blowing dust and erosion. The seeded area will be raked to provide adequate soil/seed contact. The raking may be accomplished by dragging a section of chain link fence behind a four-wheeler of small tractor. The seeded area will be broadcast fertilized with a new pasture fertilizer with the ratio of nitrogen 13, phosphorous 16, and potassium 10. No other amendments will be required.

There are no detailed plans for roads, location of sand, gravel, and product stockpiles, location of the batch plant, or the location of any supporting structures. The current HiLine Redi-Mix facility in Shelby covers approximately 1.5 acres. One of the purposes for relocation is to allow for expansion. The area at the Facility requiring revegetation after remediation is estimated to be 1 acre, less than the existing size of the HiLine Redi-Mix batch plant. If after 1 year there are areas of the Facility that are not being used by the HiLine Redi-Mix batch plant they will be seeded with perennial bunch grasses. The proposed seed mix is:

Common Name	Scientific Name	Seeding Rate (pounds per acre)
Western Wheatgrass	Pascopyrum smithii	3
Rough Fescue	Festuca scabrella	2
Bluebunch Wheatgrass	Pseudoroegneria spicata	3
Green Needlegrass	Stipa viridula	3

The area will be seeded in the late fall (October or early November) to give the best chance for successful germination and survival. Germination and seedling establishment will be visually monitored throughout the first growing season. Areas where seedlings did not become established will be reseeded at the beginning of the following growing season. Revegetated areas should have a minimum of 40 percent live plant canopy cover by the peak of the second growing season. Noxious weeds and annuals will not be accounted for in the 40 percent live plant canopy cover total. A management plan will be adopted to eliminate noxious weeds in the reclaimed areas during the first growing season (Appendix L). City of Shelby staff will be responsible for monitoring or maintenance of the reclamation including weed control.

5.1.3 Materials Handling

All on-Facility workers present during activities that will disturb contaminated soils must have completed OSHA 40-hour HAZWOPER training and annual updates. The types of materials that will be handled during remediation include petroleum contaminated soil.

The Facility will be secured during construction by erecting temporary fences around all excavations deeper than 2 feet and around the contaminated soil stock piles. Signs will also be posted warning that the area is a construction site.

The construction contractor will select the precise equipment to be used. It is likely that an excavator will be used to complete the excavation activities. Dump trucks will likely be used to transport the contaminated soil and clean fill around the Facility and to the landfill.

The waste will be transported to the City of Shelby Landfill in covered trucks. Figure 5-1 shows the haul route to and from the City of Shelby Landfill. The tonnage of waste will be recorded once the vehicle reaches the landfill. At the landfill, the waste will be deposited into the landfarm or used as daily cover. If a belly or end dump truck or trailer was used to haul contaminated soil it will be lined with plastic and will not required decontamination. If a side dump trailer was used and the truck was not lined, the interior of the truck bed will be power washed to remove clumped soil.

5.2 SCREENING AND CLEANUP LEVELS

Screening levels will be required for portions of the Facility with known or suspected petroleum contamination.

5.2.1 Screening Levels

All the data presented in Section 4.8 were screened against the appropriate benchmarks to identify COCs. The soil data were screened against RSL for residential soil, RBSL for residential direct contact, RBSL for excavation direct contact, the RSL SSL for a DAF of 10, the RBSL for leaching 0-10 feet to groundwater, and for arsenic background concentrations (Table 4-16). A complete discussion of the data as they relate to the screening criteria is presented in Section 4.8.

5.2.2 Cleanup Levels

The screening levels and cleanup levels apply to soil at the entire Facility. The cleanup levels for surface soil at the Facility will be the current Tier 1 commercial RBSLs for less than 10 feet to groundwater

(Table 1, DEQ 2007) (Table 5-2). The cleanup levels for subsurface soil at the Facility will be the current Tier 1 subsurface soil RBSLs for less than 10 feet to groundwater (Table 2, DEQ 2007)(Table 5-2). The VPH cleanup levels will be modified based on the results of the soil gas investigation. This VCP defines the remedial actions that will be completed for the areas of concern. Institutional controls comprised of a Declaration of Restrictive Covenants on Real Property will be placed on the Facility.

5.3 CLEANUP REQUIREMENTS

The cleanup requirements for the preferred alternative is described in the following sections. Section 5.5 presents a detailed analysis of the remedial alternatives using the appropriate criteria.

5.3.1 Protectiveness

Protectiveness is an assessment of the degree to which the remedial action will cleanup the hazardous or deleterious substance, control the threatened release or further release of that substance, and assure protection of public health, safety, and welfare and of the environment. Institutional controls comprised of a Declaration of Restrictive Covenants on Real Property will be implemented prohibiting residential use and to ensure protectiveness. A Declaration of Restrictive Covenants on Real Property has been prepared for and is applicable to the portion of the Facility in the southeast quarter section of section 27, Township 32 north, and Range 2 west (Appendix H).

Protectiveness will be assured by the removal and off-Facility disposal of the petroleum contaminated soil with concentrations above the RBSLs. Institutional controls that are comprised of a Declaration of Restrictive Covenants on Real Property will be implemented. Off-Facility disposal is protective since it will remove the contamination from this Facility and place it in a licensed solid waste landfill that meets all state regulations.

5.3.2 Environmental Requirements, Criteria, or Limitations

Environmental requirements, criteria, or limitations (ERCLs) are federal or state laws that may be applicable or relevant to the proposed remedial actions. An analysis of the ERCLs is presented in Appendix J for the proposed remedial action.

5.3.3 Mitigation of Risk

State law requires that the proposed remedial actions will mitigate potential exposure risks to the public health, safety, and welfare and to the environment. Risks to human health will be mitigated by the implementation of institutional controls comprised of a Declaration of Restrictive Covenants on Real Property. All soil containing petroleum constituents above the commercial RBSLs will be removed.

5.3.4 Effective and Reliable

The remedial actions must be effective and reliable for the short term and the long term. Short term risks are those that will be encountered during the remedial action. The remedial actions will not result in further release of contamination or an increase in the risk to unacceptable levels during cleanup. Long term effects of the remedial action will prevent future releases and ensure that acceptable risk levels will not be exceeded. The effectiveness and reliability of institutional controls comprised of a Declaration of Restrictive Covenants on Real Property will be ensured through the City of Shelby's enforcement of the controls.

Excavation and off-Facility disposal of the petroleum contaminated soil will produce the following short term risks: potential chemical exposure to workers during excavation, physical hazards from heavy equipment, and transportation hazards. The chemical exposure, physical, and transportation hazards can be mitigated by engineering controls, dust control, and safe work practices during construction. The effectiveness of the alternative will be ensured through the collection of confirmation samples from the base and sides of the excavation as defined in Section 5.1. Long term risk will be eliminated due to the removal and proper disposal of the contamination and the implementation of institutional controls comprised of a Declaration of Restrictive Covenants on Real Property. Record of the institutional controls will be attached to the property deeds and copies will be placed in the appropriate city files. The long-term effectiveness and reliability of the off-Facility disposal facilities is ensured through State of Montana landfill regulations.

5.3.5 Practicable and Implementable

State law requires that the selected remedial alternatives be practicable and implementable. Institutional controls comprised of a Declaration of Restrictive Covenants on Real Property are easily implemented. The excavation and backfilling procedures to be used for the petroleum contaminated soil are used routinely in many different construction activities. The selected remedial alternative is easily practicable and implementable at the Facility.

5.3.6 Treatment or Resource Recovery Technologies

State law requires that remedial actions use treatment or resource recovery technologies if practicable, giving due consideration to engineering controls. The contaminated soil will be transported to the City of

Shelby Landfill. At the landfill, the City of Shelby operates a landfarm for petroleum contaminated soil. Contaminated soil from the Facility will be placed on the landfarm or placed in a disposal cell at the discretion of the City landfill management. Engineering controls will be used during remedial action as follows: (1) contaminated soil will be placed on a liner prior to transport off-Facility, (2) berms of clean soil will be used to control surface water run-on, (3) the excavations will be used to control run-off from the contaminated soil, and (4) the trucks used to transport the soil will be lined as appropriate and covered.

5.3.7 Cost Effectiveness

The preliminary cost estimate for the preferred remedial alternative is $410,000 (Appendix K). The preferred alternative provides a permanent risk reduction by removing the contamination from the Facility.

5.4 SAMPLING OR TREATABILITY STUDIES

No treatability studies are required prior to implementation of the VCP. Confirmation sampling will be completed during the remedial actions. The following samples will be collected:

- Confirmation soil samples will be collected from the sides and bottom of the excavations and analyzed for EPH and VPH. One sample will be collected from the walls of the excavation for every 625 square feet of surface area. Samples will be collected from the bottom of the excavation for every 25 foot by 25 foot or equivalent (625 square foot) area. The EPH and VPH samples will be five point composite samples. Compositing of the samples will be completed at the laboratory.
- A sample will be collected from the soil removed from the excavation and judged in the field to be below standards. The field judgment will be based on the presence of staining and odor, non-detect head space analysis, and available laboratory results for soil with similar characteristics. One sample will be collected for each 500 cubic yards of stockpiled soil and from each distinct pile and analyzed for EPH and VPH. The EPH and VPH samples will be five point composite samples. Compositing of the samples will be completed at the laboratory.
- One composite sample will be collected from every 2,000 cubic yards of soil transported to the Facility for use as backfill and analyzed for arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury. A composite subsample will be collected from one in every five truckloads of soil. When the volume of soil represented by the subsamples equals 400 cubic yards the subsamples will be combined, homogenized, and sent to the laboratory.
- Soil gas samples will be collected prior to the start of remedial activities. The sample locations, collection methods, and data evaluation are included in Appendix M.

The sample collection methods, location, frequency, analytical parameters, and quality assurance/quality control procedures are defined in the attached confirmation sampling and analysis plan.

5.5 REMEDIAL ALTERNATIVE COMPARISON

Section 75-10-734(3)(b), MCA, requires a brief comparison of the remediation proposals to reasonable alternatives based on the remedy selection criteria in § 75-10-721, MCA. Institutional controls comprised of a Declaration of Restrictive Covenants on Real Property will be placed on the Facility. Five areas may or will require remedial action including the south sludge pit, south tank farm and process area, north sludge pit, north tank farm, and west tank farm. Based on the information available about each area, and knowledge and experience with remedies for other similar contaminated areas, three remedial alternatives have been identified as the most reasonable alternatives for the area.

Table 5-2 presents a summary of each evaluated remedial alternative. Appendix K contains the cost estimates for each remedial alternative.

These alternatives are evaluated based on the following seven criteria included in § 75-10-721, MCA.

Protectiveness – The proposed remedy must be demonstrated protective of public health, safety, and welfare and the environment.

Compliance – The proposed remedy must comply with applicable and relevant state or federal environmental requirements, criteria, or limitations.

Mitigation – The proposed remedy must be demonstrated to mitigate exposure to risks to public health, safety, and welfare and the environment to allowable levels.

Effectiveness and Reliability – The proposed remedy must be effective and reliable in the short and long term.

Practicability and Implementability – The proposed remedy must be practicable and implementable.

Treatment or Resource Recovery Technology – The proposed remedy must be chosen in consideration of treatment and resource technologies, giving due consideration to engineering controls.

Cost-Effectiveness – The proposed remedy must be cost-effective relative to the risk reduction it would achieve.

5.5.1 Alternative 1: No Action

The no action alternative would leave the remediation area in its present condition without further remediation, monitoring, or institutional controls.

Protectiveness – This alternative would not be protective of public health, safety, and welfare and the environment as it would not prevent direct contact of humans to petroleum contaminated soil or contaminants leaching to groundwater.

Compliance – The no action alternative does not comply with ERCLs as it does not prevent leaching to groundwater that may result in exceedances of DEQ-7 standards.

Mitigation - This alternative would not mitigate existing risks to public health, safety, and welfare and the environment to exposure to petroleum contaminated soil.

Effectiveness and Reliability – This alternative is not effective and reliable in the short or long term since contamination is left in place.

Practicability and Implementability – This alternative is practicable and implementable since no actions would be required.

Treatment or Resource Recovery Technology – This alternative does not use treatment technologies, resource recovery technologies, or engineering controls.

Cost-Effectiveness – The no-action alternative has no cost but does not reduce risks.

5.5.2 Alternative 2: Excavation and On Facility Landfarming

The excavation and on-Facility landfarming alternative includes excavation of approximately 10,000 cubic yards of soil and placement in a lined on-Facility landfarm. Soil will be excavated until cleanup levels (Table 5-2) are reached. The excavation would be backfilled with clean fill, covered with topsoil, and reseeded. The landfarmed soil will be revegetated once soil tilling is complete. Institutional controls comprised of a Declaration of Restrictive Covenants on Real Property will be put in place.

Protectiveness – This alternative would be protective of public health, safety, and welfare, as well as the environment because contaminated soil is excavated and treated until it meets cleanup numbers for direct contact risk and leaching to groundwater.

Compliance – This alternative complies with all ERCLs because by achieving cleanup levels, it prevents leaching to groundwater that may result in exceedances of DEQ-7 standards.

Mitigation - This alternative mitigates exposure to risks to public health, safety, and welfare and the environment by removing the contaminated soil thus preventing leaching to groundwater that may result in exceedances of DEQ-7 standards. It also mitigates risk to human health by achieving cleanup levels based on direct contact. However, during the time the contaminated soil is landfarmed, there is potential for some exposure to the public. The short-term exposure to the public could be mitigated through the use of engineering controls (fence). Mitigation of exposure would also be completed through implementation of institutional controls that prohibit residential use.

Effectiveness and Reliability – This alternative is effective and reliable in the long term because it meets cleanup levels based on direct contact and leaching to groundwater. In the short term, the risk for direct contact would increase, but institutional and engineering controls could mitigate that risk. Institutional controls are effective in the short and long term.

Practicability and Implementability – This alternative is practicable and implementable. The technologies needed to remove and landfarm the soil are practicable and implementable.

Treatment or Resource Recovery Technology – This alternative would involve a landfarming treatment technology. This is an established and frequently used best available technology (BAT) treatment technology. Access to the landfarm would need to be restricted until soil petroleum concentrations decreased below RBSLs.

Cost-Effectiveness – This alternative has an approximate cost of $645,000 to implement. This alternative is more expensive than other alternatives which provide the same level of long-term risk reduction.

5.5.3 Alternative 3: Excavation and Off-Facility Disposal

The excavation and off-Facility disposal option would include excavation and off-facility disposal of approximately 10,000 cubic yards of contaminated soil. Soil will be excavated until cleanup levels (Table 5-2) are reached. The excavation would be backfilled with clean fill and reseeded. Institutional controls comprised of a Declaration of Restrictive Covenants on Real Property will be put in place.

Protectiveness – This alternative would be protective of public health, safety, and welfare and the environment as it would prevent contaminants from leaching to groundwater and removes contaminated soil that exceeds cleanup numbers based on direct contact. Institutional controls would protect potential receptors through limiting the types of land use that can occur.

Compliance - This alternative complies with all applicable and relevant ERCLs as described in Section 5.3 and Appendix J.

Mitigation - This alternative mitigates exposure to risks to public health, safety, and welfare and to the environment by removing contaminated soil in compliance with cleanup levels based on direct contact and leaching to groundwater. Mitigation of exposure would also be completed through implementation of institutional controls that prohibit residential use.

Effectiveness and Reliability – This alternative is effective and reliable in both the short and long term because it meets cleanup levels based on direct contact and leaching to groundwater. The off-Facility disposal facility is permitted and maintained in compliance with state law. When properly enforced, institutional controls are effective and reliable in the short and long term. In the short term, this alternative is effective is removing the petroleum contaminated soil. In the long term, this alternative is effective since it removes a source for the groundwater contamination. In addition, the landfill holding the contaminated soils will be maintained and monitored for the long term.

Practicability and Implementability – This alternative is practicable and implementable because the contaminated soil is removed. The excavation of the petroleum contaminated soil is practicable and easily implementable.

Treatment or Resource Recovery Technology – This alternative would involve treatment technologies if the contaminated soil is placed on the City of Shelby landfarm. If the contaminated soil is used as daily cover no treatment will occur. However, it does make good use of available engineering controls. Engineering controls will be used for surface water run-on and run-off control as well as dust control during transport.

Cost-Effectiveness – This alternative has an approximate cost of $410,000 to implement, which is cost-effective relative to the level of long-term risk reduction achieved.

5.5.4 Summary of Alternatives Comparison

Alternative 1 was retained for comparative reasons, but it does not meet the seven criteria included in § 75-10-721, MCA. Alternative 2 meets all the evaluation criteria. Alternative 2 provides less short-term mitigation of risks and short term reliability than Alternative 3. Alternative 3 meets all the evaluation criteria, provides a more cost effective mitigation of risk than alternative 2, and is effective and reliable in the short and long term. Based on the evaluation criteria, Alternative 3 is the selected remedial alternative. Table 5-3 summarizes this evaluation. The excavation and off-Facility disposal alternative provides a permanent and cost effective solution for the Facility.

5.6 PROJECT SCHEDULE

Table 5-4 contains the anticipated project schedule.

5.7 HEALTH AND SAFETY

All applicable health and safety regulations will be met during implementation of the remediation proposal. A Health and Safety Plan will be prepared prior to implementation of the remedy.

5.8 MINIMIZATION OF SHORT-TERM DISTURBANCES

The short term disturbances that are anticipated to occur during the remedial actions include generation of fugitive dust and disruption of traffic as trucks pull onto Highway 238. Fugitive dust will be suppressed by spraying the excavation surface with water from water trucks. Disruption of traffic will be addressed through the posting of “trucks entering” signs along the highway. The mayor of the City of Shelby will be informed of all construction activities.

5.9 REQUIRED PERMITS

A Montana construction storm water discharge permit will be obtained prior to excavation of the petroleum contaminated soil. Remedial actions will be halted if significant runoff is generated and will not resume until adequate runoff control measures are in place.

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APPENDIX A

RESUMES OF TETRA TECH STAFF

APPENDIX B

WRITTEN CONSENT OF PROPERTY OWNER
FOR
VOLUNTARY CLEANUP AND ACCESS

APPENDIX C

FEDERAL EMERGENCY MANAGEMENT AGENCY
FLOOD HAZARD BOUNDARY MAP

APPENDIX D

MONTANA NATURAL HERITAGE PROGRAM SPECIES OF SPECIAL CONCERN

APPENDIX E

MONTANA GROUNDWATER INFORMATION CENTER WELL DATABASE TOWNSHIP 32 NORTH RANGE 2 WEST SECTIONS 21, 22, 23, 26, 27, 28, 33, 34, AND 35

APPENDIX F

WELL LOGS

APPENDIX G

CITY OF SHELBY ZONING REGULATIONS

APPENDIX H

INSTITUTIONAL CONTROLS

APPENDIX I

CONFIRMATION SAMPLING AND ANALYSIS PLAN AND OPERATION AND MAINTENANCE PLAN

APPENDIX J

ENVIRONMENTAL REQUIREMENTS, CRITERIA, OR LIMITATIONS

APPENDIX K

REMEDIAL ALTERNATIVE COST ESTIMATES

APPENDIX L

REVEGETATION PLAN

APPENDIX M

SOIL GAS SAMPLING WORK PLAN

TABLES