Submitted to:
BNSF Railway
Helena, Montana

Submitted by:
AECOM
Fort Collins, Colorado
May 2019

Application for Class 3 Part B Permit Modification Montana Hazardous Waste Permit MTHWP-14-01
Revision 1

BNSF Former Tie Treating Plant Paradise, Montana

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BNSF Former Tie Treating Plant Paradise, Montana

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List of Acronyms

ACL	Alternate Concentration Limit
AOC	Areas of Concern
ARM	Administrative Rules of Montana
ATS	Akritas-Theil-Sen
BDAT	Best Demonstrated Available Technology
BFE	Base Flood Elevations
BGS	Below Grade Surface
BNRR	Burlington Northern Railroad
BNSF	BNSF Railway Company
BTZ	Below Treatment Zone
CAMU	Corrective Action Management Unit
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
CPA	certified public accountant
CSA	Container Storage Area
CY	Cubic Yard
DO	Dissolved Oxygen
DNAPL	Dense Non-Aqueous Phase Liquid
ft	foot
ft/yr	foot/year
Facility	former tie treating plant in Paradise, Montana
GAC	Granulated Activated Carbon
GCAP	Groundwater Corrective Action Plan
HASP	Health and Safety Plan
LTD	Land Treatment Demonstration
LTU	Land Treatment Unit
MDEQ	Montana Department of Environmental Quality
mg/kg	milligram per kilogram
MHWA	Montana Hazardous Waste Act
msl	mean sea level
NRCS	Natural Resource Conservation Service
O&M	Operations and Maintenance
Order	Notice of Violation/Administrative Order
OWS	Oil Water Separator
PAH	Polycyclic Aromatic Hydrocarbons
Permit	Montana Hazardous Waste Permit

PHC	Principal Hazardous Constituent
POC	Point of Compliance
POE	Point of Exposure
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
PRS	Product Recovery System
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
ReTeC	Remediation Technologies, Inc.
RETEC	The RETEC Group, Inc.
RFI	RCRA Facility Investigation
SAP	Sampling and Analysis Plan
SI	Surface Impoundment
SOPs	Standard Operating Procedures
SWMU	Solid Waste Management Units
TA	Temporary Authorization
USEPA	United States Environmental Protection Agency
VFD	Volunteer Fire Department
VOC	Volatile Organic Compound
WAP	Waste Analysis Plan
WPU	Waste Pile Unit
ZOI	Zone of Incorporation

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1.0 Introduction

1.1 Regulatory Frame Work

Pursuant to the Montana Hazardous Waste Act (MHWA) and regulations promulgated thereunder by the Montana Department of Environmental Quality (MDEQ), a Montana Hazardous Waste Permit (Permit) was issued to BNSF Railway Company (BNSF) for the former tie treating plant in Paradise, Montana (Facility). The Permit (Number MTHWP-14-01) was issued October 17, 2014 (MDEQ 2014). The Permit authorized operation of a corrective action management unit (CAMU), continued maintenance of designated regulated units, and Facility-wide corrective action. The Permit expires October 17, 2024. This modification is submitted pursuant to Permit Condition I.J.6.

The Permit was issued pursuant to MHWA and under Title 17, Chapter 53 of the Administrative Rules of Montana (ARM). As described in ARM 17.53.1201, the Montana Hazardous Waste Permitting Program has adopted and incorporated Federal Resource Conservation and Recovery Act (RCRA) permitting requirements in Title 40 Part 270 of the Code of Federal Regulations (CFR). Section 5.1 of this document provides a table cross-referencing both sets of regulations.

This modification to the Permit Application (Application) for the Paradise MTHWP-14-01 Permit includes revisions to the RCRA Permit Part B Application. The required content of a RCRA Part B Permit Application is described in 40 CFR 270.14 through 270.28 and 264, and the ARM 17.53 regulations. The Permit modification is requested to abandon the current product recovery system (PRS) in the Surface Impoundment (SI) Area and Retort Area, transition to localized periodic product recovery in the SI Area and Retort Area, and optimize the groundwater monitoring program at the Facility. A line item discussion of changes is presented in Section 2.

1.2 BNSF Paradise Permit History

In 1980, BNSF submitted to the United States Environmental Protection Agency (USEPA) Region 8 a Notification of Hazardous Waste Activity (USEPA Form 8700-12) and a Part A Application (Form 1 General Information and Form 3 Hazardous Waste Permit Application) (Burlington Northern Railroad [BNRR] 1980). The Facility was issued the USEPA Identification Number MTD000716787 [40 CFR 264.11 (ARM 17.54.702)] and granted interim status under RCRA.

In the summer of 1984, approximately 500,000 gallons of creosote were recovered from the Paradise surface impoundment (SI) for reuse at the BNSF Somers Tie Treating Plant. Closure plans for the SI were prepared calling for removal of visibly contaminated soil from the impoundment and temporary storage in a double lined waste pile, while the Part B permit application was prepared for the waste pile and land treatment units. The SI closure was approved in 1985 and BNSF submitted a Part B Permit application for the waste pile in 1985 (Remediation Technologies, Inc. [ReTeC] 1985). In the same year, the waste pile permit was approved (MTHWP-88-03) (MDEQ 1988). The waste pile unit (WPU) was constructed in XXXX. Soils were removed from the SI and placed in the WPU between XXXX and XXXX. The SI closure was completed in 1988.

In July 1985, MDEQ approved a permit to conduct a land treatment demonstration (LTD) plot study. A RCRA LTD was constructed to obtain data to support a full scale RCRA land treatment unit (LTU). The LTU was intended to manage wastes in the WPU. The LTD study proved that approved wastes could be degraded, transformed, and immobilized within the treatment zone of the LTU.

The LTU Part B permit was issued December 29, 1988 and modified June 12, 1989. In 1989, the LTU was constructed and impacted soils from the WPU were applied. Waste pile closure was completed in 1990. All cells in the LTU met the closure performance standard at the end of the 1995 treatment season.

The 1985 Part B Permit issued by MDEQ included corrective action requirements for the SI. Due to the presence of groundwater impacts in the immediate vicinity of the SI, BNSF submitted a Groundwater Corrective Action Plan (GCAP) (ReTeC 1989) in 1989 as required by the permit. In 1990, BNSF received comments from MDEQ on the GCAP and responded to those comments. Also as part of the GCAP, BNSF submitted a request for permit modification.

In 1995, supplemental information to that request was submitted, which presented Facility-specific data demonstrating the polycyclic aromatic hydrocarbons (PAH) plume from the SI was not expanding or migrating. BNSF conducted a human health risk assessment to establish groundwater protection standards at the point of exposure (POE) wells as part of a 1996 supplemental Alternate Concentration Limit (ACL) petition (ReTeC 1996). At the time, the RCRA Part B permit renewal in 2001 was to incorporate the ACL. However, with the 2001 permit reissuance, MDEQ required additional information to be provided in order to incorporate the ACL. BNSF provided the information in a supplemental ACL petition, which was finalized in 2004. The 2006 Permit revisions incorporated the requirements for the ACL and the GCAP. In addition, Tanks T-6 and T-7 were incorporated into the Permit with the 2006 Permit Revision.

A Corrective Action Management Unit (CAMU) was requested in the 1998 Application for Part B Permit Renewal (RETEC 1998), and approved by MDEQ as part of the issuance of the Permit. The CAMU is comprised of the eastern portion of the SI (Section 18 SI), the LTU cells, and a Product Recovery System (PRS). In 2002, additional remediation wastes were applied to a portion of the LTU cells; the Permit Option B closure performance standard was met in 2006. MDEQ approved closure of the entire LTU in 2009.

EPA issued a permit for facility-wide corrective action February 1, 1989 (EPA 1989). The permit required BNSF to complete a RCRA Facility Investigation (RFI) and a Corrective Measures Study (CMS) for the SWMUs and areas of concern (AOC) listed in Table 5.4-1 of this Application. Phase I and Phase II RFIs were completed in 1994 and 1996 for all SWMUs and AOCs identified and was approved in June of 1996. The CMS was completed for those SWMUs and AOCs determined through the RFI to present a threat to human health and the environment. The CMS was conditionally approved in August 2000.The CAMU, PRS (including the SI Area and the Retort Area), remain as the active operating units at the Facility.

BNSF prepared a Temporary Authorization (TA) Request per 40 CFR 270.42.e.2.iii to recover product (creosote) or Dense Non-Aqueous Phase Liquid (DNAPL) from individual recovery wells in the SI using an alternative method in lieu of the PRS in the SI. This request was submitted on February 1, 2019 and was approved on March 1, 2019. A discussion of DNAPL recovery has been added to Section 5.3.7 of this modification.

1.3 Facility Background

BNSF operated a tie treating plant in Paradise, Montana from 1908 to 1982 when the plant was destroyed by fire. During tie treating operations, wastewater from the creosote plant was discharged through a buried pipe into the SI located northwest of the Facility. The SI was used during plant operation as a sedimentation basin for recovery and reuse of creosote. In 1980, BNSF initiated the permitting process for a Hazardous Waste Facility. Permits and interim status regarding the Facility are discussed Section 1.2.

A LTD plot study showed the wastes were appropriate for treatment in a full scale RCRA LTU. The LTD was cleaned closed to residential risk-based levels in 2002 by moving the impacted material to the CAMU for treatment.

The overall closure of the SI was accomplished through the on-site land treatment of the sludge and impacted soils. The SI was closed in 1985. The SI is currently in post-closure and is maintained under post-closure care requirements. Surface soil sampling in Section 18 of the SI (Section 18 SI) confirmed this portion of the SI was clean closed to residential risk-based levels in 2002.

The WPU was constructed in September 1985 within an area of the former SI. The WPU served as the storage Facility for creosote sludge and impacted soil excavated from the SI as well as temporary storage for creosote impacted soil and wastes from BNSF's former tie treating plant in Somers, Montana. In August 1989, the LTU was constructed to treat wastes that were stored in the WPU. The WPU remained in service until September 1989, when all stored sludge and impacted soil from the SI were removed and placed in the LTU. Closure of the WPU began in September 1989 and was completed in 1990. The WPU is in post-closure care concurrently with the SI.

A series of waste applications occurred on the LTU. The first application was in 1989, when the entire 20,000 cubic yard (CY) waste pile was excavated and placed on the LTU. In April 1990, 4,500 CY of soil excavated from the former drip track area was applied to the LTU. Additional applications included 10 CY of soil generated during the 1992 RCRA Facilities Investigation (RFI) and 3 CY of soil generated during the RFI Phase II in 1994. All seven cells met the "Option B" performance closure standards of (1) 100 milligrams per kilogram (mg/kg) total polycyclic aromatic hydrocarbon (PAH), (2) decrease in total PAH concentrations less than 20 percent from the previous year, and/or (3) Zone of Incorporation (ZOI) soil is nontoxic in any uniform area (determined through Microtox test of similar) as established in Permit Condition III.LT.N(2) (MDEQ 1989).

Construction of the PRS in the SI and in the retort area was completed in November 1996 and routine operations started in October 1997. The LTU, the eastern a portion of the SI, and the PRS were designated as a CAMU so that remediation wastes could be managed on site.

In 2002, remediation wastes generated from the closure of the Solid Waste Management Units (SWMUs), LTD plots, and materials generated from the PRS were land treated in the LTU. In 2006, all cells in the LTU met the Permit Option B closure performance standard. Final closure of the LTU was approved by MDEQ in 2009 (MDEQ 2009a).

Currently, the CAMU and PRS are the operating units at the Facility. The product generated from PRS operations is stored on-site prior to shipment off-site for disposal.

1.4 Objective and Scope of this Application

The objective of this modification is to provide information needed to comply with ARM 17.53.1201 and 40 CFR 270 regulatory requirements for the reissuance of the BNSF Paradise Hazardous Waste Permit (MTHWP-01-02). The majority of the permit application has not been updated because these aspects are not being modified.

The scope of this permit modification includes the following:

- Facility background, regulatory framework, and regulated unit status;
- Changes to Permit No. MTHWP-01-02;
- RCRA Part B application and associated information;
- New Closure and Post-Closure Plan.

2.0 Changes to Existing Permit

This chapter serves to highlight the proposed changes to the Paradise Part B Permit, including the following:

1. Proposed abandonment of the PRS, including closure of the permitted on-site tanks.
2. Modification of the permit to include periodic localized recovery of product or DNAPL from individual wells in the SI Area as documented in the TA approved on March 1, 2019. Recovered product will be stored in 55-gallon drums staged in a container storage area (CSA) in the shop building.
3. Add a discussion of the new SI Manual Recovery Procedure.
4. Modify the floodplain figure and formally document the floodplain evaluation as submitted to MDEQ on September 14, 2015.
5. Modification of the closure plan to close the PRS separately.
6. Modification of the Facility groundwater monitoring program, the point of compliance (POC) well network and POE well network as presented to MDEQ on December 13, 2018.

3.0 [40 CFR 270.11(a)(1)] Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Date ____________________ ____

Yueh Chuang
Manager of Environmental Remediation
BNSF Railway Company
Helena, Montana

4.0 [40 CFR 270.13] RCRA Part A Permit Application

Part A of the application consists of USEPA Form 8700-23, which includes both the RCRA Subtitle C Site Identification Form and the Hazardous Waste Permit Information Form. Maps, drawings, and photographs also are included. **Appendix A** includes the Part A Permit Application and associated information.

5.0 [40 CFR 270.14] RCRA Part B Permit Application

Part B of the RCRA hazardous waste permit application contains detailed, site-specific information. There is no form for the Part B Permit Application; therefore, the following sections provide the information required in applicable sections of 40 CFR 270.14, 40 CFR 270.16, and 40 CFR 270.20, and ARM 17.54.

5.1 Regulatory References

The Federal RCRA Part B Permit Renewal requirements (40 CFR 270) and the Montana Hazardous Waste Rules (ARM 17.54) are provided in **Appendix B**.

5.2 [270.14(b)] General Information Requirements

5.2.1 [40 CFR 270.14(b)(1)] General Facility Description

The BNSF Paradise former tie treating plant is located on the northern bank of the Clark Fork River, approximately 2.7 miles downstream of the confluence with the Flathead River, and approximately 0.75 mile northwest of the town Paradise, Montana. The Facility is located in the NW ¼ of Section 20, the SE ¼ of Section 18, and the SW ¼ of Section 17, Township 19 North, Range 25 West, Sanders County, Montana. **Figure 5.2.1-1** is a Facility location map.

The Facility is owned by:

BNSF Railway Company
800 N. Last Chance Gulch, Suite 101
Helena, MT 59601

The Facility mailing address is:

Paradise Tie Plant
P.O. Box 66
BN Tie Plant Road
Paradise, MT 59856

BNSF operated a tie treating plant in Paradise, Montana until October 1982 when the plant was destroyed by fire. The tie treating plant has not been in operation since that date. During operation of the tie treating plant, wastewater containing creosote was discharged to an unlined surface impoundment. The wastewater flowed through a buried pipe into the SI located northwest of the former Facility. The SI was used as a sedimentation basin for recovery and reuse of creosote. The sludge generated by the sedimentation of wastewater is classified as a RCRA hazardous waste (K001) from Tank T-7; materials recovered from the SI are classified as RCRA hazardous waste (K001 and F034).

The Facility has five regulated units: the CAMU (which includes the closed SI, closed LTU, and the SI PRS), two hazardous waste storage tanks (Tanks T-6 and T-7), the closed WPU, and two clean-closed LTD plots. The surface soil in the Section 18 SI has been clean-closed to residential risk-based levels and is, therefore, no longer a regulated unit. **Figure 5.2.1-2** presents the Facility layout.

The SI recovery wells in the PRS were operated from October 1997 to May 2018 based on thickness of DNAPL measured weekly in the wells. The recovery wells were constructed with 3- to 5-feet long sumps attached to the base of the well screen that were used to stage the product recovery pump and provide a reservoir for DNAPL to accumulate for removal via pumping. Recovered fluids from the SI wells were conveyed through a header pipe to the PRS Building where DNAPL and groundwater were separated in an oil-water separator. Recovered DNAPL was temporarily stored in the PRS Building in Tank T-4 before being transferred to the permitted product storage tank T-6. The separated water was treated using two activated carbon units and subsequently discharged to the northwestern area of the SI Area. Product from well CA-33 at the Retort Area was pumped to Tanks T-7.

This permit modification is being submitted to change the recovery procedure to a manual system in the SI Area and Retort Area and to modify the groundwater sampling conducted at the Facility. Details of the changes are presented in Section 2.

Additional details about the regulated units were provided in Chapter 5 of the 1998 Application for Part B Permit Renewal (RETEC 1998) and are not repeated in this Application.

The Facility also has several SWMUs and AOCs that required corrective action. Section 5.4 provides more details on the SWMUs and AOCs.

5.2.2 [40 CFR 270.14(b)(2) and 264.13(a)] Chemical and Physical Waste Analyses

Creosote was the only preservative known to have been used at the Facility. Sampling and analysis conducted since 1984 have shown no evidence of preservatives other than creosote. Creosote is a complex mixture of hundreds of organic compounds and is a distillate of coal tar. Creosote waste (USEPA Hazardous Waste Numbers K001 and F034) is a hazardous waste per 40 CFR 261.32. Additional information about creosote was provided in Chapter 7 of the 1998 Application for Part B Permit Renewal (RETEC 1998) and is not repeated in this Application.

Remediation wastes also were generated in 2002 from the closure of the SWMUs and LTD plots. Remediation wastes also are generated from the PRS and include spent granulated activated carbon (GAC), bottom sediment sludge, and recovered creosote. Information about these remediation wastes was provided in Chapter 7 of the 1998 Application for Part B Permit Renewal (RETEC 1998) and is not repeated in this Application.

5.2.3 [40 CFR 270.14(b)(3) and 264.13(b)] Waste Analysis Plan

The Waste Analysis Plan (WAP) describes the procedures used to determine the physical and chemical characteristics waste generated at the Facility. This WAP includes identification of the wastes to be sampled, analytical parameters and the rationale for choosing these parameters, sampling procedures, analytical methods including quality assurance/quality control (QA/QC) procedures and data and records management.

5.2.3.1 Waste Identification

Wastes currently generated from Facility cleanup activities include remediation waste and debris, recovered creosote and spent GAC, non-contaminated materials from remediation activities, and decontamination materials. The Facility also generates a small quantity of universal waste (e.g., fluorescent light bulbs, batteries). Personal protective equipment (PPE) and disposable sampling equipment will be decontaminated if feasible and, upon determination of no visible contamination, disposed off-site. Materials that cannot be decontaminated to a visually clean surface will be disposed of as remediation waste. Reusable equipment will be decontaminated using methods outlined in the Facility standard operating procedures (SOPs) provided in the revised Sampling and Analysis Plan (SAP) AECOM 2016 and is not repeated in this Application. Decontamination wastes will be managed in accordance with this section by shipment to a licensed facility for treatment and disposal.

Remediation derived wastes are generated on a case specific basis. The volume, decontamination, and disposition of each type of waste will be determined during the development and subsequent MDEQ approval of each remediation specific work plan.

Appendix C presents a copy of the Facility Waste Management Plan. The Waste Management Plan is used as a guide to determine appropriate disposal methods.

5.2.3.2 Sampling Plan

Samples will be collected and analyzed as requested by the receiving hazardous waste or treatment facility. As the process of waste generation (or waste stream) and the general characteristics of the waste and recovered creosote have not changed, frequent sampling and analysis by the receiving facilities have not been required.

5.2.3.3 Chain of Custody

A chain of custody from the field to the receiving analytical laboratory will be maintained and documented, as described in Section 5.7 of this Application. Upon receipt at the laboratory, the samples will be logged into the laboratory logbook and given a unique identification number. All samples will be inspected for damage and leakage upon receipt.

5.2.3.4 Analytical Parameters

Analytical parameters will be determined as requested by the receiving hazardous waste facility.

5.2.4 [40 CFR 270.14(b)(4) and 264.14] Security Procedures

The Paradise security measures are designed to prevent unknowing entry and to minimize the possibility of unauthorized entry of persons or livestock into the Facility.

5.2.4.1 Entry Control

The Facility is located in a sparsely populated area not normally frequented by people. The Facility is located on property owned by BNSF and access to people or livestock is restricted. A fence has been constructed and is maintained around the perimeter of the Facility, including the SI, WPU, and LTU (**Figure 5.2.4-1**). The fence is constructed of four strand barbed wire. Fence posts are placed at a maximum of 20 feet (ft) intervals along the fence, and at all bends in the fence and termination points. The fence posts are either treated 4-inch x 4-inch wooden fence posts or metal fence posts. Four 20-foot-wide, double-drive gates have been constructed at the locations shown on **Figure 5.2.4-1**, to control access. Barbed wire gates control access into the Section 18 SI. The gates remain locked when not in use.

The LTD plots are located northwest of the Facility and are not enclosed within the perimeter fence illustrated in **Figure 5.2.4-1**. The LTD plots are clean closed and access is not controlled.

5.2.4.2 Warning Signs

Warning signs are attached to all fence lines. There is a minimum of one sign per 200 feet of straight section of fence, and a sign is posted at each gate. The signs state: Danger-Unauthorized Personnel Keep Out". The signs are 10 inches by 14 inches, and the lettering is 2 inches high and in English.

5.2.4.3 Inspection

BNSF currently conducts physical and Webcam inspections of the Facility, including the SI/WPU, CAMU, and storage tanks. These inspections ensure that unauthorized entry of persons or livestock into the Facility does not or has not occurred.

5.2.5 [40 CFR 270.14(b)(5), 264.15, 264.195, and 264.273] Inspection Plan

The inspection program for the Facility includes the SI/WPU, CAMU, PRS, CSA, and the monitoring well network to ensure the integrity of the units.

5.2.5.1 General Inspection Requirements

BNSF currently conducts physical and Webcam inspections of the Facility, including the SI/WPU, CAMU, and storage tanks. The purpose of the inspections and Webcam monitoring is to identify any deterioration, malfunctions or discharges which may result in the endangerment of public health or the environment. Facility personnel will either conduct the inspections or delegate the responsibility to another authorized individual. If the modification to remove the tanks and add the CSA is approved, the CSA will be inspected weekly.

5.2.5.2 Inspection Schedule and Procedures

BNSF will conduct monthly inspections of the Facility, including the SI/WPU, and CAMU, , and after storm events.

Table 5.2.5-1 presents the proposed schedule for inspection of specific operating and structural equipment associated with the Facility. This schedule will be kept at the Facility and inspections will be conducted by facility personnel. The following section describes the specific methods and procedures to be used in the inspections and the remedial action to be undertaken in the case of deterioration or malfunction of the structures or equipment.

5.2.5.3 Inspection Procedures

The entire Facility will be physically inspected quarterly. These inspections will include Facility fences, gates, safety equipment, condition of the recovery wells at the SI and Retort Areas, and run on and run off control. All on-site emergency equipment will be inspected on a quarterly basis for availability in case of an emergency. This inspection will include equipment such as fire extinguishers, first aid kits, and other systems, which could deteriorate over time. Other inspection criteria will address the access to safety equipment and the availability of off-site equipment. Monitoring wells will be inspected semi-annually.

All fences and gates will be inspected for missing signs and wires, rotten posts, and locked gates. The CAMU will be evaluated for berms, erosion, and run on/off controls. Monitoring wells will be inspected semi-annually at the time of sampling for missing well covers and locks and integrity of well pads.

The non-permitted CSA will be inspected weekly for deteriorating drums, secondary containment issues, and evidence of spills.

If an inspection reveals a developing or present malfunction or deterioration, remedial action (e.g., repairs to structures or equipment, replacement of safety materials) will be taken on a schedule that ensures the situation does not develop into an environmental or human health hazard. If the inspection reveals that a hazard is present or imminent, remedial action will be taken immediately. In the event of an emergency involving the release, or threatened release of hazardous substances to the environment, BNSF will immediately notify the appropriate authorities listed in the Contingency Plan (Section 5.2.7) and undertake the necessary containment, removal, and restoration actions.

5.2.5.4 Inspection Records

Results of the quarterly inspections will be recorded on the Inspection Log Sheet for the Facility (**Figure 5.2.5-1**). Records of corrective action activities (e.g., repairs) also are kept on the log. These inspection records will be kept for a minimum of three years from the date of inspection. Weekly inspection of the CSA will be noted on a separate log sheet (Figure 5.2.5-2). Copies of the inspections also will be provided as part of the Annual CAMU and Monitoring Report.

5.2.6 [40 CFR 270.14(b)(6) and 264 Subpart C] Preparedness and Prevention

BNSF has undertaken a series of steps at the Facility to prevent and to be prepared to respond to an emergency situation. A more detailed description of emergency procedures is provided in the Contingency Plan (Section 5.2.7).

5.2.6.1 Facility Design and Operation

The Facility was designed and constructed, and is operated and maintained, to minimize the possibility of a fire, explosion, or any unplanned release of waste or waste constituents, which could threaten human health or the environment. It is important to note that the probability of a fire, explosion, or release of hazardous waste resulting in a potential threat to human health or the environment is remote because the waste stored and historically treated at the Facility is non-combustible and non-reactive. Nevertheless, BNSF has implemented procedures to ensure the health and safety of Facility personnel during operation of the PRS. These health and safety procedures are specified in the Contingency Plan (Section 5.2.7).

5.2.6.2 Emergency Communication Systems

The Facility operator will generally be the only personnel on the Facility except when activities require additional employees. The Facility will be inspected according to the Inspection Plan described in Section 5.2.5 , however, should any waste or waste constituents be released from any unit, the released constituents would not result in an immediate danger to human health or the environment. Therefore, an internal alarm system at the Facility is not necessary.

Facility personnel will have a cellular phone in the project vehicle during inspections of the Facility. This will enable summoning assistance from the local emergency organizations, if required. A telephone also is available at the Facility office.

5.2.6.3 Emergency Equipment

The threat of fire/ignition/explosion at the Facility is minimal based on the characteristics of the waste. BNSF has established and coordinated arrangements with local authorities and emergency services. The Paradise Volunteer Fire Department (VFD) has been designated the primary emergency authority for the Facility.

Portable fire extinguishers, a first aid kit, and other emergency equipment will be maintained at the Paradise office for emergencies. Details on the specifications and quantity of the emergency equipment are provided in **Table 5.2.7-2** in the Contingency Plan.

5.2.6.4 Access to Communication and Emergency Services

Personnel on-site during inspections will have access to a cellular phone in their vehicle in order to summon off-site emergency assistance. A telephone also is available at the Facility office.

5.2.6.5 Required Aisle Space

Sufficient space is provided around the Facility to enable the unobstructed movement of emergency equipment (e.g., fire-fighting vehicles). The Facility roads, LTU aisles and berms between cells will be kept clear of obstructions at all times. There will be a minimum of three feet between the aisles of drums in the CSA.

5.2.6.6 Arrangements with Local Authorities

BNSF has established and coordinated arrangements with local authorities and emergency services. A description of the organizations and their responsibilities is included in the Contingency Plan (Section 5.2.7). The Paradise VFD has been designated the primary emergency authority for the Facility.

BNSF has notified local authorities of the operation of the Facility and solicited their assistance in responding to possible emergencies at the Facility.

5.2.7 [40 CFR 270.14(b)(7) and 264 Subpart D] Contingency Plan

This Contingency Plan presents systematic procedures for immediate response to potential emergencies. The Contingency Plan will enable emergency coordinators to act quickly and efficiently to minimize human health hazards and adverse environmental effects.

The Facility has five permitted regulated units: the CAMU (which includes the closed SI, closed LTU, and the SI PRS), two hazardous waste storage tanks (Tanks T-6 and T-7), the closed WPU, and two clean-closed LTD plots. Tanks T-6 and T-7 are currently operational as part of the PRS and CAMU; the SI and WPU are under post-closure care. The Facility is located in the NW ¼ of Section 20, the SE ¼ of Section 18, and the SW ¼ of Section 17, Township 19 North, Range 25 West (**Figure 5.2.1-2**).

5.2.7.1 Emergency Coordinators

The Primary Emergency Coordinator is the Facility manager. The Primary Emergency Coordinator has the authority to commit the resources necessary to implement the Contingency Plan. In his absence, the designated Alternate Emergency Coordinator is the facility supervisor of the BNSF Tie Treating Plant in Somers, Montana. The Alternate Emergency Coordinator is familiar with constituents of creosote and is properly trained in health and safety operations at both facilities.

Table 5.2.7-1 lists the Emergency Coordinators and the organizations that can be contacted in case of emergency. This table will be reviewed annually with the Facility Health and Safety Plan (HASP) and updated as necessary as personnel or contract information changes. **Table 5.2.7-2** lists the emergency equipment available at the Facility. Both tables will be contained in all copies of the Contingency Plan.

5.2.7.2 Implementation of the Contingency Plan

The Contingency Plan will be implemented when an imminent or actual incident could threaten human health or the environment. Potential incidents are: 1) fire and/or explosion, 2) flooding, and 3) release of hazardous waste as described below.

<u>Fire and/or Explosion</u>

- Fire within the Facility that threatens waste management areas and where intense heat could ignite and/or release hazardous waste or hazardous waste constituents.
- Fire outside the Facility that threatens the Facility and could ignite and/or release hazardous waste constituents.
- Explosion where fragments or shock waves damage waste management areas resulting in the ignition and/or release of hazardous waste constituents.

<u>Flooding</u>

- Flooding that threatens waste management areas and could potentially cause release of hazardous waste constituents.

<u>Release of Hazardous Waste</u>

- Erosion or structural damage of containment and/or berms resulting in the release of hazardous waste or hazardous waste constituents.
- Erosion or structural damage of containment foundations, and pumps or flanges.

5.2.7.3 Emergency Response Procedures

General Procedures

The following procedures will be implemented by the Emergency Coordinator upon the occurrence of any emergency situation which threatens human health or the environment.

1. Notify appropriate state or local organizations if their help is needed.
2. Assess the possible hazards to human health or the environment that may result from a fire, explosion, or release. The assessment will include both direct and indirect hazards (e.g., effects of any hazardous surface water run-off from the use of chemical fire retardants).
3. An evacuation of the local area is unlikely to be necessary due to the lack of residential properties in the immediate area and because the waste is not ignitable or reactive. If an evacuation should be necessary, the Emergency Coordinator for the Facility will notify the Paradise VFD and the Sanders County Sheriff Department. The Emergency Coordinator then will be available to help direct the evacuation.
4. Immediately notify the government official designated as the on-scene coordinator for this area (in the regional contingency plan under CFR Part 1510 or the National Response Center at 800-424-8802). The report will include:
   - Name and telephone number of reporter;
   - Name and address of Facility;
   - Time and type of incident (e.g., release, fire);
   - Name and quantity of materials involved, to the extents known;
   - The extent of injuries, if any; and
   - The possible hazards to human health or the environment outside the Facility.
5. Take all reasonable measures necessary to ensure that fires, explosions and/or releases do not occur, recur, or spread to other parts of the Facility. These measures will include, where applicable, collecting and containing released waste and removing or isolating containers.
6. Monitor for discharges from the Facility which may result in an emergency situation.
7. Immediately after an emergency, the Emergency Coordinator will provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the Facility. (Note: Unless it can be demonstrated in accordance with 40 CFR 261.3(d), that the recovered material is not a hazardous waste and must be managed in accordance with all applicable requirements of the regulations.)
8. Ensure that in the affected area(s) of the Facility:
   - No waste that may be incompatible with the released material is treated, stored, or disposed of until clean-up procedures are completed.
   - All emergency equipment listed in the Contingency Plan is cleaned and fit for its intended use.
9. Notify the USEPA Regional Administrator, the MDEQ, and other appropriate state and local authorities, that the requirements of paragraph 8 above have been met.
10. Note in the Facility operating record the time, date, and details of any incident that requires implementation of the Contingency Plan. Within 15 days after the incident, a written report must

be submitted on the incident to the USEPA Regional Administrator and MDEQ. The report must include:

- Name, address, and telephone number of the owner or operator;
- Name, address, and telephone number of the Facility;
- Date, time and type of incident (e.g., fire, explosion);
- Name and quantity of material(s) involved;
- The extent of injuries, if any;
- An assessment of actual or potential hazards to human health or the environment, where this is applicable; and
- Estimated quantity and disposition of recovered material that resulted from the incident.

Personal Injuries

The health and safety program has been established to allow Facility operations to be conducted without adverse impacts on worker health and safety (Section 5.2.8, Hazardous Prevention). In addition, supplementary emergency response procedures have been developed to cover extraordinary conditions at the Facility.

General Emergency Procedures. All accidents and unusual events will be dealt with in a manner to minimize a continued health risk to Facility workers. In the event that an accident or other unusual event occurs, the following procedure will be followed:

- First aid or other appropriate initial action will be administered by those closest to the accident/event. This assistance will be conducted so that those rendering assistance are not placed in a situation of unacceptable risk.
- All accidents and unusual events must be reported to the Emergency Coordinator who is responsible for conducting the emergency response in an efficient, rapid, and safe manner. The Emergency Coordinator will decide if off-site assistance and/or medical treatment are required and arrange for assistance.
- All workers on-site should conduct themselves in a mature, calm manner in the event of an accident/unusual event. All personnel must conduct themselves to avoid spreading the danger to themselves and surrounding workers.

Response to Specific Situations. If an employee working in a contaminated area is physically injured, Red Cross first-aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be moved, he will be taken to the edge of the work area (on a stretcher, if needed) where contaminated clothing will be removed and emergency first aid administered. He then will be transported to a local emergency medical facility.

If the injury to the worker is chemical in nature (e.g., over-exposure), the following first aid procedures are to be instituted.

- **Eye Exposure** – If contaminated solids or liquids get into the eyes, wash eyes immediately with appropriate solution and lifting the lower and upper lids occasionally. Obtain medical attention immediately.
- **Skin Exposure** – If contaminated solids or liquids get on the skin promptly wash the contaminated skin using soap or mild detergent and water. Obtain medical attention immediately when exposed to concentrated solids or liquids. If a skin burn occurs from contact with creosote,

saturate the skin burn with water but do not attempt to remove the creosote. Apply cold water sterile dressing loosely over the burned area and obtain medical attention as soon as possible.

- **Breathing** – If a person inhales large amounts of a toxic vapor, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.
- **Swallowing** – When contaminated solids or liquids have been swallowed, the Poison Control Center (1-800-222-1222) will be contacted and their recommended procedures followed.

Fire and/or Explosion. If a localized fire occurs, chemical fire extinguishers will be used. If necessary and feasible, a fire blanket, soil or other inert materials should be placed on the burning area to extinguish the flames and minimize the potential for spreading. Water or foam should not be used. The Emergency Coordinator will decide whether to summon the Paradise VFD for assistance.

5.2.7.4 Emergency Equipment

The emergency equipment listed in **Table 5.2.7-2** will be available at the Facility office. This equipment will be available on-site when personnel are involved in the operation of the Facility.

5.2.7.5 Coordinated Emergency Services

BNSF has made arrangements with the local authorities listed in **Table 5.2.7-1** to respond to emergency situations. Each of the organizations on the Emergency Response Team (**Table 5.2.7-1**) was provided with copies of the Contingency Plan in 1989 and updated revisions were provided in November 1989 and October 1996. The most recent copies of the letter and updated **Table 5.2.7-1** sent to these organizations are included as **Appendix D** of this Permit Renewal Application.

The Paradise VFD is the primary emergency authority for the Facility. The Emergency Coordinator is responsible for initiating contact with the responsible organizations. The Emergency Coordinator will contact the National Response Center (1-800-424-8802) in the event the Facility has a fire, explosion, or release which could threaten human health or the environment.

Evacuation Plan

Unexpected severe weather, wildfires and personnel injury could require evacuation of personnel from the Facility. Evacuation is initiated at the discretion of the personnel working at the Facility. The evacuation order is communicated by either voice, radio or visually by gestures and actions. The designated evacuation route from the Facility is:

- Southeast from the Facility to the town of Paradise.
- Northwest 7 miles on Highway 200 to the town of Plains.

The alternate evacuation route is:

- Southeast from the Facility to the town of Paradise.
- Southeast on Highway 200 for ½ mile.
- Across Clark Fork River Bridge, first right onto River road for 7 miles to the town of Plains.

Copies of Contingency Plan

The Contingency Plan will be maintained at the Facility office and by the organizations listed in **Table 5.2.7-1**. Copies of the letter and updated **Table 5.2.7-1** sent to these organizations are included as **Appendix D**.

<u>Amendment of Contingency Plan</u>

The emergency coordinators listed in **Table 5.2.7-1** will be reviewed annually with the HASP and updated to reflect changes in Facility personnel or contact information. The Contingency Plan will be reviewed and amended, if necessary, whenever:

1. The Facility Permit is revised.
2. Deficiencies are noted during an emergency.
3. The Facility design, construction, operation, maintenance, or other circumstances change in a way that increases the potential for fires, explosion or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency.
4. The list of Emergency Coordinators Changes.
5. The list of emergency equipment changes.

5.2.8 [40 CFR 270.14(b)(8)] Hazard Prevention

The CAMU actively manages remediation wastes. This section will discuss the CAMU portion of the Facility and the associated hazard procedures, structures, and equipment used to prevent hazards.

5.2.8.1 Operational Hazard Prevention

The LTU is located northeast of the SI Area and south of the Retort Area (**Figure 5.2.1-2**). A berm has been constructed around the perimeter of the LTU, within the fence line, to prevent storm water run-on from entering the LTU and to contain storm water run-off within the LTU. As the LTU is in post-closure, there are no operational hazards associated with this unit.

The SI is a regulated unit currently being maintained under post-closure requirements. The SI has been documented to be one of the areas on the Facility with residual and free phase creosote.

As a result of changing conditions described in Section 5.3.7, the DNAPL collection in the SI was modified from the PRS to collection at individual wells. Tank-4, Tank 6, Tank 7, the oil water separator (OWS), the GAC tanks, and ancillary piping will be removed in accordance with the Closure Plan. Secondary containment will be added to a drum at well CA-33 located in the Retort Area. As a result, the Facility will no longer maintain permitted tanks. Creosote will be pumped from the sumps at the SI recovery wells and the drum at CA-33 into a truck-hauled trailer tank. The tank contents will be transferred to 55-gallon DOT steel drums positioned on containment pallets in the CSA located in the shop building. The concrete floor in the CSA will serve as the final barrier between the spill pallets and soil. If there are no records of spills in the CSA, the floor will not require decontamination. The contents of the drums will be removed from the Facility and transferred to an approved off-site disposal facility in less than the regulated accumulation time from the start of filling that drum.

5.2.8.2 Run-on, Run-off and Flood Prevention

Run-on to the LTU is controlled by a berm around the perimeter. The accumulated run-off from outside the LTU berms will collect in the drainage swales. The LTU is closed and there is no direct pathway to wastes via run-on or run-off. In addition, although the LTU is located in the 100-year flood plain of the Clark Fork River, the floodplain evaluation presented in Section 5.2.11 demonstrates that the LTU is above the floodplain base level elevation.

5.2.8.3 Prevention of Water Supply Contamination

The contractors were required to comply with applicable federal and state laws, orders, and regulations concerning the control and abatement of water pollution during the construction of the LTU and the PRS facilities at Paradise. The Paradise aquifer below the Facility is impacted with creosote constituents related to historical activities prior to 1982 and is not suitable as a drinking water supply. The Town of Paradise's water supply well is upgradient of the Facility.

CAMU operations (e.g., product pumping, product transfer, soil excavation, waste loading activities, and routine cultivation activities) have been performed by methods that prevented entrance or accidental spillage of solid matter, constituents, debris, and other objectionable pollutants and wastes into streams, water courses, lakes, and groundwater sources. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, concrete, sewage effluent, industrial wastes, oil and other petroleum products, mineral salts, and thermal pollution.

5.2.8.4 Mitigation of Equipment Failure and Power Outages

The LTU, SI, WPU, and LTD plots are all closed facilities and do not require electrical power or mechanical equipment to contain waste. In the event of a power outage or equipment failure, there will be no releases of waste or waste constituents at these units.

5.2.8.5 Prevention of Unloading and Personnel Hazards

A health and safety program has been established based on an analysis of potential hazards; and personnel protection measures have been selected that are commensurate with the potential risks. Procedures to be used while at the Facility and the Personal Protective Equipment (PPE) required are defined in the health and safety program.

An evaluation of conditions at the Facility was made to determine the danger to personnel during operations. Recovered product will be removed from the sumps at individual wells and transported to the CSA via a truck and trailer, with a tank attached to the trailer. The tank and trailer will remain on-site when there is product in the trailer. The truck will be driven off public roadways and over an LTU berm from the SI Area to the Retort Area to empty the drum at CA-33.

The product is unloaded from the transfer tank via a portable pump and air compressor. The wheels of the truck and trailer will not come in contact with any waste and will not need to be decontaminated prior to leaving the SI Area or the Retort Area.

- Personnel will be wearing proper PPE as defined in the Facility HASP.
- All pumps and piping containing product that were used in the transfer process will be evacuated of the product by blowing air through them at the completion of the transfer step.
- Personnel are given periodic instruction on the characteristics and handling of wastes, precautions to be observed, and proper use of PPE.
- Due to the composition of the product and its lack of ignition potential, fire hazards are virtually non-existent.
- Appropriate spill prevention equipment is on hand at the Facility to contain a spill if it were to happen (i.e., adsorbent booms, adsorbent pads, floor dry, etc.).

5.2.9 [40 CFR 270.14(b)(9) and 264.17] Ignitable, Reactive, and Incompatible Wastes

The creosote impacted wastes managed at the Facility is generated from wood preserving processes and are not considered an ignitable or reactive waste according to 40 CFR 261 Subpart C. Therefore, special precautions to prevent accidental ignition or reaction are not necessary.

5.2.10 [40 CFR 270.14(b)(10)] Facility Traffic Control

At the present time, the Facility is inactive and the only persons authorized to enter the Facility is the Facility operator and other personnel when needed. Therefore, Facility traffic is currently negligible. **Figure 5.2.10-1** depicts the roadways in the general vicinity of the Facility. Access to the Facility is gained via Montana State Highway 200, which is a two-lane undivided asphalt road. Access to the Facility is restricted by fences with locked gates. The load-bearing capacity of Montana Highways is controlled by the Montana Department of Highways, which allows a maximum load of 80,000 pounds, unless a special permit is obtained.

The access road leading from State Highway 200 is a two-way gravel road that leads to the Facility office, the closed WPU and the closed SI. Both the access road and Facility road have an adequate load-bearing capacity to support truck loads as evidenced by their use in past Facility activities. Traffic controls at the Facility consists of locked gates at the entrance to the Facility and at entrances to the closed WPU, closed SI, and at the northern entrance to the Facility.

Vehicle collisions are highly unlikely due to lack of traffic. During Facility activities, vehicular traffic will be confined to traveling along the access road. This traffic will generally consist of a few passenger cars and light trucks which will be used by Facility personnel. If excavation or other activities will be performed, BNSF will ensure security and traffic control is maintained. No traffic will occur on state roads.

5.2.11 [40 CFR 270.14(b)(11) and 264.18] Facility Location Standards

This section presents the seismic and flood plain information for the Facility.

5.2.11.1 Seismic Considerations

Sanders County, Montana is listed in Appendix VI of 40 CFR 264, which indicates new hazardous waste management facilities located in this political jurisdiction must comply with the seismic standards of 40 CFR 264.18(a). Regional seismic information was provided in the 1998 Application for Part B Permit Renewal (RETEC 1998).

The Facility is not crossed by major or active faults based upon mapping by Pardee (1950), Ross et al. (1955), and Witkins (1977). The St. Mary’s and Ninemile Faults mapped by Witkins (1977) are each shown as suspected active faults located approximately ten miles southeast of the Facility. Dam site investigations conducted by the Corps of Engineers (U.S. Congress 1952) for a site located 1.5 miles downstream of the Paradise Tie Treating Plant indicated the presence of a fault in Precambrian bedrock on the left abutment of the dam site, however, no offset was observed of the Quaternary deposits overlying this fault.

Interpretation of aerial photographs indicates that numerous lineaments are present in the Facility area. These lineaments may represent surface expressions of bedrock joints, faults, bedding, dikes, or drainage anomalies. Investigations completed to date do not support a conclusion of either the presence or absence of Holocene faults at the Facility.

From the standpoint of both seismic risk and regulatory compliance, further investigations into the Facility’s seismic considerations is not warranted. The seismic risk to this type of hazardous waste management Facility is very low. This is a result of the apparent lack of surface fault offset observed along active faults in the region. In addition, the land treatment facility is closed and no longer in operation.

5.2.11.2 Floodplains

The Facility is located to prevent a washout of hazardous waste in the event of a 100-year flood event. **Figure 5.2.11-1** is a modified floodplain map of the Clark Fork River constructed by AECOM based on information provided by the Federal Emergency Management Agency (FEMA2012 and 2017). The floodplain map demonstrates that most of the Paradise LTU Facility is located in the 100-year floodplain of the Clark Fork River. However, this map was prepared without detailed hydraulic analyses and without Base Flood Elevations (BFE). Based on the upstream BFE closest to the Facility and the available topography, most of the permitted units and facility improvements appear to be at elevations above the BFE. Surface Impoundments (SWMU 1 north and SWMU 1 south) and the WPU (SWMU 2) may be below the BFE as shown in **Figure 5.2.11-1**. All other units are above the BFE, also known as a 100-year flood. Accordingly, BNSF prepared a floodplain evaluation to determine the impact of a 100-year flood upon the Facility and presented this detailed information in a memorandum to MDEQ in September 2015. This modification formalizes that evaluation and incorporates it into permit documentation.

The river is primarily confined to the modern channel banks because the river basin above Paradise is regulated by two dams creating large storage reservoirs which partially attenuate severe floods. One dam is located on the South Fork of the Flathead River creating Hungry Horse Reservoir and the other dam is on the mainstream of the Flathead River just downstream from Flathead Lake and regulates the water storage in Flathead Lake.

5.2.12 [40 CFR 270.14(b)(12) and 264.16] Personnel Training

The goal of the training program is to reduce the potential for actions that could threaten human health or the environment. The personnel training program ensures that Facility workers are familiar with their duties and responsibilities in the area of hazardous waste management.

All Facility personnel shall be covered by this training program: facility operations supervisor, facility operations personnel, and subcontractors. All job classifications will be trained in the proper procedures associated with hazardous waste activities prior to working at the Facility.

5.2.12.1 Personnel Training Program

The personnel training program for the Facility consists of selected sections of this Application. Facility personnel will have a copy of the program. The program will be kept on file at the Facility office and will be available for review by regulatory officials. Review and training will be conducted whenever any new personnel or subcontractors are at the Facility. The training will be conducted by a designee of BNSF, who is responsible for coordinating Facility compliance with hazardous waste regulations.

Table 5.2.12-1 presents the outline of the personnel training program to be presented to the Facility personnel involved with waste management. All of the personnel involved in any Facility activities, will be given the training program. A detailed description of the training program was provided in the 1998 Application for Part B Permit Renewal (RETEC 1998).

5.2.12.2 Training Director

The personnel training program will be directed by the BNSF manager of environmental remediation, or someone designated by him. The BNSF manager of environmental remediation or his designee has gained the qualifications required for this position through work experience, training, and education in hazardous waste management. The training director is required to be knowledgeable in solid and hazardous waste management practices specific to the Facility, regulatory requirements, and the requirements of the Part B Permit. The training director is responsible for oversight of the training program, reviewing and approving the training materials and methods, and revisions or changes to the training program, as necessary.

5.2.12.3 Training for Emergency Response

This training program is designed to ensure that personnel not only handle hazardous wastes in a safe manner but also properly respond to emergency situations. The program trains hazardous waste handling/management personnel to maintain compliance under both normal operating conditions and emergency conditions.

Training elements addressing non-routine and emergency situations include:

- Procedures for locating, operating, inspecting, repairing, and replacing Facility emergency equipment;

- Emergency communication procedures;
- Response to fires or explosions;
- Response to controlling waste releases; and
- Procedures for evacuation of nearby areas.

5.2.12.4 Training Schedule

All personnel will have successfully completed 40-hour Hazwoper training (29 CFR 1910.120) and the current annual 8-hour refresher courses. In addition, Facility specific Health and Safety informational training will be conducted prior to commencement of work at the Facility. All Facility personnel must successfully complete the training described in this Section within six months of their assignment to the Facility. Any personnel without this training will be supervised while on-site. Annual Facility specific training requirements are provided in the 1998 Application for Part B Permit Renewal (RETEC 1998).

5.2.12.5 Recordkeeping

Personnel training regulations (40 CFR 264.16 (d)) require that records be kept at the Facility. These records must include the job title and the personnel filling the position, as well as a written job description and the required training for each position. Currently, one employee is employed at the Facility, and has completed the required training as detailed in this section (the Facility operator). A list of qualified Facility personnel is presented in **Table 5.2.7-1**. As additional workers are required for Facility activities, the required training completion will be documented. Records will be made of the training completed by each employee and will be kept at the Facility office during the operating life of the CAMU and at least three years from the date the individual left the Facility. Subcontractors will sign a health and safety acknowledgment form after review of Facility specific health and safety requirements. When the Facility is closed, all records will be transferred to either BNSF's Helena, Montana Regional Office or the AECOM office in Billings, Montana, where they will be retained for at least three years after closure.

5.2.13 [40 CFR 270.14(b)(13), 264 Subpart G, 264.197, and 264.280] Closure and Post Closure Plans

This section of the Application presents the Closure and Post-Closure Plans for the regulated units that are not yet closed.

5.2.13.1 PRS Closure Plan

<u>Closure Performance Standards</u>

Closure performance standards ensure the PRS will be closed in a manner that: 1) minimizes the need for further maintenance; and 2) controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous water constituents, contaminated run-off, or waste decomposition products to groundwater, surface water, or to the atmosphere. BNSF will close the PRS by removing and/or decontaminating all hazardous materials (i.e., system equipment) and transporting residuals off-site to an approved disposal facility.

The closure performance standard for terminating product recovery operations will be on a well by well basis. Routine monitoring will be conducted to monitor creosote accumulation in the well. Creosote will be recovered before it reaches the top of the sump. If the product thickness in the sump stays less than 6 inches for more than a year, product recovery will cease and the well will be abandoned with MDEQ approval. Product thickness is routinely monitored at all product recovery wells. Should an operating well show sufficient product accumulation at any time, it will be pumped to recover accumulated creosote.

These closure performance standards are based on monitoring movement of creosote as it pools in the top of Zone III depressions. Once the recoverable product has been depleted, and only residual creosote remains at the base of the Zone II aquifer, product recovery will be complete, and recovery pumps will be turned off.

<u>Closure/Partial Closure Activities</u>

Recovery efforts will be terminated based on less than six inches of creosote accumulation in the sump over a year period. This evaluation will be conducted for the individual recovery wells. There are 10 recovery wells in the SI Area and 1 in the Retort Area, 4 of which have operating pumps in place; the wells are constructed with sumps that vary from 3 feet to 5.8 feet below the screened interval. Creosote recovery is expected to continue for at least 10 additional years. Once the recovery is complete, all recovery wells will be removed (e.g., pumps and piping) and the wells abandoned.

The PRS equipment and piping will be removed and decontaminated. The final rinsate will be analyzed for PAHs when it is no longer necessary to have that equipment and piping. If the analytical results are below risk-based action criteria, the piping and valves will be considered clean and can be recycled or disposed as non-hazardous. Rinsate water will be drummed and analyzed for PAHs; if the rinsate water is below risk-based action criteria, it will be discharged to the ground, if the water is contaminated it will be disposed at an approved disposal facility. If the PRS equipment cannot be cleaned, treatment of contaminated debris (i.e., PRS equipment) will render the debris non-hazardous. The treatment will meet specified best demonstrated available technology (BDAT) treatment to substantially diminish the toxicity of the waste or reduce the likelihood of migration of waste constituents and leave a “clean debris surface.” The treated debris will not exhibit any characteristic of hazardous waste (40 CFR 268.45(c)). A “clean debris surface” means the surface, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste except that residual staining from soil or waste consisting of light shadows, slight streaks, or minor discolorations, which will be limited to no more than 5 percent of each square inch of surface area (40 CFR 268.45, Table 1). High pressure steam and water sprays are defined as BDAT treatment technology for debris and are proposed for use on the PRS components.

Following BDAT treatment and inspection, decontaminated equipment and/or debris may be reused on-site or disposed at a Subtitle D solid waste facility. Rinsate or residuals from the decontamination process or any soil with PAH concentrations above the risk-based cleanup levels generated in closure activities will be transported off-site to an approved disposal facility. Debris that cannot be rendered non-hazardous also will be transported off-site to an approved disposal facility.

To achieve clean closure, the PRS components and hazardous debris must be removed and each type of equipment or debris managed and treated based on its physical characteristics and regulatory classification. BNSF proposes to provide for closure of the PRS following guidelines established in the *Contaminated Debris Rule* (40 CFR 268.45) that allows treatment of hazardous remediation debris to render it non-hazardous prior to disposal or recycling. BNSF has identified the following steps for implementing clean closure of the PRS:

- Decommission and/or dismantle all product recovery and treatment system equipment and structures.
- Decontaminate and remove all PRS hazardous “Contaminated Debris” using high pressure steam and water spray as a BDAT technology. Decontamination activities will take place within the PRS building or on a temporary constructed decontamination pad. Decontamination water will be collected and processed through the PRS or shipped off-site to an approved disposal facility.
- Optional off-site disposal of BDAT treated materials at a Subtitle D disposal facility.
- Ship recovered creosote to an off-site recycling facility or approved off-site disposal facility.
- Ship remediation wastes (rinsate water, residuals, spent carbon GAC, contaminated soil) to an approved off-site disposal facility.

- Dispose, reuse at another BNSF facility, or recycle any equipment that had no contact with product.
- Facility restoration and clean closure certification of the product recovery operation.

The estimated costs to complete the demolition and removal of equipment, contaminated debris and treatment and materials disposal/recycling are discussed in Section 5.2.14.

The PRS was constructed and operated within the CAMU. While closure activities are being conducted, groundwater monitoring will continue as described in Section 5.3 .

Remediation and Hazardous Waste Inventory

The PRS processes recover creosote from the bottom of the water table aquifer in the southeastern end of the SI and in the Retort Area. Remediation wastes generated from product recovery include creosote and creosote residuals including co-produced groundwater water and remediation wastes. **Tables 5.2.13-1** and **5.2.13-2** list the volumes of remediation waste and debris, and PR equipment inventory expected to be encountered during the closure process.

Equipment Decontamination Requirements

All PR pump assemblies, including product discharge hoses and air supply lines, will be pulled from the PR wells. The steel piping product collection header will be drained into product collection tanks and disassembled. Recovered product, including that stored in Tanks T-6 and T-7, will be shipped to an off-site recycling facility or approved off-site disposal facility (which may include fuel recovery at a cement kiln). The product/water separation and storage tanks, piping, and valves containing product or untreated water will be removed from the PR building in the order that material is processed through the system. All tanks, piping and/or equipment that have been in contact with recovered product will be staged in the PRS building. All equipment will be decontaminated as described below.

Treated water tanks and connected piping will be segregated from the materials requiring decontamination. Materials such as pipe racks and electrical equipment that have not come in contact with recovered product will be managed independently for reuse or recycling.

Decontamination and Disposal Procedures

After completion of the remediation activities at the Facility, the existing equipment and systems will need to be properly managed through decontamination and disposal procedures. The equipment and systems requiring these procedures at closure are discussed above, and in **Tables 5.2.13-1** and **5.2.13-2**.

Decontamination

Upon removal and dismantling of the PRS, the larger pieces of equipment (e.g., tanks, oil/water separator, pumps) will be decontaminated using high pressure steam and water spray as a BDAT technology. The smaller pieces (e.g., pipes, valves, hoses) will be decontaminated using high pressure steam and water spray or will be disposed of as listed hazardous waste.

Non-hazardous Material

All non-hazardous equipment or debris removed from the CAMU and retort areas will be transported to an off-site recycling or Subtitle D land disposal facility or reused for similar applications. Recovered product collected from the PRS will be shipped off-site for disposal or fuel recovery.

Hazardous Materials Amenable to Visual Inspection

All hazardous materials or debris removed from the CAMU and retort areas that are amenable to visual inspection must be visually inspected and certified as having a “clean debris surface.” If the material is not amenable to visual inspection, such as the inside of piping, effective decontamination will be demonstrated by testing the rinsate for hazardous constituents (**Table 5.2.13-3**). If concentrations are below the applicable regulatory thresholds for wastes managed in the system, the material will be determined clean. It then will be transported to an off-site recycling or Subtitle D land disposal facility or reused for similar applications. Remediation solids and residues from the pressure washing operation will be packaged and transported off-site to a licensed a hazardous waste treatment and/or disposal facility.

Hazardous Materials not Amenable to Visual Inspection

All hazardous materials or debris removed from the CAMU and retort areas that are not amenable to visual inspection must be dismantled, packaged and transported off-site to a licensed hazardous waste treatment and/or disposal facility as well as meet the applicable requirements for closure of tank systems. Decontamination efforts will demonstrate effective contact to all contaminated surfaces with an appropriate decontamination solution or media. Decontamination progress and/or completion will be demonstrated by testing the spent solution or media for hazardous constituents present in the wastes managed. Completion of effective decontamination will be demonstrated by hazardous constituent concentration is in the rinsate being below the applicable regulatory thresholds for wastes managed in the system (**Table 5.2.13-3**).

PRS Building Flooring and Secondary Containment

The building flooring and secondary containment areas for the PRS Building and CSA will be inspected for cracks. The flooring will be rinsed and the final rinsate analyzed for PAHs. If concentrations are below the applicable regulatory thresholds for wastes managed in the buildings, the building will be considered clean. If analytical data do not support this designation, the buildings will be recleaned until it is determined the slabs are clean or must be removed. If the slab cannot be cleaned, the slab will be removed as hazardous debris as described above. Evidence of release will include inspection records as well as visual inspection. If the slab must be removed, the area beneath the slab will be sampled for the presence of PAHs and contaminated soil removed and disposed at an appropriate facility. At this time, the PRS Building and the CA-33 shed are not scheduled for demolition. The CA-33 pump will stay in the well and be run automatically. The CA-33 shed will be formally closed when the shed is no longer needed.

<u>Schedule for Closure</u>

BNSF installed a PRS in 1996 to recover free phase and residual creosote in the SI and retort areas. As a result of changing conditions of the PRS in the SI and Retort areas, Tanks T-4, T-6 and T-7 will be closed as described above; however, the product recovery wells will continue to operate and creosote will be pumped from the sumps in those wells to a portable tank and transferred to 55-gallon steel drums located in the CSA in the shop building. When pumping is discontinued, the drum at CA-33 will be removed and the CSA will be closed.

<u>Copies of Closure Plan</u>

The closure plan is included as an attachment to the Permit (MDEQ 2001). A copy of the Permit will be located at the office of the BNSF Manager of Remediation. BNSF will be responsible for updating the Facility closure plan.

<u>Final Closure Notification</u>

BNSF will notify the MDEQ at least 60 days prior to the date of final closure of the PRS, SI Area, Retort Area, and the CAMU.

<u>Certification of Closure</u>

Periodic inspections of the closure activities will be made by an independent registered professional engineer to ensure that the Facility has been closed in accordance with the closure plan specification.

Within 60 days of completion of closure, BNSF will submit to the USEPA regional administrator and the MDEQ administrator closure certification by both BNSF and an independent registered professional engineer.

5.2.13.2 SI/WPU Post-Closure Plan

The SI was closed by removing visibly contaminated soil from the impoundment and temporarily storing the material in the WPU. The SI closure was completed in 1988. In 1989, the LTU was constructed and impacted soils from the WPU were applied. Waste pile closure was completed in 1990. Due to the presence of groundwater impacts in the immediate vicinity of the SI, BNSF implemented the GCAP (ReTeC 1989) and in 2006 incorporated the requirements for the ACL and the GCAP into the monitoring program into the Permit (MDEQ 2001). Post-closure care will include corrective action groundwater monitoring, conducted on an annual basis in POC wells and on a semiannual basis in POE wells.

Groundwater Monitoring and Reporting Activities

Groundwater monitoring will be continued through the post-closure care period on an annual frequency. The groundwater monitoring locations used for the post-closure care period will be the same as those used during the operating period of the Facility. The groundwater monitoring and reporting plan is provided in further detail in Section 5.3.

Facility Contact

The post-closure plan is included as an attachment to the Permit (MDEQ 2001). A copy of the Permit will be located at the office of the BNSF Manager of Remediation. BNSF will be responsible for updating the Facility post-closure plan.

The Facility contact during the post-closure care period is:

Manager Environmental Remediation
BNSF Railway Company
800 North Last Chance Gulch, Suite 101
Helena MT 59601
Telephone: (406) 256-4040

Whenever changes in operating plans or Facility design occur during the active life, or post-closure period that may affect this post-closure plan, or whenever there is a change in the expected year of closure, this plan will be revised at that time.

5.2.13.3 LTU Post-Closure Plan

The post-closure period for the LTU began upon the receipt and approval MDEQ of the closure certification for the entire LTU. BNSF has proposed that the post-closure care period continue for 15 years after the closure performance standards were met. The LTU was approved closed by MDEQ on September 9, 2009 (MDEQ 2009a); therefore, the proposed post-closure period would run through November 7, 2024. MDEQ has not approved the request at this time.

Post-closure care will include inspection and maintenance of the vegetative cover and run-on/run-off control system; control of wind dispersal and food chain crops at the Facility; continued unsaturated zone and groundwater monitoring; and inspection of the Facility security system.

Vegetative Cover/Wind Dispersal

The vegetative cover will control particulate dispersal and wind and storm water erosion of any material, which may be present in the soil following closure. The vegetative cover will be inspected late summer during post-closure in years 1, 2, 3, 7, and 15 (if the reduced post-closure care period is approved by MDEQ). If the vegetative cap is shown to be declining at any time during the post-closure period, corrective actions will be implemented as described in the *Land Treatment Unit Vegetative Cap Monitoring Plan* (AECOM 2009).

Run-on/Run-off Control System

The existing storm water management system will be maintained throughout the post-closure care period. The berms surrounding the LTU will remain in place to prevent run-on from storms and flood water from the Clark Fork River from washing out the LTU. The run-off collection berms and dikes will remain in place and collect any storm water that falls within the LTU. The run-on/run-off control system is inspected on a quarterly basis as described in Section 5.2.5.

Food-Chain Crops

BNSF has not and does not plan to grow food-chain crops on the LTU. As part of the post-closure plan, BNSF will continue to comply with prohibition and conditions concerning growth of food-chain crops.

Groundwater Monitoring and Reporting Activities

Groundwater monitoring will be continued through the post-closure care period on a frequency of 1, 3, 7, and 15 years (if the reduced post-closure care period is approved by MDEQ). The groundwater monitoring locations used for the post-closure care period will be the same as those used during the operating period of the Facility. The groundwater monitoring and reporting plan is provided in further detail in Section 5.3.

Unsaturated Zone Monitoring and Reporting Activities

Unsaturated zone monitoring will be conducted through the post-closure care period on a frequency of 1, 3, 7, and 15 years (if the reduced post-closure care period is approved by MDEQ). Soil beneath the LTU will be sampled and analyzed to determine if any hazardous waste or hazardous waste constituents have migrated below the treatment zone. Soil-pore liquid samples will not be collected during post-closure care. The unsaturated zone monitoring and reporting plan is provided in further detail in Section 5.5.

Facility Contact

The post-closure plan is included as an attachment to the Permit (MDEQ 2014). A copy of the Permit will be located at the office of the BNSF Manager of Remediation. BNSF will be responsible for updating the Facility post-closure plan.

The Facility contact during the post-closure care period is:

Manager Environmental Remediation
BNSF Railway Company
800 North Last Chance Gulch, Suite 101
Helena MT 59601
Telephone: (406) 256-4040

Whenever changes in operating plans or Facility design occur during the active life, or post-closure period that may affect this post-closure plan, or whenever there is a change in the expected year of closure, this plan will be revised at that time.

5.2.13.4PRS Post-Closure Plan

A post-closure plan is not required for the PRS, as the entire system and impacted areas will be clean closed, as described in Section 5.2.13.2.

5.2.13.5 Amendment of Post-Closure Plan

If amendments or changes to the post-closure plan are required, BNSF will submit a written notification of a request for Permit modification to authorize a change in the approved post-closure plan. BNSF may request for MDEQ to shorten the post-closure period, if the reduced period is sufficient to protect human health and the environment. The written notification or request will include a copy of the amended post-closure plan for review or approval by MDEQ. Post-closure plan amendments will meet all of the requirements put forth in 40 CFR 264.118.

5.2.13.6 Post-Closure Notices

In March and October 1990, notations on the deed to the Facility property were made following closure of the SI and WPU. In addition, a Facility-wide deed restriction was recorded in January 2007. The notices state that the land has been used to manage hazardous wastes, its use is restricted under 40 CFR Subpart G, and the survey plat and record of type, location, and quantity of hazardous waste disposed at the Facility have been filed with the local zoning authority. A certification, signed by a BNSF official, stating that BNSF has recorded the notation on the deed to the property was submitted to the USEPA Regional Administrator and the MDEQ Administrator.

In 2009, a notation on the deed was filed following closure of the LTU. The notice states the LTU, approximately 29 acres, was used to treat hazardous waste to Option B Closure standards in the Montana Hazardous Waste Permit MTHWP-01-02 Condition V.C.1.b. (MDEQ 2001) Individual LTU cells were closed when the average carcinogenic PAH concentrations were below the closure performance standards of 40 milligrams per kilogram (mg/kg) carcinogenic PAH in surface soils from 0 to 12 inches below ground surface. The notice also indicates its use is restricted to industrial uses, and the survey plat and record of type, location, and quantity of hazardous waste disposed at the Facility have been filed with Sanders County Clerk and Records Office and with MDEQ. A certification, signed by a BNSF official, stating that BNSF has recorded the notation on the deed to the property was submitted to the USEPA Regional Administrator and the MDEQ Administrator. Following closure of the CAMU, the notice will be amended to include the quantity of hazardous waste managed in the CAMU.

5.2.13.7 Post-Closure Certification

BNSF will submit by registered mail to the USEPA Regional Administrator and the MDEQ Administrator certification that the post-closure care period of the Facility was performed in accordance with this approved post-closure plan. The certification will be signed by an independent registered professional engineer.

5.2.14 [40 CFR 270.14(b)(15),(16),(17),and(18) and 264 Subpart H] Cost Estimates and Financial Assurance

This section presents the closure and post-closure cost estimates for the Facility. The cost estimate for the closure of the Paradise PRS is $1,198,780 and the post-closure cost estimate for the LTU and SI/WPU is $1,143,800. In accordance with the financial assurance mechanism requirements, BNSF's financial status is in excess of the closure and post-closure requirements for the Facility. BNSF submits an updated corporate test each year.

5.2.14.1 Closure Cost Estimate

BNSF will keep this written estimate of closure cost and any subsequent estimates on file at the office of the Manager of Environmental Remediation in Helena, Montana. **Table 5.2.14-1** summarizes all closure costs. Closure cost estimates are based on actual rates BNSF is paying for certain services, average contractor estimates, and best engineering estimates. Total cost for closure of the PRS is $1,210,290.

These cost estimates will be adjusted whenever changes in the closure plan affect the associated costs. Also, BNSF will adjust the closure cost estimates annually to reflect the inflation over the previous year by using an inflation factor derived from the annual Implicit Price Deflator for Gross National Product as published by the U.S. Department of Commerce.

Estimated closure costs associated with the PRS include:

- DNAPL Recovery. The estimated costs to recover DNAPL in the SI and Retort areas for an additional 10 years and includes product recovery, , monitoring and reporting. The 10-year total for Operation and Maintenance (O&M) is $$481,100. These costs will be evaluated at 10-year intervals and updated as appropriate.
- PRS Closure. The estimated costs to complete the demolition of the PRS includes removal of equipment and contaminated debris, waste management including materials disposal and recycling, and testing of soil under the secondary containment systems. The lump sum for PRS closure is $221,760.
- Inspections and Facility O&M. Facility inspections for the LTU and SI will be conducted together. Inspection of the CSA will be conducted weekly. Monthly inspections will consist of monitoring condition of the drainage swales, berms and the Facility security system including the fencing, gates and signing. Semi-annual inspections, to be conducted during sampling, also will encompass monitoring wells and locks. Facility-wide O&M may include mowing and snow removal activities, noxious weed control, fence and signage repair, and building and equipment maintenance. Total cost for inspections and O&M for the 10-year (2020-2029) total is $356,200. These costs will be evaluated at 10-year intervals and updated as appropriate.
- Annual Reporting. The estimated costs for annual reporting for an additional 10 years. The annual report costs are split 50% with the post-closure costs for years 2020-2029. The 10-year total for annual reporting is $41,200.

5.2.14.2 Post-Closure Cost Estimate

BNSF will keep this written estimate of the post-closure cost and any subsequent estimates on file at the office of the Manager of Environmental Remediation in Helena, Montana. **Table 5.2.14-2** summarizes all post-closure costs associated with the SI and LTU following PRS closure. Post-closure cost estimates are based on actual rates BNSF is paying for certain services, average contractor estimates, and best engineering estimates. Total cost for post-closure of the Paradise LTU and SI is $1,143,800.These cost estimates will be adjusted whenever changes in the closure or post-closure plan affect the associated costs. Also, BNSF will adjust the post-closure cost estimates annually to reflect the inflation over the previous year by using an inflation factor derived from the annual Implicit Price Deflator for Gross National Product as published by the U.S. Department of Commerce.

Included are costs associated with the conservative 30-year post-closure period for the LTU. The post closure period for the LTU started in 2010 and ends in 2039. Groundwater monitoring is conducted as part of the SI/WPU and LTU post-closure requirements, and facility-wide corrective action. Associated costs are included in the post-closure estimates.

- Inspections and Facility O&M. Facility inspections for the LTU and SI will be conducted together. Monthly inspections will consist of monitoring condition of the drainage swales, berms and the facility security system including the fencing, gates and signing. Semi-annual inspections, to be conducted during sampling, also will encompass monitoring wells and locks. Facility-wide O&M (from 2030-2039) may include mowing and snow removal activities, noxious weed control, fence and signage repair, and building and equipment maintenance. Total cost for inspections and O&M is $356.200.
- Permit Renewal. Permit Renewals costs include permit renewal in years 2029 and 2039. Total cost for permit renewals is $146,000.

- LTU Post-Closure. The LTU post-closure costs consist of two vegetation surveys in years (2024 and 2039), one reseeding event, as needed, LTU soil sampling in in years (2024 and 2039) and LTU groundwater monitoring in years (2024 and 2039). Total LTU post-closure costs are $64,910.
- SI Post-Closure. The SI post-closure costs include annual SMWU inspections for 10 years, groundwater monitoring for 10-years (2020 to 2029), groundwater reporting for 10-years(2020-2029), and annual reporting for years 2020-2039. The annual reporting cost for years 2020-2029 will be split 50% with the closure costs for years 2020-2029. Total SI post-closure costs are $472,700. Groundwater monitoring costs will be evaluated at 10-year intervals and updated as appropriate.

5.2.14.3 Financial Assurance

BNSF uses a financial test and a corporate guarantee in order to comply with the requirements for documentation of financial assurance for closure (40 CFR 264.143(f)), post-closure (40 CFR 264.145(f)), and liability coverage (40 CFR 264.147(f)).

The following financial documents are used to meet the regulatory requirements:

- A letter signed by BNSF's Chief Financial Officer and worded as specified in 40 CFR 264.151(g), Alternate II.
- A copy of the independent certified public accountant's (CPA) report on examination of BNSF's financial statements for the latest completed fiscal year.
- A report from BNSF's CPA stating that:
  - The data in the letter from BNSF's Chief Financial Officer has been compared with the data in BNSF's financial statements.
  - During the comparison of these documents, no matters arose which indicated the specified data should be adjusted.

BNSF will send updated proof of financial responsibility to MDEQ annually within 90 days of the close of each succeeding fiscal year or as requested by MDEQ. This information will include the documents specified above. If BNSF no longer meets the requirements indicated above, notice will be sent to MDEQ indicating BNSF's intent to establish alternative financial assurance.

5.2.15 [40 CFR 270.14(b)(19)] Topographic Map

5.2.15.1 General Information

Prior to 1982, the primary land use for the area was industrial. Portions of the BNSF property are now leased for cultivation of wheat and alfalfa. Land shown on **Figure 5.2.1-2**, which encompasses the area between the Clark Fork River and the primary railroad trackage, is owned by BNSF; 200 feet on either side of the mainline railroad track is leased by Montana Rail Link (mainline track is the northernmost track).

The CAMU location is shown on **Figure 5.2.1-2**. Access to the Facility is limited by the use of fences, which are depicted on the map. A four strand barbed wire fence surrounds the Facility including the closed WPU, the closed SI and the closed LTU. There are four gates for access into the Facility, illustrated in the figure, and the gates remain locked when not in use. Groundwater monitoring wells are on **Plate 1**. LTU, WPU, and SI monitoring wells are specifically located to monitor each unit.

A wind rose diagram for Dixon, Montana is provided in **Appendix E**. The figure presents data collected at the Missoula/Johnson-Bell field station between 1961 and 1990 (**Appendix E**). These wind roses are based upon annual data as well as for the specific seasons (spring-fall). These data for wind direction and velocity are considered to be typical; no geologic changes have occurred to discredit the data. Wind roses present wind direction, frequency and average velocity. Wind direction is indicated by compass points at increments of 22.5 degrees. Frequency is presented by three concentric circles (0 to 15 percent). Average wind velocity is indicated by the numeric values along the circumferences of the circles. Data used to generate these wind roses are available from the Natural Resource Conservation Service (NRCS) National Weather and Climate Center (NRCS 2011).

5.2.15.2 Topographic Map

Several figures were used to provide the information required in 40 CFR 270.14(b)(19). The base map used to generate these figures was constructed in 1991 using photogrammetric mapping techniques with ground target control.

A description of the requirements and the corresponding figure/plate is provided below:

1. Show the area 1,000 feet surrounding the Facility – **Plate 1**
2. Contours equal to 1 feet – **Plate 1**
3. Map scale (1 inch = 200 feet) and date (1991) – **Plate 1** and this section
4. 100-year flood plain – **Figure 5.2.11-1**
5. Surface waters including intermittent streams – **Plate 1**
6. Surrounding land use (residences, farms, etc.) – **Plate 1**
7. Wind rose – **Appendix F**
8. North arrow – **Plate 1**
9. Legal boundaries of the CAMU and SWMUs – **Plate 1** and **Figure 5.2.1-2**
10. Access control (gates) – **Figure 5.2.4-1**
11. Injection/withdrawal wells – PRS Wells are shown on **Figure 5.2.15-1**
12. Buildings, etc. – **Plate 1**
13. Barriers for drainage or flood control – **Plate 1**
14. Location of operating units – **Plate 1**

5.3 [40 CFR 270.14(c) and 264 Subpart F] Additional Information

This section provides the information required under 40 CFR 270.14(c) and 264 Subpart F, including groundwater characteristics and groundwater monitoring programs associated with the CAMU.

5.3.1 [40 CFR 270.14(c)(1)] Interim Groundwater Monitoring

A summary of the RCRA interim status groundwater monitoring data collected under 40 CFR 265 Subpart F is included in Appendix N of the 1989 Part B Permit application (ReTeC 1989b). Eleven quarters of groundwater sampling were completed under this program through September 1988.

5.3.2 [40 CFR 270.14(c)(2)] Regional and Local Geology and Hydrogeology

This section describes the geology and hydrogeology located beneath the Facility property.

5.3.2.1 Regional Geologic Setting

The Facility is located on the alluvial valley floor north of the Clark Fork River, 2.7 miles downstream from the confluence with the Flathead River.

The Clark Fork River Valley between Plains and the confluence with the Flathead is a straight linear feature incised into the rugged topography of the Coeur d'Alene Mountains. The Coeur d'Alene Mountains in the Paradise vicinity are composed of Precambrian bedrock of the Prichard Formation. The linear valley is breached anticline structure in the bedrock. The Prichard Formation is a fine-grained quartzite to argillite of the Belt Series and is estimated to be over 12,000 feet thick.

The Paradise area landscape was largely unglaciated. The historic glaciers to the north, northeast, and west had considerable indirect effect on the landscape. During the Wisconsonian time of the Pleistocene Epoch, glaciers from the north blocked the outlet near the town of Noxon, Montana. The water of the Clark Fork and Flathead Rivers backed up forming Glacial Lake Missoula.

The maximum water level is estimated to have been 4,269 feet above mean sea level (msl). The lake level fluctuated considerably resulting in many levels of terraces. These terraces are composed primarily of lacustrine silts, and terrace remnants can be found hundreds of feet above the present valley floor.

Pleistocene Glacial Lake Missoula sediments several hundred feet thick fill the Clark Fork Valley and are overlain by alluvial deposits. The tie treatment plant buildings are located approximately 1,000 feet northeast of the Clark Fork River at an elevation of approximately 2,482 feet above msl. The former wastewater impoundment is located in the "slough", an abandoned meandering river channel with a minimum elevation of 2,462 feet msl. There are numerous other surface water bearing topographic depressions in the area.

5.3.2.2 Local Geologic Setting

The local geology of the Facility has been investigated by installing and sampling vertical soil borings, backhoe test pits, and conducting a resistivity survey. The results of these investigations indicate that there are three major stratigraphic units occurring as relatively continuous zones beneath the Facility. Thirteen (13) geologic cross sections were provided in the 1989 Permit Application (ReTeC 1989) to illustrate the three major stratigraphics units. Conclusions from studies are summarized as follows:

Zone I silt of moderate to low plasticity which ranges from 1 to 14 feet in thickness and averages 3.7 feet in thickness. This deposit appears to be recent (post-Pleistocene) Eolian and alluvial overbank sediments. It occurs between the ground surface and the top of Zone II. Although this unit is continuous across the Facility, it is thinner in topographic depressions, such as in the slough.

Zone II is a well-graded sand and gravel deposit typically 20 to 30 feet thick. The saturated portion of this zone is an unconfined water table aquifer which is hydraulically connected to the Clark Fork River. The Zone II sand and gravel is interpreted to be a recent river channel deposit.

Underlying the alluvial sand and gravel is Zone III, a deposit of silt, clayey silt and fine silty sand of lacustrine origin. Zone III sediments appear to be derived from deposition occurring with glacial Lake Missoula during Pleistocene. The deepest boring on the Facility (Well 33) is 150 feet. Zone III is continuous to this depth. Borings by the U.S. Army Corps of Engineers (U.S. Congress 1952) approximately 1.5 miles downstream indicate that bedrock is at depth of about 270 feet and that Zone III is underlain at depth by a confined gravel aquifer approximately 30 feet thick. USGS (Soward 1965) borings 3 miles upstream on the Flathead River Valley report bedrock at 255 feet bgs. It is estimated that total thickness of Zone III is approximately 210 feet.

Underlying the Zone III sediments in this region is the Precambrian Prichard Formation. This bedrock formation is a fine grained quartzite and argillite and is approximately 17,000 feet thick. This formation crops out on either side of the river valley. There is no evidence of bedrock surficial crop out in the immediate vicinity of the proposed land treatment Facility.

Contour elevations for the base of the uppermost aquifer (Zone II) or top of Zone III deposit is shown on Figure 21-2 in the 1998 Application for Part B Permit Renewal (RETEC 1998). A trough in the vicinity east of the waste pile and also west of the waste pile, however, less pronounced. A ridge or divide exists between the two troughs on the east ridge of the waste pile.

The CAMU is situated on an alluvial deposit on the north side of the Clark Fork River near Paradise, Montana. This alluvial valley deposit is approximately five miles in length and up to one mile in width. A slough, which was formerly a channel of the Clark Fork River, exists between the CAMU and the river. This slough is approximately one mile in length and is no longer connected to the Clark Fork River during periods of normal discharge.

5.3.2.3 Regional and Local Hydrogeology

<u>Aquifer Definition</u>

The aquifer of primary interest at the Facility is the saturated portion of the sand and gravel unit (Zone II). This zone is identified as the uppermost aquifer beneath the hazardous waste management facilities and is currently being monitored for potential groundwater impacts.

The surficial silt layer (Zone I) is not saturated. This zone is not of direct interest as an aquifer unit. Indirectly, however, this silt zone acts to retard recharge from surface infiltration and may locally be effective in retarding direct transport of Facility constituents from the surface to the uppermost aquifer.

The silt and fine silty sand (Zone III) which underlies the uppermost aquifer is relatively low in permeability as compared to Zone II. Results of permeability testing indicate that the silt content of soils significantly reduces the permeability of sands and gravels. The zone acts to retard the movement of creosote at the base of the uppermost aquifer and as a confining layer over the gravel presumed to underlie the Facility at a depth of over 200 feet. The fine texture, great thickness, and laminated bedding of this zone contribute to its low vertical permeability and effectiveness as a barrier to downward migration of Facility constituents.

<u>Groundwater Movement</u>

Potentiometric surface contour maps have been constructed quarterly or semi-annually since 1981 for submission with the annual groundwater reports. The potentiometric surface maps illustrate the water table gradient in the uppermost aquifer. **Figures 5.3.2-1** and **5.3.2-2** presents the March and September 2017 and 2018 potentiometric maps from the *2017 Annual Monitoring and CAMU Operations Report* (AECOM 2017) and the Spring and Fall 2018 Groundwater Reports (AECOM, 2018a, 2018b). The potentiometric surface maps demonstrate that the groundwater flow is generally to the west or north-west away from the river or parallel to the river. Occasionally, as observed in March 2017, a southward groundwater flow direction towards the river is observed in the spring sampling events during periods of high precipitation and snowmelt run-off.

On a regional scale, the Clark Fork River recharges the Zone II aquifer upstream of the Facility and the aquifer discharges back into the river downstream of the Facility. The Zone II aquifer discharges back in the Clark Fork River approximately 5,000 to 8,000 feet downstream from the slough, near the junction of the river and the north bank bedrock outcropping.

The regional direction of groundwater flow is parallel to the river and the edges of the low permeable Precambrian rocks bound the aquifer on both side (RETEC 2004).

Aquifer Characteristics

Results of aquifer tests are located in Appendix M of the 1989 Part B Permit application. Additional aquifer characterization occurred in the years following permit issuance. The results of several pump tests are presented in *Aquifer Characterization Report* (RETEC 1993). These results show a marked distinction between aquifer characteristics close to the SI and the river and further away from the river in the vicinity of the former tie plant. Hydraulic conductivity close to the river was found to be on the order of 1,500 feet per day (ft/day) whereas in the vicinity of the retort building, hydraulic is higher on the order of 4,100 ft/day. Transmissivity values ranged from 8,100 feet squared per day (ft^2/day) to 59,400 ft^2/day.

With long-term pumping, the aquifer may be expected to exhibit an unconfined specific yield of 0.25.

Groundwater Flow Rate and Direction

Using the observed horizontal gradient of approximately 0.0005, an average hydraulic conductivity of 1,800 feet/day (RETEC 2004), and assuming a porosity of 0.25 (for sand and gravel matrix), the velocity of groundwater is estimated to be approximately 1,300 feet/year (ft/yr). It is conceivable that gradient reversals may occur in the gravel aquifer near the river.

Nested wells indicate that the vertical gradient is very slight in the upward direction from the silty sand (Zone III) to the uppermost aquifer (Zone II). **Table 5.3.2-1** presents historical data of the vertical gradient at the Facility. The harmonic mean vertical hydraulic conductivity for the silty sand (Zone III) was calculated and presented in Appendix M of the 1989 Part B Permit Application (ReTeC 1989b).

The velocity component of groundwater flow within Zone III is approximately 1 to 3 ft/yr. This estimate is based on the observed range in vertical gradient and a probable hydraulic conductivity of 8 feet/day calculated from the harmonic mean of in-situ permeability tests.

5.3.3 [40 CFR 270.14(c)(3)] Site Topography

Section 5.2.15 presents the site topography in detail. The topographic map (**Plate 1**) details the individual bermed treatment cells and the topography of the SI as well as the boundaries of the CAMU and SWMUs. The plate does not go into detail past the boundaries of the valley as the relief changes would cause the topography of the facility to become unreadable.

5.3.4 [40 CFR 270.14(c)(4)] Plume Definition

In December 1988, BNSF implemented a Groundwater Compliance Monitoring program associated with the WPU and SI as defined in 40 CFR 264.99 as part of the *BNSF Paradise Tie Treating Plant Waste Pile, Montana Hazardous Waste Permit (Permit No. MTHWP-88-03) (MDEQ 1988)*. There is no evidence of groundwater impacts resulting from the former LTU operations. The compliance well network for the SI/WPU was established as wells: MW-7A, MW-18, MW-21, MW-26A, MW-40, MW-43, MW-44, MW-45, and PW-3. The first quarter of sampling was conducted in December 1988.

An ACL petition was submitted on February 27, 2004 and was granted by MDEQ (RETEC 2004). The ACL petition defined the POC and POE wells to monitor for evidence of releases from the SI and WPU that would impact groundwater. Under the ACL petition,

- The POC is defined as a “vertical surface” located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated unit [40 CFR 264.95]. The POC wells (10) include: MW-70, MW-40, MW-21, PW-3, MW-49A, MW-81, MW-7A, MW-44, MW-45, and MW-48.
- The POE is the point at which it is assumed a potential receptor may come in contact, either now or in the future, with impacted groundwater (OSWER Directive 9481.00-6C). The POE wells (9) include: MW-6, MW-8, MW-28, MW-41, MW-53, MW-72, MW-91, MW-93, and MW-96.
- Additionally, Permit Condition III.K.4 requires that well MW-27, located in the SI, be monitored separately and similarly to the POE network wells.

Per the ACL requirements, the POC wells have been sampled annually in the fall (September) and the POE wells have been sampled semi-annually in the spring (February/March/April) and fall (September).

The data collected to date indicate the following plume definition:

- There is impacted groundwater within the uppermost aquifer (Zone II) beneath the portion of the former wastewater impoundment located in the southern part of the slough and the former process area.
- Concentrations of PAH constituents in the aquifer appear to form a plume as illustrated **Figure 5.3.4-1**. Plume concentration contours are based on total PAH concentration in groundwater samples collected in March and September 2018.
- **Figure 5.3.4-1** shows that SI PAH concentrations in the groundwater of the upper aquifer were centered in the three known areas of impact. The upper slough in the vicinity well MW-21, the lower slough in the vicinity of well MW-40 and the former process area in the vicinity of wells MW-81 and MW-49A.
- The extent of the PAH plume has reduced in extent over the 29-year period of record, especially in the recent years. **Figure 5.3.4-2** shows a comparison of the total PAH contours from September 2010 and September 2018.
- The lacustrine silt and silty sand (Zone III) deposit underlying the uppermost aquifer serves to prevent or retard further downstream migration of contaminates. Lack of impacts in Zone III monitoring wells supports the hypotheses that the deposit acts as a containment barrier due to its low vertical permeability and the occurrence of an upward gradient.

The top of Zone III is apparently an irregular fluvial erosion surface which acts as a trap for creosote compounds which are of a density greater than water. The shape of this surface, as inferred from boring logs and surface resistivity data, is shown in Figure 21-2 of the 1998 Permit Application. Free phase creosote was observed in the area of former operations (SI and the former process area). These areas correspond with a depression in the elevation of the top of Zone III. Additional analysis and interpretation of groundwater data, and evaluation of the monitoring network are provided in Section 5.3.8.

5.3.5 [40 CFR 264 Subpart F] Releases from Solid Waste Management Units

This section details sampling protocol, analytical requirements, sampling frequency and additional requirements under 40 CFR 264 Subpart F.

5.3.5.1 [40 CFR 264.91] Required Programs

No releases to groundwater have been observed at the LTU and this portion of the Facility is in post-closure. Groundwater monitoring will be conducted at a decreasing frequency of throughout the post-closure period. The next scheduled sampling event for LTU groundwater detection monitoring is 2024.

The SI/WPU unit also is in post-closure. Due to the presence of dissolved PAH in the aquifer beneath the SI, this area is subject to corrective action and is monitored under a compliance monitoring program. Groundwater monitoring shows that corrective action has achieved the groundwater protection standards (i.e., the ACL at the POE).

5.3.5.2 [40 CFR 264.92, 264.93, and 264.94] Groundwater Protection Standard, Hazardous Constituents, and Concentration Limits

The purpose of the groundwater protection standard is to ensure the hazardous constituents released from a Facility do not exceed concentrations that would pose a risk to human health or the environment. Hazard constituents are defined as those constituents identified in Appendix VIII of Part 261 or derived from the waste contained in the regulated unit (40 CFR 264.93(a)). The waste handled at the Facility consisted or creosote, therefore, the groundwater protection standards were developed for the principal hazardous constituents (PHCs). The PHC list consists of a set organic constituents and water quality parameters. The PHCs serve as indicator parameters. The PHCs are found in significant quantities in the permitted wastes and provide a reliable indication of hazardous constituents in the groundwater.

The groundwater protection standards proposed for the detection monitoring program at the LTU were derived from the method detection limit for the constituents analyzed; the standards proposed for the compliance monitoring program at the SI are derived from the approved ACL petition submitted in February 2004 (RETEC 2004). **Table 5.3.5-1** presents the PHCs and groundwater protection standards for the detection monitoring program at the LTU. **Table 5.3.5-2** presents the PHCs and groundwater protection standards for the compliance monitoring program at the SI.

5.3.5.3 [40 CFR 264.95 and 264.96] Point of Compliance and Compliance Period

The POC is defined as the "vertical surface" located at the hydraulically downgradient limit of the waste management areas. The POC for the former LTU includes wells MW-4, MW-46, MW-47, MW-50, MW-51A, MW- 54, and MW-63. The POC for the SI includes wells MW-7A, MW-21, MW-40, MW-44, MW-45, MW-48, MW-49A, MW-70, MW-81, and PW-3. **Plate 1** shows the locations of the POC wells.

The compliance period is in effect when the owner/operator initiates a compliance monitoring program and continues throughout the life of the Facility. The post-closure care period for the Facility is proposed to be shortened 15 years due to the 23-year history of groundwater monitoring available for the Facility. This request has not been approved by MDEQ at this time. Post-closure care for the LTU started when closure was completed and approved on September 8, 2009; therefore, the proposed post-closure period for the LTU would run through November 7, 2024. SI/WPU groundwater monitoring will continue until the PRS is closed and the groundwater protection standards have been met at the point of compliance through the post-closure period.

5.3.6 [40 CFR 270.14(c)(5), 264.97, 264.98, and 264.99] Groundwater Monitoring Requirements

This section describes the detection and compliance monitoring programs. The LTU is monitored under a detection monitoring program; the SI is monitored under a compliance monitoring program.

5.3.6.1 [40 CFR 264.97] Detection Monitoring Program

Monitoring Well Network

Groundwater monitoring is conducted at the LTU as required 40 CFR 264.98. The system consists of seven groundwater monitoring wells (MW-4, MW-6, MW-47, MW-50, MW-51A, MW-53, MW-54, and MW-63) installed in the locations presented in **Plate 1**.

Well MW-53 is the sole background well. Its location also is presented in **Plate 1**.

Well Construction

The Facility monitoring wells have been properly constructed in both the uppermost aquifer (Zone II) and the lower Zone III aquifer. The wells are properly located to detect any significant concentrations of hazardous or non-hazardous waste or constituents that may migrate from the unit to the uppermost aquifer. Each well is cased in a manner that maintains the integrity of the well borehole. Each is properly screened, packed, and sealed to prevent impact of the groundwater and to enable the collection of representative groundwater samples at the appropriate levels in the uppermost aquifer flow zone. **Table 5.3.6-1** presents the well construction information for the wells, borings and piezometers located at the Facility. Figure 21-1 (Plate) in the 1998 Application for Part B Permit Renewal (RETEC 1998) presents the locations of each well and boring drilled at Paradise as well as the location of test pits.

Well Inspection and Maintenance

Inspections are conducted during each monitoring event as discussed in Section 5.2.5.

Sample Collection

Groundwater sampling consists of three steps: 1) water level measurements, 2) purging, and 3) sample collection.

Static water level measurements will be collected from wells listed in Section 5.3.6.1 on an annual basis using methods and procedures described in the SAP (AECOM 2016). Data collected will be used to determine groundwater flow-rate and direction in the vicinity of the CAMU. The data will be submitted in the Annual CAMU and Monitoring Report.

Purging and groundwater sample collection will be conducted following the procedures outlined in the Facility SOPs provided in the revised SAP (AECOM 2016) and is not repeated.

Sample Analyses

Detection monitoring indicator parameters are a function of the type of waste applied to the LTU cells. Indicator parameters are based on knowledge of waste composition, area soil and water chemical constituents, and hazardous waste constituent mobility and persistence in the LTU soil. Additionally, the selection of an indicator parameter depends on a reliable and accurate analytical procedure unaffected by other interfering substances. Detection monitoring groundwater samples will be analyzed for the PHCs presented in **Table 5.3.5-1**.

Monitoring Frequency

Groundwater samples will be collected at years 1, 3, 7, 15, and 30 years after closure. September 2009 was year 0. All samples are analyzed according to **Table 5.3.5-1**.

Data Evaluation Procedures

The purpose of groundwater analysis and data evaluation is to detect any release of hazardous or non-hazardous waste constituents to groundwater. The analytical practical quantitation limit (PQL) will be used to determine any significant increases in concentrations of constituents in groundwater. Individual organic compound concentrations above the PQL will be considered significant, and resampled within 30 days of receiving the laboratory analytical report.

5.3.6.2 [40 CFR 264.98] Compliance Monitoring Program

Monitoring Well Network

Groundwater monitoring is conducted at the Paradise SI as required in 40 CFR 264.99. The system will consist of six POC groundwater monitoring wells (MW-21, MW-40, MW-49A, MW-70, MW-81, and PW-3) and eight POE wells (MW-6, MW-8, MW-28, MW41, MW-53, MW-91, MW-93, and MW-96). The wells are installed in the locations presented in **Plate 1**. Section 5.3.8 presents the justification for the monitoring program updates.

Well MW-53 is the sole background well. Its location also is presented in **Plate 1**.

Well Construction

The Facility monitoring wells have been properly constructed in both uppermost aquifer (Zone II) and the lower Zone III aquifer. Details on construction are provided in Section 5.3.6.1.

Well Inspection and Maintenance

Inspections are conducted during each monitoring event as discussed in Section 5.2.5.

Sample Collection

Groundwater sampling consists of three steps: 1) water level measurements, 2) purging, and 3) sample collection.

Static water level measurements will be collected from wells listed in Section 5.3.6.1 on an annual basis using methods and procedures described the revised SAP (AECOM 2016). Data collected will be used to determine groundwater flow-rate and direction in the vicinity of the CAMU. The data will be submitted in the Annual CAMU and Monitoring Report.

Purging and groundwater sample collection will be conducted following the procedures outlined in the Facility SOPs provided in the revised SAP (AECOM 2016) and is not repeated.

Sample Analyses

Compliance monitoring indicator parameters are a function of the known waste materials that have impacted the SI. Indicator parameters are based on knowledge of waste composition, area soil and water chemical constituents, and hazardous waste constituent mobility. Additionally, the selection of an indicator parameter depends on a reliable and accurate analytical procedure unaffected by other interfering substances. Compliance monitoring groundwater samples will be analyzed for the PHCs presented in **Table 5.3.5-2**.

Monitoring Frequency

Groundwater samples will be collected biennially in fall from all the POC monitoring wells ; semi-annually in spring and fall from POE monitoring wells MW-93, MW-41, MW-96, and MW-81 (located west of the SI/WPU areas); and annually in spring from POE monitoring wells MW-28, MW-91, MW-6, and MW-53 (located south of the SI/WPU areas), near the Clark Fork river. As observed from the seasonal groundwater flow pattern at theFacility, the groundwater from the Facility is likely to flow towards the Clark Fork river during the spring months. Samples are analyzed according to **Table 5.3.5-2**.

Data Evaluation Procedures

The purpose of groundwater analysis and data evaluation is to detect any release of hazardous or non-hazardous waste constituents to groundwater. In the event that POC data exceeds the historical levels, a trend analysis for individual wells will be used to identify the well and area of the SI that is non-compliant. If PAH compounds are detected in a POE well during a sampling event above the ACL levels, the well(s) will be resampled within 30 days of receipt of analytical data to confirm the results.

Monitoring Well Abandonment

Four POC monitoring wells (MW-7A, MW-44, MW-45 and MW-48), one POE well (MW-72), and monitoring well MW-27 are no longer required to monitor groundwater impacts from SI/WPU. The revised compliance monitoring network adequately monitors the current PAHs groundwater plume. Accordingly, these six monitoring wells will be abandoned.

5.3.6.3 Recordkeeping and Reporting

All collected groundwater monitoring data will be maintained in the Facility operating record. Monitoring data will be organized in a format that allows for easy evaluation. Data will include analytical methods, a list of analyzed compounds, reportable values for each compound found in a well sample, detection limits for each compound, and a determination whether any reportable values have exceeded critical values. Groundwater elevation levels for each monitoring well also will be included.

A letter with summary tables and analytical data, and supporting QA/QC, will be supplied to the MDEQ within 30 days of receiving analytical data from the laboratory. Reports will be submitted in letter format and will include the required monitoring data summarized in tables.

5.3.6.4 Assessment Strategy

This section presents the strategy to be used should an observed detection in a well indicate a potential release to the groundwater.

In the event that POC data exceeds the historical levels, a trend analysis for individual wells will be used to identify the well and area of the SI that is non-compliant. If PAH compounds are detected in a POE well during a sampling event above the ACL levels, the well(s) will be resampled within 30 days of receipt of analytical data to confirm the results. For the LTU wells, any individual organic compound concentration above the PQL will be considered significant, and resampled within 30 days of receiving the laboratory analytical report.

5.3.7 [40 CFR 270.42(e)] SI Recovery Area

In spring 2018, high river stages on the Clark Fork River adjacent to the Facility caused groundwater levels to rise resulting in flooding to the SI area. Additionally, DNAPL accumulation in the recovery wells had been declining since 2009; subsequently, a decline curve analysis was conducted. This decline curve analysis indicates that the PRS is reaching asymptotic recovery conditions. A baildown test was initiated in 2015 on 12 recovery wells to gather well-specific data and to estimate the recoverability of DNAPL. The conclusions from the baildown test indicated that recovery rates vary by well and more efficient DNAPL recovery could be achieved by recovering from individual wells; the recovery wells exhibit a slow rate of DNAPL accumulation in the sumps (between 0.001 and 0.21 gallons per day); the sumps allow for accumulation of DNAPL during constant discharge; allowing DNAPL to accumulate in the sump over time before evacuating provides more efficient recovery of DNAPL and minimizes the volume of groundwater recovered. Therefore, recovery from individual wells is as effective, if not more effective, in recovering DNAPL than the PRS. Details justifying individual well recovery are presented in the Temporary Authorization Request (AECOM, February 1, 2019).

Based on a Temporary Authorization approved March 8, 2019, (AECOM 2019) BNSF modified DNAPL recovery from the PRS (1997 – 2018) to individual well recovery systems. The SI recovery wells were constructed with 3- to 5- foot long sumps attached to the base of the well screen that were used to stage the product recovery pump and provide a reservoir for DNAPL to accumulate for removal via pumping.

<u>Decline Curve Analysis</u>

During the first 10 years of operations (1999-2008), the ratio of groundwater to DNAPL recovery from the PRS was approximately 19:1, and on average, approximately 520 gallons of DNAPL were recovered annually. Starting in 2015, with MDEQ approval and based on the lack of DNAPL accumulation in recovery wells, operations were adjusted for the wells with DNAPL thicknesses below the regulatory criterion (less than 6 inches of product for a period of 1 year or more). These wells were either placed on quarterly monitoring schedules or abandoned. Currently, the PRS has 10 active recovery wells; of the original 20 wells, 8 have been abandoned, and 2 are scheduled for abandonment (see **Figure 5.3.7-1**). The reduction in the number of recovery wells is due to the decrease of recoverable DNAPL in the subsurface. During the last 5 years of operations (2014-

2018), the ratio of groundwater to DNAPL recovery increased to approximately 24:1, and the volume recovered annually decreased to, on average, approximately 190 gallons of DNAPL. Note that the DNAPL recovery rate during this period was affected by baildown testing (see discussion below), but still showed a significant decrease when compared to the 10-year period of 1999-2008. The increase in the ratio of groundwater to DNAPL and the decrease in the recovery rate can be attributed to the decrease of recoverable DNAPL in the subsurface.

Due to the decrease in recovery rate of DNAPL and the increase in the groundwater fraction being recovered, a decline curve analysis was developed to further evaluate the change in the rate of DNAPL recovery over time. A decline curve analysis uses a methodology developed for petroleum reservoir engineering, where DNAPL extraction data can be utilized to extrapolate the maximum expected recovery of a well or network of wells. An ideal decline curve analysis would be expected to yield the highest rate at the start, and as the mass is removed, the rate declines such that an ultimate mass or volume can be forecasted. As the recovery approaches asymptotic conditions, the rate of recovery will decline as the volume of recoverable DNAPL is reduced. The decline curve analysis (**Figures 5.3.7-2 and 5.3.7-3**) shows the recovery efforts in the SI area fit this model as recovery rates were stable in the first 13 years of operations and then started to decline as the volume of DNAPL decreased and the ratio of water to DNAPL increased. The decline curve analysis indicates that the PRS is reaching asymptotic recovery conditions.

<u>Baildown Testing</u>

Due to the reduction in recovery rates in the PRS and decline curve analysis indicating the system is reaching asymptotic conditions, a baildown testing program was started in 2015 on 12 recovery wells. The objective of the baildown testing was to gather well-specific data and to estimate the recoverability of DNAPL. Based on the configuration of the PRS, collection of data from individual wells is not possible as the recovery wells are manifolded together, and fluid volumes are measured cumulatively downstream of the recovery wells.

Prior to starting baildown testing, the PRS was shut down on October 8, 2015, to allow DNAPL in the wells to equilibrate. At the start of the tests, the wells were evacuated of DNAPL followed by measurements of DNAPL thickness over time. Baildown testing was started at the 12 recovery wells between November 6, 2015 and December 17, 2015. Due to the presence of the 3- to 5-foot-long sumps, a number of wells had not fully recovered by late 2018. After almost 3 years of recovery, DNAPL recovered above the sumps in only four wells, while DNAPL did not in eight wells; three wells (CA-7, RW-16, and RW-17) were scheduled for abandonment because they met the closure criterion (less than 6 inches over 1 year). **Figure 5.3.7-4** illustrates the baildown test results for the wells that recovered above the sump (PW-4, RW-5) and are still recovering in the sump (RW-2 and RW-1). **Table 5.3.7-1** presents the baildown test results for each well in the study.

Conclusions from the baildown tests are as follows:

- Recovery rates vary by well, indicating more efficient DNAPL recovery could be achieved by recovering from individual wells;
- The recovery wells exhibit a slow rate of constant discharge (constant rate of DNAPL accumulation in the sump) between 0.001 and 0.21 gallons per day;
- The sumps allow for accumulation of DNAPL during constant discharge; and

Because of the slow recovery rate, allowing for DNAPL to accumulate in the sump over time before evacuating provides for more efficient recovery of DNAPL, and minimizes the volume of groundwater recovered that requires treatment.

<u>Alternative DNAPL Recovery Method Pilot Study</u>

The objective of the alternative DNAPL recovery pilot study was to optimize the method and frequency of DNAPL recovery, using the decline curve analysis and baildown test results, with the ultimate goal of improving the efficiency of DNAPL recovery based on current site conditions. The pilot study was initially started using recovery wells PW-4, RW-5, and RW-15, because they were the only wells being evaluated under the baildown testing to have DNAPL recovered above their sumps. In late December 2018, DNAPL in RW-4 recovered above the sump and was added to the pilot study. The alternative method consisted of DNAPL removal from individual wells using an air-lift pump to remove only the DNAPL accumulated in the well. Data collected during the pilot study included weekly measurements of DNAPL thickness in the wells and volume (gallons) of DNAPL recovered. The other recovery wells (i.e., wells having low accumulation and not part of the pilot study) continued to undergo baildown testing.

Based on data collected during the pilot study, the alternative DNAPL recovery system recovers DNAPL as effectively as the existing PRS without also recovering groundwater. Because the frequency of recovery can be adjusted based on DNAPL accumulation rates specific to each well, less water is generated which reduces the associated handling, management, treatment, and disposal. Because data is collected on a well-by-well basis, the data collected also will support further operational refinement which can result in less infrastructure needs and associated O&M. Finally, the alternative method is suitable based on current Facility conditions (10 recovery wells instead of the original PRS design of 20 wells), maturity of the Facility (decline curve analysis; **Figures 5.3.7-2 and 5.3.7-3**), and smaller DNAPL footprint (**Figure 5.3.7-1**). **Table 5.3.7-2** and **Figure 5.3.7-6** provide a summary and graphical representation, respectively, of pilot study data collected. In addition, with only 4 operating recovery wells, 46 gallons of DNAPL were recovered during the 27-week pilot study. On an annual basis, this equates to more than 90 gallons of DNAPL, with less than 1% water which is as effective as the PRS taking into account the number of recovery wells and considering recoverable DNAPL is decreasing over time (**Figure 5.3.7-3)**.

The alternative DNAPL recovery system pilot study demonstrated the following:

- Air-lift pumps can effectively remove DNAPL;
- Periodic removal can maintain the DNAPL level within the sump, which under constant discharge conditions allows for maximum recovery; and
- Utilizing the sumps is an effective method for efficient DNAPL recovery.

In addition, the alternative DNAPL recovery system is less vulnerable to weather events, including future flooding, because the manifolded recovery lines and the water treatment system infrastructure of the PRS are not necessary. By contrast, the majority of the air-lift pumps and auxiliary equipment will be mobile and easily transferred to another secure on-site location.

<u>Demonstration</u>

Based on the pilot study results, the alternative DNAPL recovery system is demonstrated to be as effective, if not more effective, in recovering DNAPL than the PRS. The alternative method also provides the following benefits:

- Ability to recover the maximum DNAPL that could be discharged;
- Collection of DNAPL accumulation and recovery data on a well-by-well basis, and optimization of DNAPL recovery;
- Less water recovered (and subsequent management and treatment);

- Suitable to current Facility conditions, given the likely continued trend in reduction of recoverable DNAPL in the subsurface; and
- Less susceptible to future flooding.

DNAPL Management

Sumps at the SI recovery wells will act as reservoirs for DNAPL. Based upon DNAPL accumulation and recovery, DNAPL will be pumped into a tank mounted on a trailer and towed by truck. Recovered DNAPL will be pumped into 55-gallon DOT steel drums stored in the CSA in the shop building. The drums will be dated with the date that DNAPL was removed from the sumps and the DNAPL will be transported to an appropriate off-site disposal facility. The drum at CA-33 will be dated as the date that the DNAPL is accumulated in the drum. The CSA will be managed as a non-permitted unit.

5.3.8 Groundwater Data Interpretation and Analysis of Monitoring Network

Further review of the plume definition described in Section 5.3.4 along with temporal evaluation of the concentration trends and an evaluation of the current monitoring network is presented in this section.

5.3.8.1 Groundwater Data Interpretation

In over 29 years of groundwater sampling, including POC and POE sampling from 2004 onwards, the following conclusions can be drawn:

1. Groundwater in the Zone II unit associated with the SI has been contaminated with creosote, creating a dissolved-phase PAH plume. However, there is no evidence of PAH impacts from LTU operations to groundwater.

2. Groundwater flow at the Facility is generally to the west or north-west away from or parallel to the Clark Fork River. Near the river, the groundwater flow was observed to be away from or parallel with the river during 14 of the 16 recent semi-annual groundwater events. Groundwater flow towards the river was observed only twice in spring of 2014 and 2017. PAH compounds were not detected in Clark Fork River samples implying no detectable impact to surface water from Facility conditions.

3. As seen in **Figure 5.3.4-2**, the extent of the PAH plume has reduced in extent over the 29-year period of record, especially in the recent years from September 2010 to September 2018. The highest reported PAH concentrations occur in wells near the SI area, specifically near troughs at the base of Zone II where creosote is known to have accumulated. Mostly low molecular weight PAH (e.g., two-ring non-carcinogenic compounds) were detected, consistent with creosote constituents' mobility and transport in groundwater.

4. Since the approval of the ACL in 2004, the PAH concentrations in POC wells have been statistically lower than the historical data set and thereby, in compliance per the Permit and supporting the ACL's determination that the attenuation of PAH compounds from the POC to the risk-based exposure levels at the POE is occurring.

5. Dissolved oxygen (DO) data indicate less than 2 mg/L concentrations in the POC wells. The DO concentrations generally decreased with increasing total PAH concentrations. POE wells, where the PAH concentrations have been mostly non-detect, had DO levels of greater than 2 mg/L. This evidence supports biological attenuation of PAH compounds within the POC wells (AECOM, 2019).

6. Further review of recent PAH concentrations from 2017 and 2018 in POC wells indicates that among the ten POC monitoring wells, only four monitoring wells (PW-3, MW-21, MW-40, MW-81) have PAH concentrations exceeding DEQ-7/ACL limits. Also, among the 16 PAH compounds analyzed at each POC well, only five compounds (acenaphthene, benzo(a)anthracene, fluorene,

naphthalene and phenanthrene) exceeded the DEQ-7/ACL limits. Note that DEQ-7 limits and ACLs are not applicable to POC well concentrations, but are considered here for comparison purposes only. **Table 5.3.8-1** summarizes the PAH concentrations from 2017 and 2018, at the four POC monitoring wells of interest.

7. Statistical trends analysis of these five parameters using Akritas-Theil-Sen (ATS) non-parametric regression method on data from 2010 through 2018, did not show a statistically significant increasing trend. **Figures 5.3.8-1 a-d** provide a graphical representation of the data and trend. Further discussion of the statistical analysis is presented in **Section 5.3.8.2**.

The primary conclusion of the groundwater data interpretation is that the dissolved PAHs plumes are not expanding or migrating. Furthermore, intrinsic biodegradation and other natural attenuation processes are likely reducing the source area PAH concentrations.

5.3.8.2 Statistical Trend Analysis

Statistical trends analysis of PAH compounds at the four POC monitoring wells of interest (PW-3, MW-21, MW-40 and MW-81) was performed using ATS non-parametric regression method (USEPA 2009, ITRC Guidance Document 2013). The following summarizes the statistical analysis assumption and procedure:

- Each data set consisted of nine data points (2010-2018),
- Where concentrations were not detected, the laboratory Method Detection Limit was used.
- Trend analysis was considered significant when less than 50% of the data was non-detect.
- The ATS procedure was implemented using the NADA package for R statistical software via the RStudio development environment.

Figures 5.3.8-1 a-d show the concentration trends at monitoring wells PW-3, MW-21, MW-40 and MW-81, respectively. **Table 5.3.8-2** summarizes the results of the ATS analysis for the 16 PAH compounds at these four monitoring wells.

The observations from the statistical analysis are:

1) Out of 64 data sets (4 wells, 16 parameters), 29 data sets (45%) show no trend because of mostly non-detect concentrations.
2) Eight data sets (12.5%) show a statistically decreasing trend.
3) Only two data sets (fluoranthene and pyrene in MW-21) show a statistically increasing concentration trend. However, as seen in **Figures 5.3.8-1**, the magnitude of the concentrations are significantly (approximately an order of magnitude) below the Circular DEQ-7 limit.
4) The remaining 40% of the data sets have detected concentrations but do not exhibit a statistically significant trend.
5) The PAHs that currently exceed the Circular DEQ-7 limit/ ACL show either no trend or a decreasing trend.

The conclusions of the statistical trends analysis are that the dissolved PAH plume at the Facility is not increasing and the majority of the concentrations are too low to exhibit a statistically significant trend.

5.3.8.3 Evaluation of Monitoring Network

Based on the seasonal groundwater flow direction at the Facility, which is predominantly westerly and away from the river; the location and extent of PAH plumes; and the concentration trends discussed above, the current compliance monitoring network and frequency can be further streamlined while maintaining adequate lateral extent and seasonal coverage to monitor the downgradient exposure points as well as the source areas.

It is also important to note that a Controlled Groundwater Use Area designation was approved on June 11, 2011 by the Montana Department of Natural Resources and Conservation that limits the use of groundwater in the area. This provides added protection against human health exposure to groundwater.

The following is an analysis of the current monitoring network and streamlining recommendations (**Table 5.3.8-3** provides a comparison of the two monitoring plans):

- POC network: As shown in **Figure 5.3.8-2,** four monitoring wells, MW-7A, MW-44, MW-45 and MW-48 are providing redundant data or have mostly non-detect concentrations of PAHs and can be eliminated from the monitoring network. The remaining six wells PW-3, MW-21, MW-40, MW-49A, MW-70, and MW-81 provide adequate coverage to monitor the source areas. Note that monitoring wells MW-46 and MW-47, which are part of the LTU monitoring network, will be available for future sampling, if necessary. Because the concentrations have remained mostly steady or have decreased over the last 9 years, annual sampling of the POC wells can be reduced to biennial sampling (once in two years). Sampling will continue in fall per the ACL
- POE network: The western portion of the POE network can provide adequate downgradient coverage with wells MW-93, MW-41, and MW-96. Monitoring well, MW-72 can be eliminated without losing the integrity of the downgradient monitoring network. These monitoring wells will continue to be sampled semi-annually in spring and fall per ACL. Because groundwater flows to the Clark Fork River only occasionally in spring. POE wells along the Clark Fork River, MW-8, MW-28, MW-91, MW-6, and MW-53, can be sampled annually in spring when the groundwater may flow towards the river, instead of semi-annually in spring and fall.
- Monitoring Well 27: This well is installed in the SI and has had low or non-detect PAH concentrations since 2010. POE wells MW-8, MW-28, and MW-96 provide adequate downgradient coverage of PAH impacts potentially migrating from MW-40. Therefore, MW-27 can be eliminated from the monitoring network.
- This streamlined monitoring plan will provide adequate extent and seasonal coverage to monitor the downgradient exposure points as well as monitoring the reduction of PAH concentrations at the source areas.

5.4 [40 CFR 270.14(d)] Information Requirements for SWMUs

Twenty-two SWMUs and one AOC were identified in the 2001 Permit (MDEQ 2001). **Table 5.4-1** presents information regarding each SWMU/AOC, including corrective action status. In addition, **Table 5.4-1** presents a listing of the permitted units, closed and operation, at the Facility. SWMU, AOC, and permitted unit locations are shown on **Plate 1**. SWMU closure information is provided in the 2002 Activities Closure Report (RETEC 2003).

5.5 [40 CFR 270.20 and 264 Subpart M] Specific Part B Information Requirements for Land Treatment Facilities

This section covers the specific Part B information for the Paradise closed LTU.

5.5.1 [40 CFR 270.20(a) and 264.272] Land Treatment Demonstration

Detailed descriptions of the land treatment demonstration were included as Sections 21 through 30 of the June 1987 Part B Permit application and Section 22 of the 1989 Part B Revision Application (ReTeC 1989b). A brief summary is provided in this section.

The suitability of a site to effectively utilize land treatment technology is strongly dependent on soil characteristics. Based on data collected during LTD and documented in the 1989 Permit Application (ReTeC 1989b), the Facility is well suited for land treatment technology for the following reasons:

1. Less than 2 percent slope, providing little hazard for erosion of the treatment soils.
2. Moderate permeability for adequate waste penetration and only slight amounts of run-off.
3. Arid soil regime, indicating small amounts of water moving through the soil column and therefore less potential for contaminant carry down.
4. Suitable soil texture, bulk density and porosity for land treatment.
5. Soil structure not restrictive or fractured, providing adequate permeability and good soil/waste contact.
6. Soil pH, electrical conductivity and nutrient suited for microbiological activity.
7. Soil cation exchange capacity and total organic carbon content conductive to adsorption of contaminants.

The LTD study proved that approved wastes could be degraded, transformed, and immobilized within the treatment zone of the LTU.

5.5.2 [40 CFR 270.20(b) and 264.271] Land Treatment Program

The Land Treatment Program details the procedures BNSF has implemented to manage the operation of the LTU. The LTU is in post-closure and is being monitored as described in the LTU post-closure plan (Section 5.2.13.3).

5.5.2.1 Wastes to be Treated

Wastes historically applied to the LTU are described in Section 5.2.2.

5.5.2.2 Waste Application

As the LTU is in post-closure, waste application is no longer applicable.

5.5.2.3 Design Measures to Maximize Treatment

As the LTU is in post-closure, design measures to maximize treatment are no longer applicable.

5.5.2.4 Unsaturated Zone Monitoring

Unsaturated zone monitoring is required at the former LTU as part of the post-closure plan. Unsaturated zone monitoring will be conducted through the post-closure care period on a frequency of 1, 3, 7, and 15 years post closure (if the proposed post-closure care period is approved by MDEQ). Soil beneath the LTU (i.e., below treatment zone samples [BTZ] or the unsaturated zone) will be sampled and analyzed to determine if any hazardous waste or hazardous waste constituents have migrated below the treatment zone. Soil-pore liquid samples will not be collected during post-closure care.

The SAP (AECOM 2016) contains the SOPs for sample collection, handling and analysis of samples. Groundwater monitoring is discussed in Section 5.3.

Sampling Equipment, Procedures and Frequency

Since the LTU is in the post-closure period, samples are collected at the beginning of post-closure, i.e., Year 0, and years 1, 3, 7, and 15 years after closure (if the proposed post-closure care period is approved by MDEQ). September 2009 was year 0.

Soil cores will be collected using a truck mounted hollow stem auger, and a 1.5-inch or 2-inch split-spoon samplers for the unsaturated zone, or BTZ. The following procedures will be used for obtaining soil core samples:

1. Drill auger down to the required depth using a hollow stem auger.
2. Detach the head assembly from the auger.
3. With the split-spoon attached to the head assembly and drive rod, pass the tube down through the hollow stem and into the soil to the required depth (60 to 72 inches). In most applications a 140-lb hammer is used to drive the split spoon, however in soft soils the split-spoon can often be forced into the ground by the hydraulic drawdown on the drill rig.
4. Pull the split-spoon out of the soil using the hoist assembly.
5. Remove and discard the first 2 or 3 inches, and scrape the outside of the sample that has been in contact with the spoon.
6. Extrude the remainder sample into the sample container. Label the container.
7. Pour bentonite and excavated soil into the soil cavity and fill the hole to the ground surface.
8. Decontaminate the auger flights with a steam cleaner between borings.
9. Decontaminate the split spoon sampler with detergent and deionized water.

Soil cores shall be taken from the BTZ at the 60- to 72-inch interval below ground surface (bgs). Two randomly selected locations per cell shall be chosen and cored to depth, with one BTZ sample collected per location.

All samples are to be collected in accordance with methods outlines in “Test Methods for Evaluating Solid Wastes, Physical Chemical Methods,” USEPA 1986 (SW-846), or as specified in the Permit. Once samples have been collected and placed in containers, they will be iced or preserved as specific analytical methods dictate. All samples will remain iced in coolers while shipped overnight to the analytical laboratory. All sampling equipment must be pre-cleaned, and decontaminated between sampling locations.

<u>BTZ Sample Locations</u>

BTZ soil core sample locations and collection methods will be selected as described below for the defined BTZ interval. All BTZ soil sample location shall be accurately recorded. Sample locations will be selected as follows:

1. The LTU is divided into uniform areas, not exceeding 4 acres. The uniform areas are defined as cells and are shown on **Figure 5.2.1-2**.
2. Sample locations within each active cell will be selected randomly. Two random numbers will be selected using a random number formula generated in Excel. These numbers will be used to locate two points along a coordinate grid for each cell.
3. The intersection of two lines drawn perpendicular to the two base line points will be located. This intersection point represents one randomly selected location for collection of a soil core. If the point of intersection is outside the LTU, or within 20 feet of another sample location, the sampling location will be disregarded and the above procedure will be repeated.
4. Steps 2 and 3 will be repeated as many times as necessary to obtain the correct number of locations for active monitoring.

<u>BTZ Analytical Procedures</u>

All BTZ soil core samples will be analyzed for PHCs (**Table 5.6.2-1**). Samples should be analyzed according to **Table 5.6.2-2**. A chain of custody from the field to the receiving analytical laboratory must be maintained and documented. Laboratory QA/QC will be consistent with the procedures outlined in Appendix I of the 1989 Part B Permit Application.

Interpreting Analytical Results

Interpretation of analytical results for the unsaturated zone monitoring program soil core data will be conducted as follows:

1. If a hazardous constituent is detected in a BTZ sample above an estimated quantitation limit of 330 micrograms per kilogram (µg/kg), it will be re-sampled for the detected constituents.
2. The re-sampled location will be within 10 feet of where the original BTZ sample was collected.
3. A detection of a hazardous constituent above the estimated quantitation limit in the re-sample collection event, would indicate a statistically significant increase.
4. If a hazardous constituent is detected above the estimated quantitation limit in the BTZ re-sample, the BTZ will be re-sampled within 10 feet of the same location to assist in determining the source of the constituents and the potential need for corrective action.

Expected Derived Constituents

The WAP (Section 5.2.2) presents the wastes historically applied to the former LTU. A complete list of parameters (i.e., PHCs) to be monitored for during LTU post-closure is presented in **Table 5.6.2-2**. The PHC list was selected based on historical waste data evaluation, and knowledge of waste characteristics.

5.5.3 [40 CFR 270.20(c) and 264.273] LTU Run-on/Run-off and Wind Erosion Control

The former LTU includes run-on/run-off controls to protect the cells. LTU controls are described in detail in Section 5.2.8. Each treatment cell is bermed to prevent both run-on and run-off from the peak discharge of a 25-year storm event. Due to the low annual precipitation for the area (Section 20.2.3 of the 1998 Permit Renewal Application), precipitation control/collection is not normally necessary within the bermed areas. Every cell has an established cover, which controls wind dispersal of particulate matter.

The LTU Facility is inspected on a quarterly basis and with 24-hours following a 25-year storm event, conditions permitting. The inspections are conducted to detect evidence of deterioration, malfunctions, or improper operation of run-on/run-off control systems (Section 5.2.5).

5.5.4 [40 CFR 270.20(d) and (e), and 264.276] Food Chain Crops

BNSF has not and does not plan to grow food-chain crops on the former LTU. In addition, the 2009 notation on deed prohibits food chain crops.

5.5.5 [40 CFR 270.20(f) and 264.280] Vegetative Cover

The LTU was approved closed September 8, 2009, by MDEQ. One requirement for closure approval was the satisfactory establishment of a vegetative cover. A description of the vegetative cover established is provided in the Land Treatment Unit Vegetative Cap Monitoring Plan (AECOM 2009a). Maintenance requirements also are provided in the LTU Vegetative Cap Monitoring Plan.

5.5.6 [40 CFR 270.20(g) and (h), 264.81 and 264.82] Ignitable, Reactive and Incompatible Wastes

The Paradise LTU treated creosote contaminated soil and sludge from the Paradise Facility and the BNSF Somers Tie Treating Plant in Somers, Montana. The Paradise remediation wastes have a flash point of over 140°F, therefore are not considered an ignitable waste. The wastes do not exhibit any of the characteristics of reactivity; therefore they are not considered a reactive waste. In addition, incompatible wastes were not applied.

5.5.7 Recordkeeping

As the LTU is in post-closure, operational records are no longer applicable.

5.6 [40 CFR 264 Subpart E] Manifest System, Recordkeeping, and Reporting

The purpose of this section is to specify the procedures for tracking and reporting movement of hazardous waste from the Facility to an off-site location.

5.6.1 [40 CFR 264.71] Manifest System

Hazardous waste is generated at the Facility. Waste types include:

1. Recovered creosote from the SI and Retort Areas.
2. Remediation waste/debris (e.g., PPE) from PRS or post-closure activities.
3. Decontamination materials.

Waste will be handled following appropriate state and federal regulations during off-site shipments.

5.6.2 [40 CFR 264.72] Manifest Discrepancies

If manifest discrepancies are discovered, BNSF will attempt to reconcile the discrepancy with the waste transporter or disposal Facility. If the discrepancy is not resolved within 15 days, BNSF will notify the USEPA and MDEQ regional administrators and follow procedures outline in 40 CFR 264.72.

5.6.3 [40 CFR 264.73] Operating Records

BNSF will maintain a written record of the movement of materials from areas within the Paradise Facility to off-site disposal facilities. These records will be maintained at the Facility office as well as at the BNSF Manager of Environmental Remediation office for a period of at least three years after closure of the CAMU, PRS (including the SI Recovery Area and Retort Area), and the CSA.

The following information will be recorded as it becomes available:

1. Waste analysis of hazardous wastes generated at the Facility. As discussed in Section 5.2.3.2, the process of waste generation (or waste stream) and the general characteristics of the waste and recovered creosote have not changed; therefore, frequent sampling and analysis by the receiving facilities have not been required.
2. For wastes disposed off-site, the date, method of treatment and/or disposal and location for each waste shipped off-site.
3. Records of contingency plan implementation.
4. Records of corrective actions taken.
5. Inspection record.
6. Closure and post-closure estimates.

5.6.4 [40 CFR 264.74] Availability, Retention, and Disposition of Records

BNSF must allow authorized personnel from the MDEQ and/or the USEPA to inspect the operating records for the Paradise Facility. If BNSF becomes involved in an enforcement action regarding the Facility, the operating records will be maintained until the action is resolved or as requested by the authorized agency. BNSF will submit the records on quantities and disposition of waste from the CAMU to the MDEQ upon closure of the CAMU.

5.6.5 Waste Generator Annual Report

BNSF will submit an annual report describing the operation of the Paradise Facility to the MDEQ by March 1 or date designated by MDEQ of each year. The report will cover waste generation and storage during the previous calendar year and will include:

1. The USEPA identification number, name, and address of the Facility.
2. The calendar year covered by the report.
3. A description and the quantity of each hazardous waste the Facility generated during the year.
4. The method of storage and disposal of the hazardous waste.
5. The most recent closure cost estimate.
6. The certification signed by the owner or operator of the Facility or his authorized representative.

5.6.6 [40 CFR 264.76] Unmanifested Waste Report

The Paradise Facility does not accept wastes for treatment, storage, or disposal from off-site sources. Therefore, 40 CFR 264.76 does not apply.

5.6.7 [40 CFR 264.76] Additional Reports

In addition to submitting the waste generator annual reports described above, BNSF will report to the MDEQ:

1. Releases, fires, and explosions as specified in 40 CFR 264.56(j).
2. Facility closures as specified in 40 CFR 264.115.
3. Annual CAMU and Monitoring Report.

6.0 References

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Tables

Table 5.2.5-1: Inspection Schedule for the Paradise Facility and Operating Equipment

Item	Purpose	Potential Problems	Frequency
Fencing/Gates	Limit Access	Damage	Monthly Physical Inspection
Safety Equipment	Accident Use	Availability	Monthly Physical Inspection
Berms and Dikes	Run-on and Run-off Control	Erosion	Monthly Physical Inspection
Monitor Wells	Groundwater Levels and Groundwater Quality Samples	Damage, caps locked, and surface seals	Semi-Annual Physical Inspection
Recovery Wells	Product Recovery Activities	Damage, leaks	Semi-Annual Physical Inspection
Foundation	Contain Product and Groundwater	Corrosion, cracks, leaks	Monthly Physical Inspection
Container Storage Area	Contain Product	Damage, leaks	Weekly Physical Inspection
Vegetative Cover	Cap Integrity	Damage, Rills	Annual Physical Inspection

Units/Areas to be inspected: WPU/SI, CAMU and CSA

Table 5.2.7-1: Emergency Coordinators and Emergency Response Team

Emergency Coordinators	
Andrew Gonzalez (Primary Coordinator)	406-826-4469 (office)
Nancy Gilliland (Alternate Coordinator)	406-857-3449 (office)
Paradise Facility Personnel	
Andrew Gonzales	406-826-4469 (site) 916-532-5801 (cell)
Nancy Gilliland	406-671-3176 (work cell)
Yueh Chuang (Alternate Coordinator)	406-256-4040 (office)
Margaret Zebley	970-493-8878 (office)
Jacob Conver	406-896-4590 (office)
Emergency Response Team	
Firefighting, explosion	
Plains/Paradise Rural Fire District	911 406-826-3900 (non-emergency)
Public evacuation, traffic control, security	
Sanders County Sheriff's Department	911 406-827-3584 (non-emergency)
Personal injury	
Clark Fork Valley Hospital	911 406-826-3670 (non-emergency)
Plains Community Ambulance	911
Emergency Equipment	
Paradise Site Office	406-826-4469 (office)
Emergency Notification	
MDEQ – Permitting and Compliance Division	406-444-5824
USEPA Region VIII, Montana Office	1-866-457-2690
Montana Disaster and Emergency Services	406-324-4777
USEPA Emergency Center	1-800-424-8802
National Response Center	1-800-424-8802
Poison Control Center	1-800-222-1222

Table 5.2.13-1 Remediation Waste and Debris Inventory

Name of Waste	Generating Process or Source	Quantity
Remediation Equipment	Creosote impacted piping, tanks and pumps associated with product recovery system	See Table 5.2.13-2

Table 5.2.13-2 Product Recovery Equipment Inventory[1]

Inventory	Description
Surface Impoundment	
Product Recovery Well Field	
Piping and Valves	2" Diameter Galvanized Steel Piping & Brass Valves
Pumps	2" Diameter Stainless Air Operated Pumps
Discharge Hoses	2" HDPE Product Hoses
Concrete Containment Slab	Product Stained Concrete (25' x 40' 6" Thick)
Retort Area	
Product Recovery System	
Reciprocating Pump	2" Diameter Steel Drop Pipe & Pump Jack with Electric Motor
Product Transfer Pump	Double diaphragm pump
Piping and Valves	2" Diameter Galvanized Steel Piping and Valves

[1] List includes only the equipment that contacts creosote or creosote constituents.

Table 5.2.14-1: PRS Closure Cost Estimates 2020-2029

Capital Costs:				
Description	**Qty**	**Unit**	**Unit Cost**	**Total**
PRS Closure Costs				
Site O&M[1]	10	YR	$35,620	$356,200
DNAPL Recovery [2]	10	YR	$48,110	$481,100
Product Recovery Building Decommissioning	1	LS	$211,300	$211,760
Annual Reporting[3]	10	YR	$4,120	$41,200
Subtotal				**$1,100,260**
10% Contingency				$1108,030
Total Capital Closure Costs				**$1,210,290**

1) Mowing, weed spraying, fence repair, building /equipment maintenance and utility costs.
2) Includes transportation and disposal of DNAPL
3) Costs split 50% with Post Closure Costs for 2020-2029

Permit Renewal included in post closure costs

Table 5.2.14-2: Post-Closure Cost estimates 2020-2039

Capital Costs:				
Description	**Qty**	**Unit**	**Unit Cost**	**Total**
Site Wide				
Site O&M (2030-2039)[1]	10	YR	$35,620	$356,200
Permit Renewal (2029, 2039)[2]	2	EA	$73,000	$146,000
Subtotal				*$502,200*
LTU Post-Closure (2024 and 2039)				
LTU Vegetation Survey	2	EA	$6,790	$13,580
LTU Reseeding	1	EA	$3,730	$3,730
LTU Soil Sampling	2	EA	$17,300	$34,600
LTU Groundwater Sampling[3]	2	EA	$6,500	$13,000
Subtotal				*$64,910*
SI Post-Closure	-	-	-	-
Annual SWMU Inspections[4]	10	YR	$720	$7,200
Groundwater Monitoring (2020-2029)	10	YR	$24,200	$242,000
Groundwater Reporting (2020-2029)[5]	10	YR	$10,000	$100,000
Annual Reporting (2020-2029)[6]	10	YR	$4,120	$41,200
Annual Reporting (2030-2039)	10	YR	$8,230	$82,300
Subtotal				$472,700
Subtotal				**$1,039,810**
10% Contingency				$103,990
Total Capital Post-Closure Costs				**$1,143,800**

1) Mowing, weed spraying, fence repair, building /equipment maintenance and utility costs (2030-2039).
2) Every 10 years. 2029 and 2039
3) Reporting included in Annual Report Costs
4) SMWU inspections for 10 years
5) Includes Spring and Fall Letter Report
6) Costs split 50% with Closure Costs for 2020-2029

Table 5.3.2-1: Gradient Calculations

Distances (ft) between wells:

7A - 18 =	984.9		
7A - 48 =	1058.9	7A - 42 =	767.02
18 - 48 =	647.2	18 - 42 =	922.55

Date	Sep-99	Dec-99	Mar-00	Jun-00	Sep-00	Dec-00	Apr-01	Jun-01	Sep-01	* Dec-01	Apr-02	Jun-02	Sep-02
GW elev													
7A	2460.69	2462.58	2461.2	2464.57	2459.63	2460.67	2459.69	2463.41	2459.43	2459.43	2461.49	2463.08	2460.85
18	2461.26	2463.39	2461.7	2465.32	2459.9	2461.43	2460.26	2464.18	2459.96	2460.08	2462.09	2462.7	2461.44
48	2461.82	2463.1	2460.95	2465.42	2460.18	2461.23	2460.22	2464.1	2459.94	2459.7	2462.2	2464.15	2461.48
Gradient													
(18-7A)/dist	0.00057874	0.00082242	0.00050767	0.0007615	0.00027414	0.00077165	0.00057874	0.00078181	0.00053813	0.00065997	0.0006092	-0.0003858	0.00059905
(7A-48)/dist	-0.0010671	-0.0004911	0.00023609	-0.0008027	-0.0005194	-0.0005289	-0.0005005	-0.0006516	-0.0004816	-0.000352	-0.0006705	-0.0010105	-0.000595
(48-18)/dist	0.00086527	-0.0004481	-0.0011588	0.00015451	0.00043263	-0.000309	-6.18E-05	-0.0001236	-3.09E-05	-0.0004119	0.00016996	0.00224042	6.1805E-05
Avg Gradient	0.00083705	0.00058719	0.0006342	0.00057291	0.00040873	0.00053651	0.00038035	0.00051901	0.00035022	0.00047463	0.00048322	0.00121224	0.0004186

Date	Jan-03	Mar-03	Jun-03	Sep-03	Dec-03	Mar-04	Jun-04	Sep-04	Jan-05	Mar-05	Jun-05	Sep-05
GW elev												
7A	2459.49	2461.08	2467.06	2459.73	2461.16	2461.01	2464.45	2461.2	2461.42	2460.07	2467.24	2459.54
18	2459.94	2461.98	2469.48	2459.68	2461.81	2461.87	2465.53	2461.58	2462.47	2460.6	2468.28	2460.23
48	2460.10	2461.56	2467.86	2460.25	2461.74	2461.58	2465.26	2461.93	2461.91	2460.67	2468.09	2459.96
Gradient												
(18-7A)/dist	0.0004569	0.0009138	0.0024571	-5.077E-05	0.00065997	0.00087319	0.00109656	0.00038583	0.0010661	0.00053813	0.00105594	0.00070058
(7A-48)/dist	-0.0005761	-0.0004533	-0.0007555	-0.0004911	-0.0005477	-0.0005383	-0.0007649	-0.0006894	-0.0004627	-0.0005666	-0.0008027	-0.0003966
(48-18)/dist	0.00017343	-0.0006489	-0.0025031	0.00088072	-7.588E-05	-0.0004481	-0.0004172	0.00054079	-0.000607	0.00010816	-0.0002936	-0.0004172
Avg Gradient	0.00040213	0.00067202	0.00190523	0.00047419	0.00042786	0.00061985	0.00075956	0.00053867	0.00071195	0.0004043	0.00071741	0.0005048

Table 5.3.2-1: Gradient Calculations

Date	Dec-05	Mar-06	Jul-06	Sep-06	Mar-07	Oct-07	Mar-08	Sep-08	Mar-09	Aug-09	Mar-10	Sep-10
GW elev												
7A	2461.55	2461.97	2462.32	2459.92	2461.29	2460.39	2460.72	2461.41	2461.09	2460.40	2460.68	2460.39
18	2460.64	2462.82	2462.72	2460.75	2461.65	2461.22	2461.48	2462.15	2461.68	2461.15	2461.30	2460.95
48	2462.00	2462.6	2463.56	2460.28	2461.99	2460.66	2461.36	2462.06	2461.70	2461.10	2461.01	2461.07
Gradient												
(18-7A)/dist	-0.000924	0.00086303	0.00040613	0.00084273	0.00036552	0.00084273	0.00077165	0.00075135	0.00059905	0.0007615	0.00062951	0.00056859
(7A-48)/dist	-0.000425	-0.000595	-0.001171	-0.00034	-0.0006611	-0.000255	-0.0006044	-0.0006138	-0.0005761	-0.0006611	-0.0003116	-0.0006422
(48-18)/dist	0.00147417	-0.0003399	0.0012979	-0.0007262	0.00052534	-0.0008653	-0.0001854	-0.0001391	3.0902E-05	-7.726E-05	-0.0004481	0.00018541
Avg Gradient	0.00094103	0.0005993	0.00095835	0.0006363	0.00051731	0.00065432	0.00052049	0.00050142	0.00040201	0.00049994	0.00046308	0.00046539

Date	Mar-11	Aug-11	Mar-12	Sep-12	Sep-13	Mar-14	Sep-14	Mar-15	Sep-15	Mar-16	Sep-16
GW elev											
7A	2462.27	2461.59	2461.14	2459.57	2459.42	2460.74	2460.14	2464.25	2459.45	2461.62	2459.45
18	2462.97	2462.11	2462.06	2460.08	2460.06	2460.93	2460.74	2465.05	2460.10	2462.34	2459.97
48	2463.04	2462.46	2461.75	2460.16	2459.95	2461.55	2460.75	2464.96	2459.86	2462.24	2459.93
Gradient											
(18-7A)/dist	0.00071073	0.00052797	0.0009341	0.00051782	0.00064981	0.00019291	0.0006092	0.00081227	0.00065997	0.00073104	0.00052797
(7A-48)/dist	-0.0007272	-0.0008216	-0.0005761	-0.0005572	-0.0005005	-0.0007649	-0.0005761	-0.0006705	-0.0003872	-0.0005855	-0.0004533
(48-18)/dist	7.5877E-05	0.00054079	-0.000479	0.00012361	-0.00017	0.00095797	1.5451E-05	-0.0001391	-0.0003708	-0.0001545	-6.18E-05
Avg Gradient	0.00050459	0.00063012	0.00066305	0.00039954	0.0004401	0.00063861	0.00040024	0.00054061	0.00047266	0.00049035	0.00034769

Date	Mar-17	Sep-17	Apr-18	Sep-18
GW elev				
7A	2467.10	2460.08	2462.91	2459.97
18	2466.64	2460.68	2463.24	2460.30
48	2467.69	2460.49	2463.62	2460.66
Gradient				
(18-7A)/dist	-0.0004671	0.0006092	0.00033506	0.00033506
(7A-48)/dist	-0.0005572	-0.0003872	-0.0006705	-0.0006516
(48-18)/dist	0.00113815	-0.0002936	0.00058714	0.00055624
Avg Gradient	0.00072079	0.00042999	0.0005309	0.00051431

Average Gradient from 1999-2018: 0.0005853

NOTES:

* = In 12/01, well 48 was dry and well 42 was used instead.

NM = Not Measured

Table 5.3.5-1: Principal Hazardous Constituents for Detection Monitoring

Parameter	Method	Groundwater Protection Standard (µg/L)
PAH		
acenaphthene	8310	10
acenaphthylene	8310	10
anthracene	8310	6.6
benzo(a)anthracene	8310	0.13
benzo(a)pyrene	8310	0.23
benzo(b)fluoranthene	8310	0.18
benzo(g,h,i)perylene	8310	0.76
benzo(k)fluoranthene	8310	0.17
chrysene	8310	1.50
dibenzo(a,h)anthracene	8310	0.30
fluoranthene	8310	2.1
fluorene	8310	2.1
indeno(1,2,3-cd)pyrene	8310	0.43
naphthalene	8310	10
phenanthrene	8310	6.4
pyrene	8310	2.7
Water Quality Indicator Parameters		
Dissolved Oxygen, Field	field	--
pH	field	5 to 11
specific conductance	field	NA
temperature	field	--
total suspended solids (TSS)	160.2	100

NOTES:

PAH = polyaromatic hydrocarbons
µg/L = micrograms per liter
NA = Not available

Table 5.3.5-2: Principal Hazardous Constituents for Compliance Monitoring

Parameter	Method POC Wells	Method POE Wells	ACL (µg/L)
PAH			
acenaphthene	8270	8310	70*
acenaphthylene	8270	8310	70*
anthracene	8270	8310	2100*
benzo(a)anthracene	8270	8310	0.5*
benzo(a)pyrene	8270	8310	0.05*
benzo(b)fluoranthene	8270	8310	0.5*
benzo(g,h,i)perylene	8270	8310	0.76**
benzo(k)fluoranthene	8270	8310	5.0*
chrysene	8270	8310	50*
dibenzo(a,h)anthracene	8270	8310	0.05*
fluoranthene	8270	8310	20*
fluorene	8270	8310	50*
indeno(1,2,3-cd)pyrene	8270	8310	0.5*
naphthalene	8270	8310	100*
phenanthrene	8270	8310	6.4**
pyrene	8270	8310	20*
Water Quality Indicator Parameters			
Dissolved Oxygen	field	field	--
pH	field	field	5 - 11
Specific conductance	field	field	--
temperature	field	field	--
Total suspended solids	160.2	160.2	100

NOTES:
ACL = Alternative Concentration Limit
PAH = polyaromatic hydrocarbons
µg/L = micrograms per liter
* Circular DEQ-7 (May 2017)
** When no DEQ-7 value was available, a site-specific Department approved ACL/Permit Concentration Limit was used.

Table 5.3.6-1: Well, Boring and Piezometer Parameters

Well/ Boring Number	Total Boring Depth (feet)		Total Well Depth (feet)	Ground Elevation (feet)		TOC Elevation (feet)		Depth To Top of Zone 3 (feet)	Screen Length (feet)	Sump Length (feet)	Casing Diameter (inches)	Top of Zone 3 Elevation (feet)		Aquifer Zone Monitored	Free Phase Creosote
MW-1	29.5		29.5	2482.20		2483.61		29.5	10	---	2	2452.70	b	II	NO
MW-2	30.0		30.0	2481.50		2482.65		30	10	---	2	2451.50	b	II	NO
MW-3	31.5		28.9	2484.50	d	2486.02	g	31.5	10	---	2	2453.00	b	II	NO
MW-4	21.5		19.5	2474.10		2475.96		21.5	10	---	2	2452.60	b	II	NO
MW-5	24.5		24.5	2479.70		2481.12		19	10	---	2	2460.70		II & III	NO
MW-6	24.5		24.5	2478.60	d	2479.50	d	24.5	10	---	2	2454.10	b	II	NO
MW-8	24.5		24.5	2477.70		2479.43		24.5	10	---	2	2453.20	b	II	NO
MW-9	30.0		29.5	2476.90		2479.07		a	18.5	---	4	2476.9		II	YES
MW-11	30.0		29.5	2476.90		2479.53		28	10	---	4	2448.9		II & III	c
MW-12	31.0		24.8	2477.20		2479.28	d	a	10	---	4	2477.2		II	NO
MW-13	51.0		47.0	2477.10		2479.26		37	15	---	4	2440.1		II & III	NO
MW-B16	31.5		boring	2475.0		boring		30	---	---	---	2445.0	b	---	YES
MW-17	31.5		27.6	2477.10		2478.90		27.5	10	---	2	2449.60		II & III	NO
MW-18	32.0		29.0	2476.40		2479.08		27	10	---	2	2449.40		II & III	NO
MW-20	26.5		22.5	2472.40		2473.43		22	10	---	2	2450.40		II & III	NO
MW-21	32.5		26.5	2477.10		2479.18		27.5	10	---	2	2449.60		II	NO
MW-B22	30.0		boring	2475.00		boring		28	---	---	---	2447.00	b	---	YES
MW-23	31.5		23.0	2477.40		2478.72		22.5	10	---	2	2454.90		II & III	NO
MW-B24	21.5		boring	2480.00		boring		a	---	---	---	f		---	YES
MW-B25	30.0		boring	2482.00		boring		28	---	---	---	2454.00	b	---	YES
MW-26A	27.5		27.0	2475.77		2478.75		27.5	10	---	2	2448.27		II	NO
MW-28	30.0		24.0	2480.00		2482.22		24	10	---	2	2456.00		II	NO
MW-29	31.5		25.5	2478.30		2479.65		28	10	---	2	2450.30		II	NO
MW-B30	26.0		boring	2478.50		boring		a	---	---	---	f		---	YES
MW-31	31.5		27.5	2481.50	d	2483.11	d	27.5	10	---	2	2454.00		II	NO
MW-32	35.0		28.0	2480.90		2483.15		28	10	---	2	2452.90		II	NO
MW-33	150.0		150.0	2478.20		2479.41		28	20	---	2	2450.20		III	NO

Table 5.3.6-1: Well, Boring and Piezometer Parameters

Well/ Boring Number	Total Boring Depth (feet)		Total Well Depth (feet)	Ground Elevation (feet)		TOC Elevation (feet)		Depth To Top of Zone 3 (feet)	Screen Length (feet)	Sump Length (feet)	Casing Diameter (inches)	Top of Zone 3 Elevation (feet)		Aquifer Zone Monitored	Free Phase Creosote
MW-34	102.5		102.5	2477.90		2479.36		28	10	---	---	2449.90		III	NO
MW-36	98.0		98.0	2475.30		2476.91		30	20	---	2	2445.30		III	c
MW-B37	49.0		boring	2477.00		boring		33.5	---	---	2	2443.50	b	---	NO
MW-B38	30.0		boring	2475.00		boring		26	---	---	2	2449.00	b	---	YES
MW-39	30.0		30.0	2477.80		2479.23		30	5	---	2	2447.80		II	NO
MW-40	31.0		29.5	2477.50		2479.20		31	5	---	2	2446.50		II	c
MW-41	32.0		31.0	2480.50		2481.71		32	12.8	---	2	2448.50		II	NO
MW-43	100.0		100.0	2476.10		2478.69		33	11	---	2	2443.10		III	NO
MW-46	34.0		28.7	2480.35		2482.31		32	15	---	2	2448.35		II	NO
MW-47	29.0		29.0	2481.90	e	2483.20	e	29	5	---	2	2452.90		II	NO
MW-49A	48.0		48.0	2483.97		2486.14	d	48	5	---	2	2435.97		II	NO
MW-50	29.0		29.0	2482.21		2485.65		29	15	---	2	2453.21		II	NO
MW-51A	29.0		29.0	2484.15		2486.39	d	29	5	---	2	2455.15		II	NO
MW-53	34.0		29.0	2483.99		2485.75		34	5	---	2	2449.99		II	NO
MW-54	30.0		26.5	2482.77		2484.70		30	15	---	2	2452.77		II	NO
MW-63	31.0		29.5	2483.32		2485.75	d	31	15	---	2	2452.32		II	NO
MW-B64	22.0		boring	---		boring		20	---	---	---	---		---	NO
MW-B65	26.0		boring	---		boring		24	---	---	---	---		---	NO
MW-B66	27.0		boring	---		boring		25	---	---	---	---		---	NO
MW-70	47.0		33.5	2478.00		2480.00		47	10	---	2	2424.00	b	II	NO
MW-71	28.0		26.5	2476.50		2478.60		a	10	---	2	f		II	NO
MW-B73	30.0		boring	2479.00		boring		29	---	---	---	2450.00		---	NO
MW-B74	28.5		boring	2476.90		boring		25	---	---	---	2451.90		---	NO
MW-B75	26.0		boring	2479.80		boring		26	---	---	---	2453.80		---	NO
MW-76	40.0		37.0	2481.30		2483.38		35	3	2	2	2446.30		II	NO
MW-77	40.0		39.0	2478.80		2480.30		37	3	2	2	2441.80		II	NO
MW-78	49.0		48.0	2482.30		2484.61	g	47	3	2	2	2435.30		II	YES

Table 5.3.6-1: Well, Boring and Piezometer Parameters

Well/ Boring Number	Total Boring Depth (feet)	Total Well Depth (feet)	Ground Elevation (feet)	TOC Elevation (feet)		Depth To Top of Zone 3 (feet)	Screen Length (feet)	Sump Length (feet)	Casing Diameter (inches)	Top of Zone 3 Elevation (feet)		Aquifer Zone Monitored	Free Phase Creosote
MW-79	43.0	43.0	2483.40	2485.63	g	41	3	2	2	2442.40		II	NO
MW-80	43.0	43.0	2482.60	2485.07	g	41	3	2	2	2441.60		II	NO
MW-82	48.0	43.6	2474.10	2476.13		47	10	---	2	2427.10		II	NO
MW-B83	25.5	boring	2472.80	boring		25	---	---	---	2447.80		---	NO
MW-84	24.0	21.5	2472.70	2475.16		22	10	---	2	2450.70		II	NO
MW-85	49.0	47.0	2482.70	2485.38		47	2.7	2	2	2435.70		II	NO
MW-86	54.0	38.0	2481.30	2484.30		49	9.5	2	2	2432.30		II	NO
MW-B88	84.0	boring	2476.70	boring		81	---	---	---	2395.70		---	NO
MW-91	38.0	38.0	2479.40	2482.13		38	10	---	2	2441.40		II	NO
MW-92	53.5	53.0	2481.20	2483.88		53	10	---	2	2428.20		II	NO
MW-93	33.0	31.0	2481.50	2483.32		31	10	---	2	2450.50		II	NO
MW-94	39.0	38.0	2484.30	2487.06		38	10	---	2	2446.30		II	NO
MW-95	39.0	38.0	2476.90	2479.69		38	10	---	2	2438.90		II	NO
MW-96	73.5	52.0	2477.80	2480.83		54	15	---	2	2423.80		II	NO
DW-1	255.0	boring	2476.60	boring		44	---	---	---	2432.6		---	NO
DW-2	237.0	boring	2473.40	boring		38	---	---	---	2435.4		---	NO
DW-3	240.0	boring	2478.60	boring		31	---	---	---	2447.6		---	NO
LTA-1	43.0	boring	2483.40	boring		35	---	---	---	2448.4		---	NO
LTA-2	35.0	boring	2481.70	boring		35	---	---	---	2446.7		---	NO
PW-1	32.0	30.0	2477.20	2478.20		32	16	---	8	2445.20		II	NO
PW-2	28.0	27.0	2476.70	2478.18		28	5	---	6	2448.70	b	II	YES
PW-3	21.0	21.0	2476.70	2478.73		a	10	---	4	f		II	NO
PW-4	37.0	33.0	2477.60	2480.56		33	10	---	4	2444.60		II	YES
PW-5	21.0	19.3	2470.70	2471.92		22	15	---	10	2448.70		II	YES
PW-6	52.0	46.0	2483.00	2485.29		48	10	---	6	2435.00		II	NO
PW-7	42.0	42.0	2483.10	2482.28		42	10	---	6	2441.10		II	NO
CA-2	20.0	18.0	2470.30	2472.39		20	13	---	6	2450.30		II	YES

Table 5.3.6-1: Well, Boring and Piezometer Parameters

Well/ Boring Number	Total Boring Depth (feet)	Total Well Depth (feet)	Ground Elevation (feet)	TOC Elevation (feet)	Depth To Top of Zone 3 (feet)	Screen Length (feet)	Sump Length (feet)	Casing Diameter (inches)	Top of Zone 3 Elevation (feet)	Aquifer Zone Monitored	Free Phase Creosote
CA-3	21.0	boring	2472.80	boring	21	---	---	---	2451.80	---	NO
CA-4	27.0	boring	2478.20	boring	27	---	---	---	2451.20	---	NO
CA-5	42.0	boring	2478.30	boring	30	---	---	---	2448.30	---	YES
CA-6	28.0	boring	2477.50	boring	26.5	---	---	---	2451.00	---	NO
CA-7	21.0	17.5	2468.80	2470.74	20	12.5	---	6	2448.80	II	YES
REDRILLED	25.0	24.5	2468.80	---	20	2	4	5.5	2448.80	II	YES
CA-10	40.0	boring	2475.50	boring	27	---	---	---	2448.50	---	YES
CA-12	35.0	boring	2477.40	boring	33	---	---	---	2444.40	---	YES
CA-13	33.0	boring	2477.10	boring	25	---	---	---	2452.10	---	NO
CA-14	31.0	boring	2478.00	boring	31	---	---	---	2447.00	---	YES
CA-16	54.0	boring	2478.40	boring	35	---	---	---	2443.40	---	YES
CA-18	29.0	boring	2476.60	boring	27.5	---	---	---	2449.10	---	NO
CA-19	36.0	boring	2477.70	boring	30	---	---	---	2447.70	---	NO
CA-20	30.0	boring	2476.80	boring	29	---	---	---	2447.80	---	NO
CA-21	28.0	25.2	2468.20	2470.07	21.5	5	4	6	2446.70	II	YES
CA-22	31.5	boring	2474.40	boring	25	---	---	---	2449.40	---	NO
CA-23	41.0	boring	2482.20	boring	40	---	---	---	2442.20	---	NO
CA-24	38.0	boring	2475.50	boring	33	---	---	---	2442.50	---	NO
CA-25	42.0	boring	2483.80	boring	32	---	---	---	2451.80	---	NO
CA-26	35.0	boring	2484.00	boring	32	---	---	---	2452.00	---	NO
CA-27	36.0	boring	2484.30	boring	35	---	---	---	2449.30	---	NO
CA-28	40.0	boring	2478.50	boring	37	---	---	---	2441.50	---	NO
CA-29	38.0	boring	2478.20	boring	34	---	---	---	2444.20	---	NO
CA-30	28.0	boring	2479.90	boring	28	---	---	---	2447.90	---	NO
CA-31	27.0	boring	2461.90	boring	26	---	---	---	2449.90	---	NO
CA-32	27.0	boring	2475.80	boring	27	---	---	---	2434.80	---	NO
CA-33	62.0	---	---	---	48	---	---	---	---	---	YES

Table 5.3.6-1: Well, Boring and Piezometer Parameters

Well/ Boring Number	Total Boring Depth (feet)		Total Well Depth (feet)	Ground Elevation (feet)	TOC Elevation (feet)	Depth To Top of Zone 3 (feet)	Screen Length (feet)	Sump Length (feet)	Casing Diameter (inches)	Top of Zone 3 Elevation (feet)	Aquifer Zone Monitored	Free Phase Creosote
CA-34	28.0		boring	2475.90	boring	26	---	---	---	2449.90	---	YES
CA-35	22.0		boring	2461.80	boring	18	---	---	---	2443.80	---	YES
CA-36	20.0		boring	2469.60	boring	17	---	---	---	2452.60	---	YES
CA-37	36.0		boring	2478.10	boring	33	---	---	---	2445.10	---	NO
CA-38	28.0		boring	2478.10	boring	27	---	---	---	2451.10	---	NO
CA-39	23.0		boring	2468.40	boring	19	---	---	---	2449.40	---	YES
CA-40	23.0		boring	2470.10	boring	21	---	---	---	2449.10	---	YES
PIEZOMETERs												
1	20.0	b	20.0	2474.00	2476.69	20	10	---	2	2454.00	II	YES
2	20.0	b	20.0	2476.00	2479.61	20	10	---	2	2456.00	II	YES
3	21.5	b	21.5	2474.00	2477.90	21.5	10	---	2	2452.50	II	YES
4	21.0	b	21.0	2473.50	2476.89	21	10	---	2	2452.50	II	YES
5	14.0	b	14.0	2468.00	2470.79	14	10	---	2	2454.00	II	YES
6	30.0		29.0	2475.90	---	28	15	---	2	2447.90	II	YES
7	19.0		19.0	2469.30	---	18	10	---	2	2451.30	II	YES
8	30.0		28.0	2476.30	---	28.5	10	---	2	2447.80	II	YES
9	40.5		40.0	2477.80	2478.60	40	10	---	2	2437.80	II	NO
10	38.0		38.0	2479.40	2480.70	38	10	---	2	2441.40	II	NO
11	48.0		48.0	2480.30	2481.81	48	10	---	2	2432.30	II	NO
12	40.0		40.0	2480.20	2482.00	40	10	---	2	2440.20	II	NO
13	53.0		50.0	2481.10	2482.84	53	10	---	2	2428.10	II	NO
14	34.0		33.0	2479.90	2481.00	34	10	---	2	2445.90	II	NO
15	31.0		30.0	2480.40	2482.01	31	10	---	2	2449.40	II	NO
16	26.0		25.0	2478.50	2480.29	26	10	---	2	2452.50	II	NO

Table 5.3.6-1: Well, Boring and Piezometer Parameters

Well/ Boring Number	Total Boring Depth (feet)	Total Well Depth (feet)	Ground Elevation (feet)	TOC Elevation (feet)	Depth To Top of Zone 3 (feet)	Screen Length (feet)	Sump Length (feet)	Casing Diameter (inches)	Top of Zone 3 Elevation (feet)	Aquifer Zone Monitored	Free Phase Creosote
RFI BORINGS											
B67-1	23.0	boring	2471.90	boring	21.5	---	---	---	2450.40	---	NO
B10-1	44.0	boring	2480.20	boring	42	---	---	---	2438.20	---	NO
B10-5	36.0	boring	2476.50	boring	31	---	---	---	2445.50	---	NO
B10-7	36.0	boring	2475.80	boring	31	---	---	---	2444.80	---	NO
B10-9	35.0	boring	2476.70	boring	31	---	---	---	2445.70	---	NO
B13-1	48.0	boring	2482.80	boring	44	---	---	---	2438.80	---	NO
B13-2	58.0	boring	2482.90	boring	52	---	---	---	2430.90	---	YES
B13-3	49.0	boring	2481.80	boring	45	---	---	---	2436.80	---	YES
B13-4	118.0	boring	2482.70	boring	58	---	---	---	2424.70	---	YES
B15-2	49.0	boring	2482.50	boring	41	---	---	---	2441.50	---	NO
B15-5	49.5	boring	2482.30	boring	42	---	---	---	2440.30	---	NO
B15-6	42.0	boring	2482.10	boring	39	---	---	---	2443.10	---	NO
B15-8	42.5	boring	2481.70	boring	38	---	---	---	2443.70	---	NO
B18-1	50.0	boring	2483.00	boring	48	---	---	---	2435.00	---	NO
B18-2	50.0	boring	2483.10	boring	47	---	---	---	2436.10	---	NO
B18-3	49.0	boring	2482.80	boring	47	---	---	---	2435.80	---	YES
B18-4	50.0	boring	2482.60	boring	49	---	---	---	2433.60	---	YES
RECOVERY WELLS											
RW-1	28.0	25.7	2468.00	2470.34	28	2	5.67	---	2440.00	---	YES
RW-2	28.0	26.0	2467.80	2469.99	28	2	5.83	4	2439.80	---	YES
RW-4	40.0	30.7	2477.30	2479.50	40	2	4.33	5	2437.30	---	YES
RW-5	36.0	31.6	2469.10	2470.41	36	2	5.58	4	2433.10	---	YES
RW-6	28.0	boring	2468.80	boring	24	---	---	---	2444.80	---	YES
RW-7	25.0	boring	2469.60	boring	20	---	---	---	2449.60	---	YES
RW-8	32.0	boring	2477.70	boring	32	---	---	---	2445.70	---	NO
RW-9	23.0	boring	2468.50	boring	23	---	---	---	2445.50	---	NO

Table 5.3.6-1: Well, Boring and Piezometer Parameters

Well/ Boring Number	Total Boring Depth (feet)		Total Well Depth (feet)	Ground Elevation (feet)		TOC Elevation (feet)		Depth To Top of Zone 3 (feet)	Screen Length (feet)	Sump Length (feet)	Casing Diameter (inches)	Top of Zone 3 Elevation (feet)		Aquifer Zone Monitored	Free Phase Creosote
RW-10	42.0		boring	2477.40		boring		42	---	---	---	2435.40		---	NO
RW-11	37.8		37.7	2478.00		2478.42		37.8	2	5.7	4	2440.20		---	YES
RW-13	27.0		24.0	2470.20		2473.39		27	3	3	5	2443.20		---	YES
RW-14	28.0		23.0	2469.20		2471.35		28	3	3	5	2441.20		---	YES
RW-15	38.0		31.0	2478.00		2480.58		38	3	3	5	2440.00		---	YES
RW-17	25.0		23.0	2468.80		2470.79		25	3	3	5	2443.80		---	YES
RW-18	23.0		23.0	2470.40		2472.38		23	3	3	5	2447.40		---	YES
RW-19	28.0		boring	2470.00		boring		27	---	---	---	2450.00		---	---

a = Depth to top Zone III uncertain.
b = Elevation of Zone III estimated.
c = Creosote contamination uncertain.
d = Resurveyed May 1990.
e = Resurveyed November 1990.
f = Top of Zone III elevation unknown.
g = Resurveyed August 1993.
h = Resurveyed October 2002.
TOC = Top of casing (outer steel protective casing).

Note: Well elevation measured to top of outer steel protective casing.

Table 5.3.7-1: Baildown Results

Well	Date Measured	Recovered DNAPL Thickness (feet)	Constant DNAPL Discharge (gallons/day)	Sump Length (feet)	Time to Fill Sump (Days)
PW-4	1/20/2016	8.4	0.21	4	8
RW-5	8/29/2016	7.94	0.04	5.58	116
RW-15	4/25/2016	2.33	0.06	3	56
RW-4	8/6/2018	5.3	0.07	4.27	60
CA-7	8/6/2018	0.5	0.001	4	>1,000
CA-21	8/6/2018	1	0.07	4	>1,000
RW-1	8/6/2018	5.4	0.01	5.67	600
RW-2	8/6/2018	3.67	0.01	5.83	600
RW-13	8/6/2018	2.2	0.01	3	500
RW-14	8/6/2018	2	0.02	3	>1,000
RW-17	8/6/2018	0.33	0.001	3	>1,000
RW-16	Did not recover to 6-inches. Well Abandoned in 2017				

NOTES:

After 34 months DNAPL has not recovered above sump in most wells

> = Greater than

Table 5.3.7-2: Alternative DNAPL Recovery Method Study Data

Date	DNAPL Thickness (ft)				DNAPL Removed (gal)			
	PW-4	RW-4	RW-5	RW-15	PW-4	RW-4	RW-5	RW-15
5/29/2018	4.92	4.08	NM	0.83	-	-	-	-
7/30/2018	1.75	5.00	7.00	1.50	-	-	-	-
8/6/2018	0.17	5.33	4.75	0.17	1.25	-	4.50	1.50
8/13/2018	0.25	5.67	1.58	0.17	-	-	4.30	-
8/20/2018	0.33	5.08	0.42	0.25	-	-	1.20	-
9/3/2018	0.70	5.20	0.70	0.30	-	-	1.30	-
9/9/2018	0.50	5.10	0.70	0.30	-	-	0.40	-
9/17/2018	0.50	5.10	0.11	0.40	-	-	0.72	-
9/24/2018	3.90	4.80	0.40	0.50	2.54	-	-	-
10/1/2018	1.17	4.17	1.50	0.42	0.75	-	1.00	-
10/8/2018	0.83	4.17	0.00	0.42	0.50	4.45	-	-
10/15/2018	1.67	1.33	0.17	0.42	1.20	1.40	-	-
10/22/2018	0.42	0.17	0.17	0.42	-	-	-	-
10/29/2018	2.33	0.33	0.42	1.00	1.50	-	-	1.25
11/5/2018	0.42	0.42	1.25	0.00	-	-	1.00	-
11/12/2018	0.42	0.42	0.33	0.08	-	-	-	-
11/19/2018	0.42	0.42	0.42	0.17	-	-	-	-
11/26/2018	4.92	0.67	1.67	0.17	2.75	-	1.20	-
12/3/2018	2.17	0.58	0.17	0.17	1.50	-	-	-
12/10/2018	2.50	0.33	3.75	0.25	1.60	-	3.20	-
12/19/2018	0.42	0.33	0.17	0.25	-	-	-	-
12/26/2018	4.08	0.42	0.33	0.42	2.50	-	-	-
12/31/2018	0.17	0.42	0.42	0.42	-	-	-	-
1/7/2019	0.42	0.42	0.42	0.42	-	-	-	-
1/14/2019	1.42	0.42	0.75	1.58	1.20	-	-	1.50
1/22/2019	0.33	0.42	0.58	0.17	-	-	-	-
1/28/2019	0.42	0.42	0.42	0.17	-	-	-	-

NOTES:

Thickness measurements were taken prior to DNAPL recovery
- = No recovery
ft = feet
gal = gallons
NM = Not measured

Sump Length (feet)
PW-4: 4 feet
RW-4: 4.27 feet
RW-5: 5.58 feet
RW-15: 3 feet

Table 5.3.8-1: 2017-2018 PAH Concentrations – PW-3, MW-21, MW-40, MW-81

Monitoring Wells PAH Compounds	PW-3 2017	PW-3 2018	MW-21 2017	MW-21 2018	MW-40 2017	MW-40 2018	MW-81 2017	MW-81 2018	ACL/DEQ-7
Acenaphthene	206	76.0	237	128	144	120	18.8	15.9 J	70
Acenaphthylene	2.62	1.44	1.62	0.659	1.63	1.7	0.531	0.391	70
Anthracene	6.13	1.11	6.11	3.34	3.61	2.85	0.493	1.12	2100
Benzo(a)anthracene	0.0533	0.0453 J	< 0.00410	< 0.00410	0.0228 J	0.0194 J	< 0.00410	< 0.00410	0.5
Benzo(a)pyrene	< 0.0116	< 0.0116	< 0.0116	< 0.0116	< 0.0116	< 0.0116	< 0.0116	< 0.0116	0.05
Benzo(b)fluoranthene	< 0.0500 U	0.0114 J	< 0.0500 U	0.00217 J	< 0.00212	< 0.00212	< 0.00212	< 0.00212	0.5
Benzo(g,h,i)perylene	< 0.0500 U	0.00586 J	< 0.00227	< 0.00227	< 0.00227	< 0.00227	< 0.00227	< 0.00227	0.76
Benzo(k)fluoranthene	< 0.0136	< 0.0136	< 0.0136	< 0.0136	< 0.0136	< 0.0136	< 0.0136	< 0.0136	5
Chrysene	0.0250 J	0.0235 J	< 0.0108	< 0.0108	< 0.0108	< 0.0108	< 0.0108	< 0.0108	50
Dibenzo(a,h)anthracene	< 0.00396	0.0376 J	< 0.00396	0.0127 J	< 0.00396	0.0110 J	< 0.00396	< 0.0500 U	0.05
Fluoranthene	5.88	4.03	3.29	1.8	4.74	4.82	0.0363 J	0.177	20
Fluorene	57.6	11.4	95.7	61.6	50.3	54.8	2.82 J	6.23	50
Indeno(1,2,3-cd)Pyrene	< 0.0148	0.102	< 0.0148	< 0.0148	< 0.0148	0.0149 J	< 0.0148	< 0.0148	0.5
Naphthalene	8.34	0.270 J	79.0	14.3 J	767	878 J	374 J	0.273	100
Phenanthrene	19.4	1.79	76.7	29.6	43.7	45.5	2.66	8.12	6.4
Pyrene	2.62	1.76	1.24	0.783	2.72	2.82	0.0221 J	0.0587	20

NOTES:

Units mg/L

= ACL/Circular DEQ-7 Limit Exceedance

Bold = Detected Value

Permit Limits for Water Quality Indicator Parameters are from MTHWP-14-01, Attachment III.3.

In accordance with Permit Condition III.D.5.i non-detect data is shown less than the method detection limit; with the exception of results qualified in the Data Validation report as less than the reporting limit or less than the detected value.

PAHs were analyzed via Method 8270C SIM.

< = less than

J = estimated concentration

Table 5.3.8-2: Summary of PAH Concentrations Trend Analysis (POC Wells PW-3, MW-21, MW-40, and MW-81)

PAH Compounds	PW-3	MW-21	MW-40	MW-81
Acenaphthene	No Trend, 9D	No Trend, 9D	No Trend, 9D	Decreasing, 9D
Acenaphthylene	Decreasing, 9D	No Trend, 9D	No Trend, 9D	Decreasing, 9D
Anthracene	No Trend, 9D	No Trend, 9D	No Trend, 9D	No Trend, 9D
Benz(a)anthracene	No Trend, 7D, 2ND	No Trend, 9ND	No Trend, 5D, 4ND	No Trend, 1D, 8ND
Benzo(a)pyrene	No Trend, 1D, 8ND	No Trend, 9ND	No Trend, 9ND	No Trend, 9ND
Benzo(b)fluoranthene	No Trend, 2D, 7ND	No Trend, 1D, 8ND	No Trend, 9ND	No Trend, 1D, 8ND
Benzo(g,h,i)perylene	No Trend, 2D, 7ND	No Trend, 9ND	No Trend, 9ND	No Trend, 9ND
Benzo(k)fluoranthene	No Trend, 9ND	No Trend, 9ND	No Trend, 9ND	No Trend, 9ND
Chrysene	Decreasing, 8D, 1ND	No Trend, 9ND	No Trend, 9ND	No Trend, 9ND
Dibenzo(a,h)anthracene	No Trend, 2D, 7ND	No Trend, 1D, 8ND	No Trend, 1D, 8ND	No Trend, 9ND
Fluoranthene	No Trend, 9D	Increasing, 9D	No Trend, 9D	Decreasing, 8D, 1ND
Fluorene	No Trend, 9D	No Trend, 9D	No Trend, 9D	Decreasing, 9D
Indeno(1,2,3-cd)Pyrene	No Trend, 3D, 6ND	No Trend, 9ND	No Trend, 1D, 8ND	No Trend, 9ND
Naphthalene	No Trend, 9D	No Trend, 9D	No Trend, 9D	No Trend, 7D, 2ND
Phenanthrene	No Trend, 9D	No Trend, 9D	No Trend, 9D	Decreasing, 9D
Pyrene	No Trend, 9D	No Trend, 9D	Increasing, 9D	Decreasing, 8D, 1ND

Notes

#D = Number of Detects

#ND = Number of Non Detects

Akritas-Theil-Sen (ATS) non-parametric regression for (left) censored data was employed (USEPA 2009, Helsel 2012, ITRC Guidance Document 2013). Non-Detects were used at the lab reported value, "report_result_value". Non-detects were censored for the ATS procedure. The ATS procedure was implemented using the NADA package for R statistical software via the RStudio development environment.

Bold = ACL/Circular DEQ-7 Limit Exceedance in 2017 or 2018 or both

Helsel, D.R. 2012. Statistics for Censored Environmental Data Using Minitab and R, Second Edition. John Wiley & Sons, New York, 324 p

ITRC 2013, Groundwater Statistics and Monitoring Compliance, The Interstate Technology & Regulatory Council, December.

USEPA 2009, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, United States Environmental Protection Agency, March.

Blue Shading = Indicates No Trend due to high number of non-detects.

Green Shading = Indicates statistically significant decreasing trend

Red Shading = Indicates statistically significant increasing trend

Table 5.3.8-3: Comparison of Current and Streamlined Groundwater Compliance Monitoring Plans

Well ID	Type of Well	Monitoring Frequency		Rationale
		Current	Streamlined	
MW-70	POC	Annual	Biennial (Fall)	Limited variability in PAH concentrations, mostly non-detect.
MW-40	POC	Annual	Biennial (Fall)	Limited variability in PAH concentrations.
MW-21	POC	Annual	Biennial (Fall)	Limited variability in PAH concentrations.
PW-3	POC	Annual	Biennial (Fall)	Limited variability in PAH concentrations.
MW-49A	POC	Annual	Biennial (Fall)	Limited variability in PAH concentrations, mostly non-detect.
MW-81	POC	Annual	Biennial (Fall)	Limited variability in PAH concentrations, mostly non-detect.
MW-93	POE	Semi-Annual	Semi-Annual (Spring, Fall)	No Change
MW-41	POE	Semi-Annual	Semi-Annual (Spring, Fall)	No Change
MW-96	POE	Semi-Annual	Semi-Annual (Spring, Fall)	No Change
MW-81	POE	Semi-Annual	Semi-Annual (Spring, Fall)	No Change
MW-28	POE	Semi-Annual	Annual (Spring)	Near Clark Fork River. Groundwater flowed towards the river only 2 times (both times in Spring) in the last 16 sampling events.
MW-91	POE	Semi-Annual	Annual (Spring)	Near Clark Fork River. Groundwater flowed towards the river only 2 times (both times in Spring) in the last 16 sampling events.
MW-6	POE	Semi-Annual	Annual (Spring)	Near Clark Fork River. Groundwater flowed towards the river only 2 times (both times in Spring) in the last 16 sampling events.
MW-53	POE	Semi-Annual	Annual (Spring)	Near Clark Fork River. Groundwater flowed towards the river only 2 times (both times in Spring) in the last 16 sampling events.
MW-72	POE	Semi-Annual	Abandon	The western portion of the POE network can provide adequate downgradient coverage with wells MW-93, MW-41, MW-96
MW-27		Semi-Annual	Abandon	This well is installed in the SI and has had low or non-detect PAHs since 2010. POE wells MW-8, MW-28 and MW-96 provide adequate downgradient coverage of PAH impacts potentially migrating from MW-40
MW-7A	POC	Annual	Abandon	PW-3, MW-21, MW-40, MW-49A, MW-70 and MW-81 provide adequate coverage to monitor the source areas
MW-44	POC	Annual	Abandon	PW-3, MW-21, MW-40, MW-49A, MW-70 and MW-81 provide adequate coverage to monitor the source areas
MW-45	POC	Annual	Abandon	PW-3, MW-21, MW-40, MW-49A, MW-70 and MW-81 provide adequate coverage to monitor the source areas
MW-48	POC	Annual	Abandon	PW-3, MW-21, MW-40, MW-49A, MW-70 and MW-81 provide adequate coverage to monitor the source areas

POC - Point of Compliance
POE - Point of Exposure

Figures

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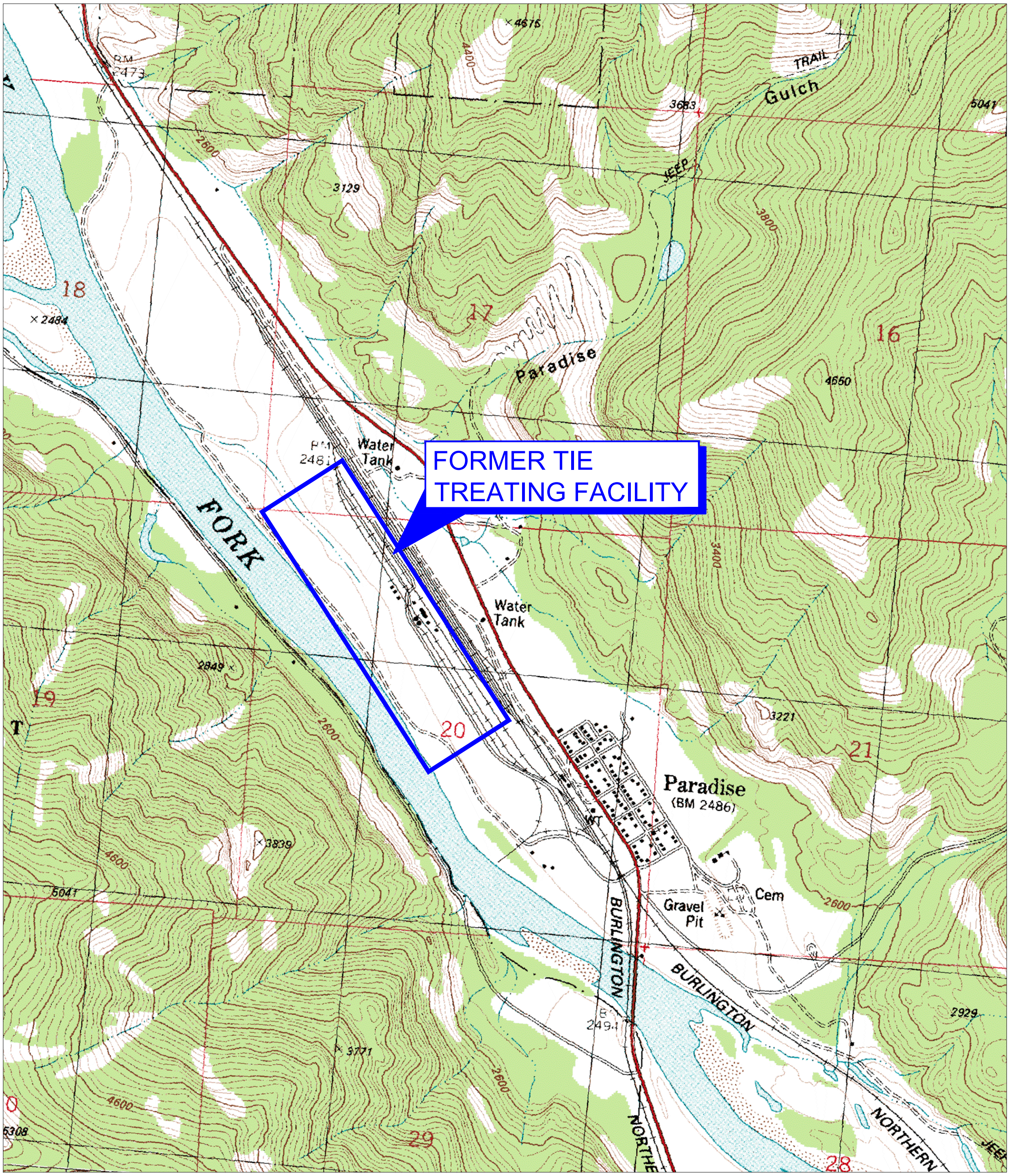

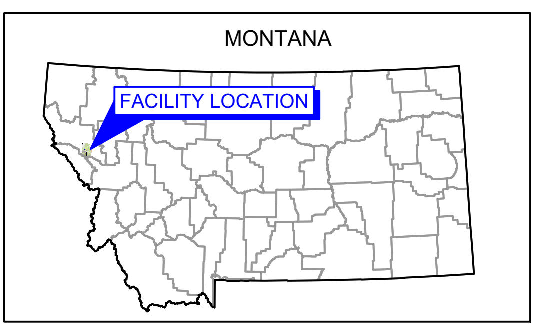

UNITED STATES GEOLOGIC SURVEY
PARADISE QUADRANGLE
MONTANA
7.5 MINUTE SERIES (TOPOGRAPHY)

1000 0 2000
1"=2000'

RCRA Permit Modification
BNSF Railway Company
Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/14/19

FACILITY LOCATION MAP

AECOM

Figure: 5.2.1-1

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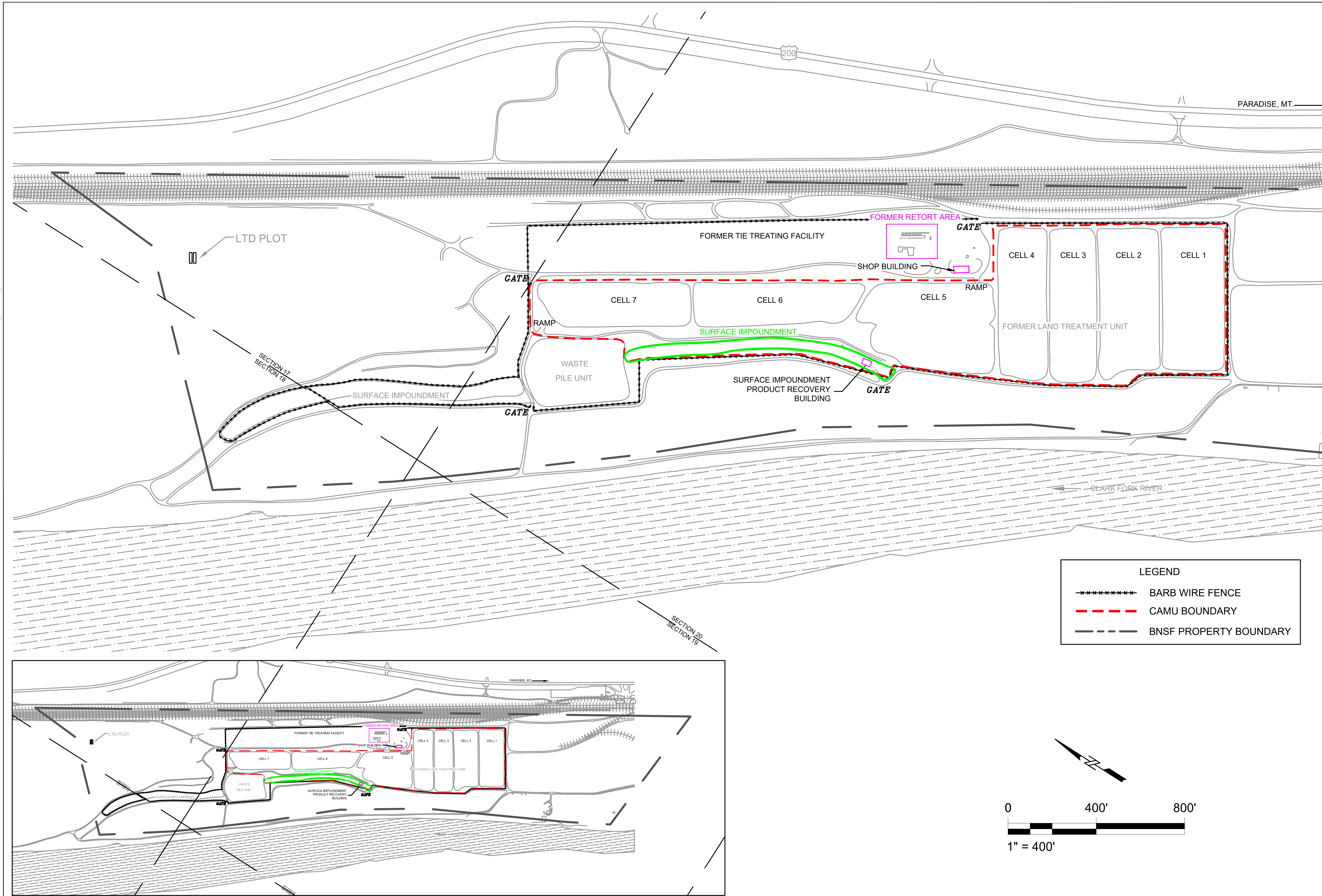

AECOM

Figure: 5.2.1-2

FACILITY LAYOUT

RCRA Permit Modification
BNSF Railway Company
Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/14/19

Project Management Initials: Designer: Checked: Approved: ANSI B 11" x 17"
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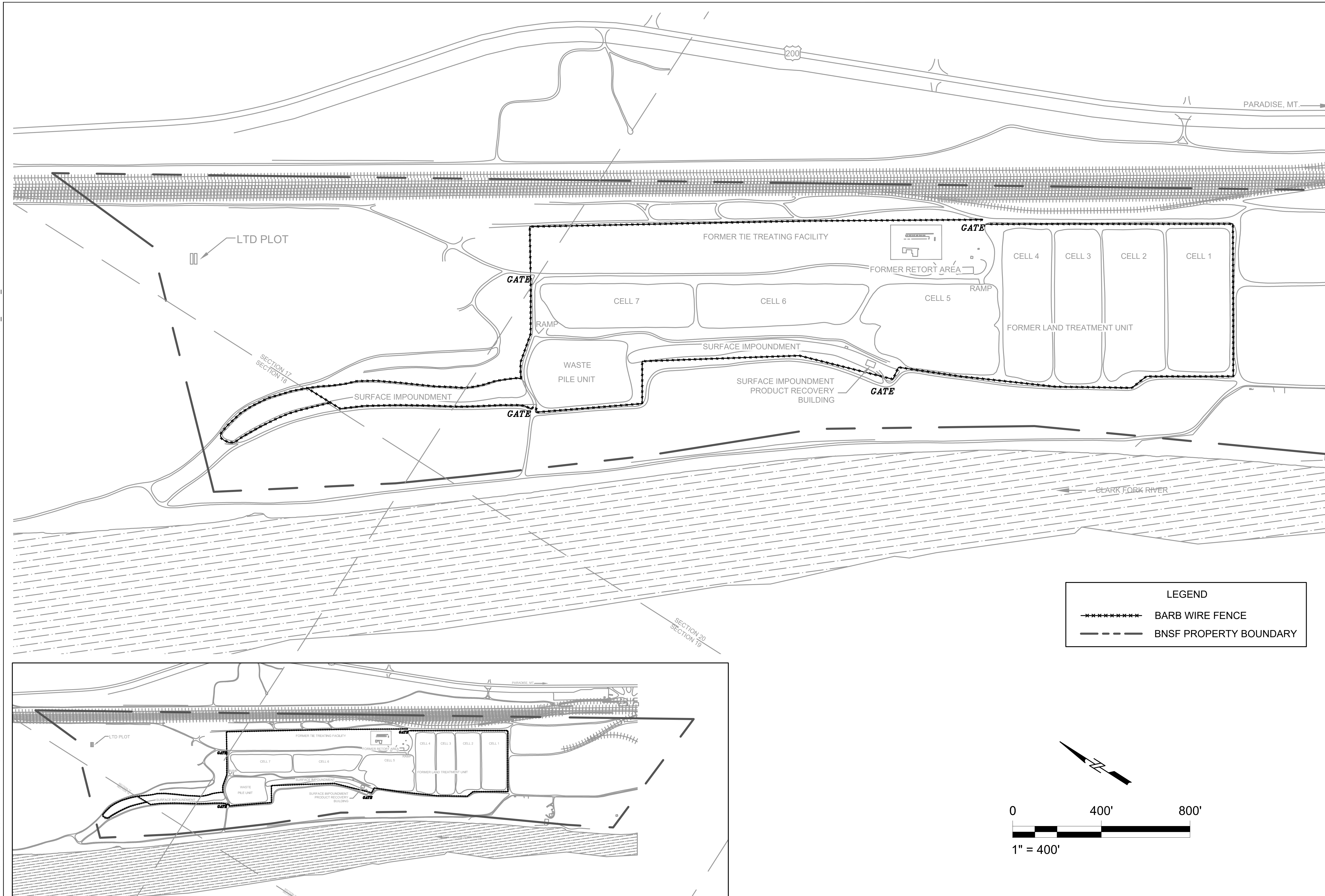


AECOM

Figure: 5.2.4-1

FACILITY ACCESS

RCRA Permit Modification
BNSF Railway Company
Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/14/19

Figure 5.2.5-1
Example Inspection Log for the Paradise Facility
BNSF – Paradise, MT

Inspector: ___________________________ Date: ______________________
Time: ______________________

Fencing/Gates:
Gates Closed? ____
Broken Wires? ____
Condition of posts/signs? ____________________________________
Corrective Action: ____

Safety Equipment:
Available? ____
Access? ____
Condition? ____
Corrective Action: ____

Treatment Area:
Erosion? ____
Run-off/Run-on controls? ____________________________________
Corrective Action: ____

Berms (CAMU):
General condition? ____
Erosion? ____
Corrective Action: ____

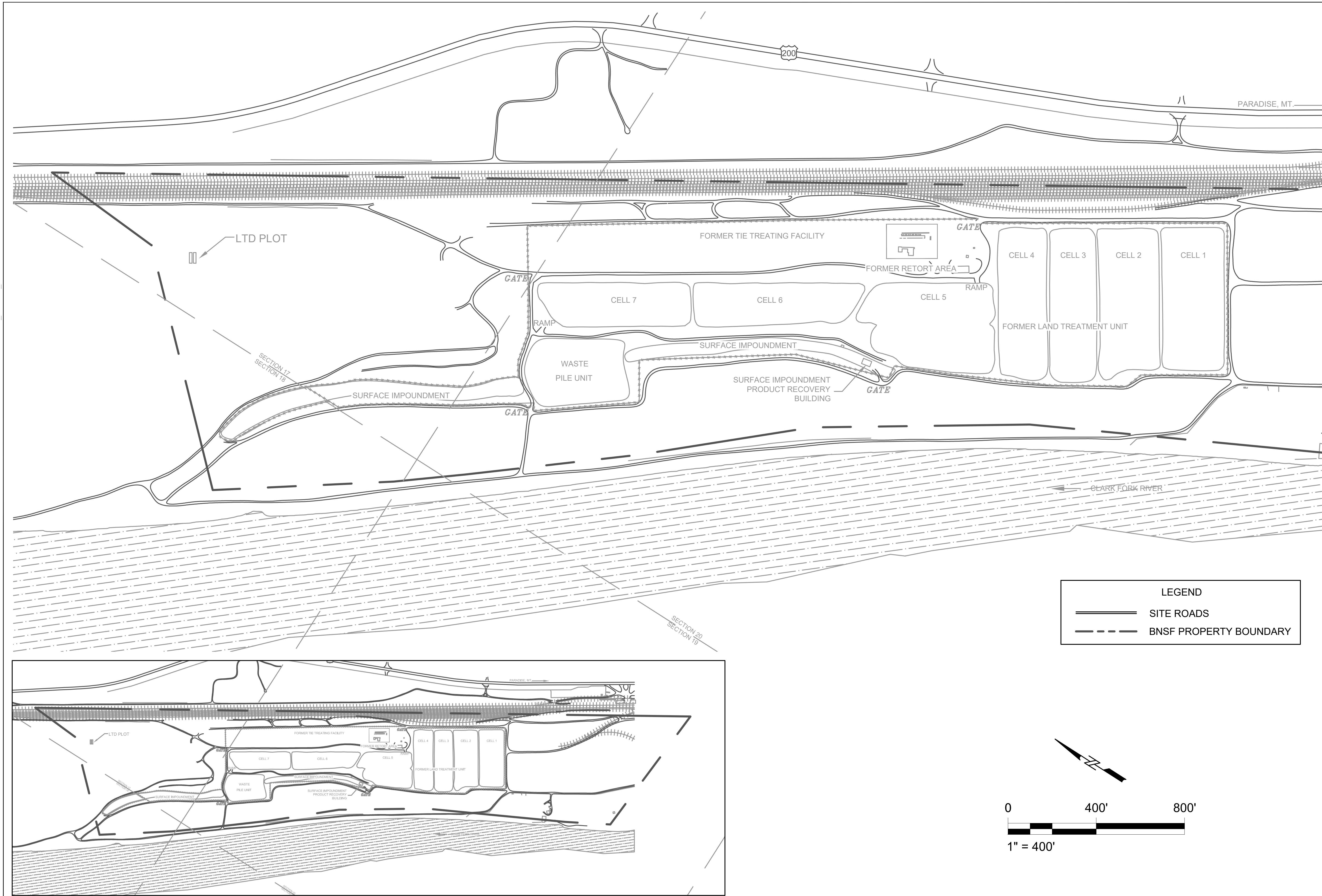
Pumps:
Leaks (pumps and flanges)? __________________________________
Corrective Action: ____

Monitor Wells:
Damage? ____
Caps locked? ____
Surface seal condition? ______________________________________
Corrective Action: ____

Units/Areas to be inspected: WPU/SI, CAMU

Figure 5.2.5-2
Example Container Storage Inspection Form
BNSF – Paradise, Montana

Inspector:	Time:	
Date:	Yes	No
Is there any evidence of container leaks?		
Corrective Action:		
Is there any damage to the secondary containment?		
Corrective Action:		
Is there any evidence of damage to the flooring?		
Corrective Action:		
Is there any evidence of damage to loading/unloading area?		
Corrective Action:		



AECOM

Figure: 5.2.10-1

SITE ROADWAYS

RCRA Permit Modification
BNSF Railway Company
Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/14/19

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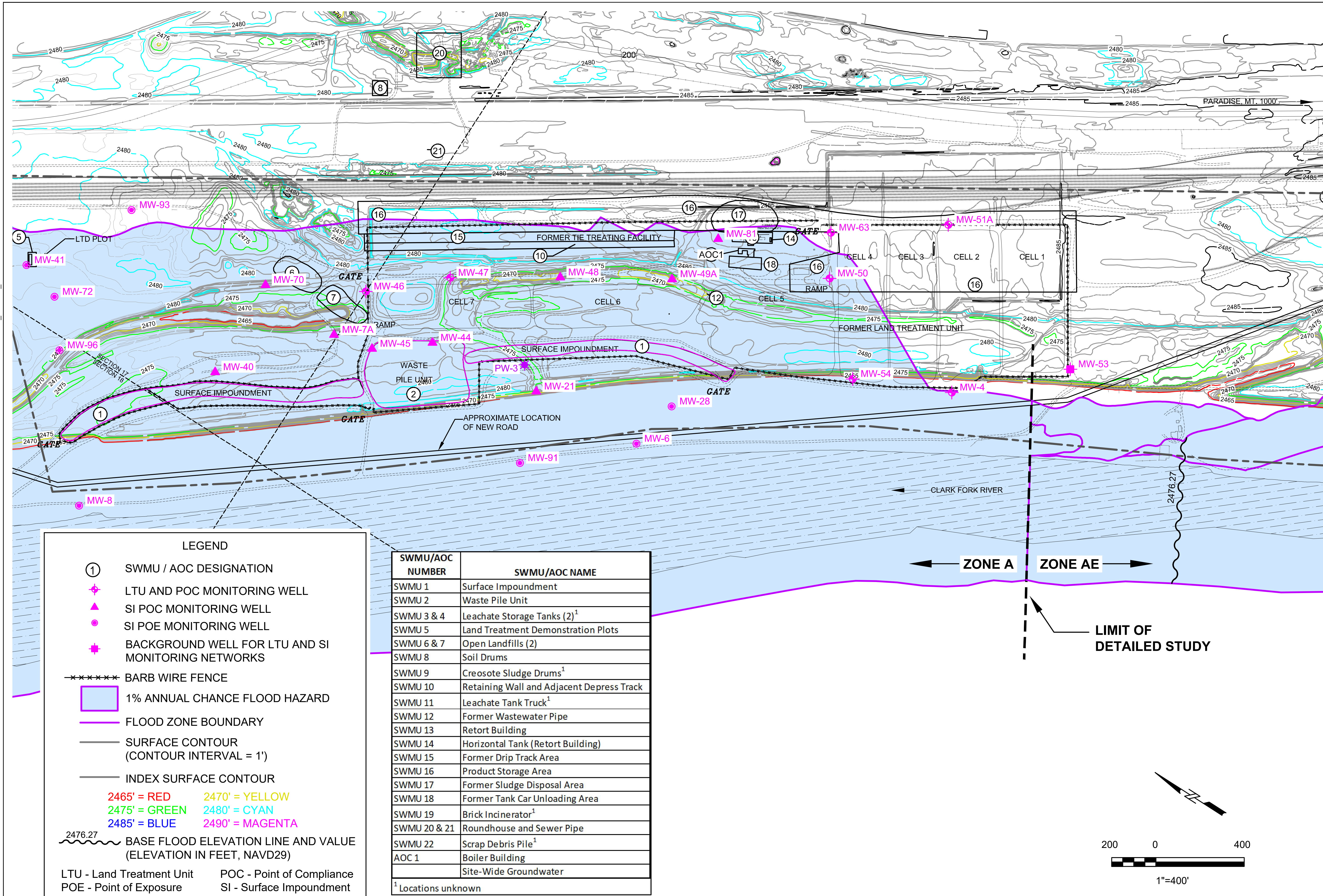

LEGEND

- ① SWMU / AOC DESIGNATION
- LTU AND POC MONITORING WELL
- SI POC MONITORING WELL
- SI POE MONITORING WELL
- BACKGROUND WELL FOR LTU AND SI MONITORING NETWORKS
- BARB WIRE FENCE
- 1% ANNUAL CHANCE FLOOD HAZARD
- FLOOD ZONE BOUNDARY
- SURFACE CONTOUR (CONTOUR INTERVAL = 1')
- INDEX SURFACE CONTOUR

2465' = RED 2470' = YELLOW
2475' = GREEN 2480' = CYAN
2485' = BLUE 2490' = MAGENTA

2476.27 BASE FLOOD ELEVATION LINE AND VALUE (ELEVATION IN FEET, NAVD29)

LTU - Land Treatment Unit POC - Point of Compliance
POE - Point of Exposure SI - Surface Impoundment

SWMU/AOC NUMBER	SWMU/AOC NAME
SWMU 1	Surface Impoundment
SWMU 2	Waste Pile Unit
SWMU 3 & 4	Leachate Storage Tanks (2)[1]
SWMU 5	Land Treatment Demonstration Plots
SWMU 6 & 7	Open Landfills (2)
SWMU 8	Soil Drums
SWMU 9	Creosote Sludge Drums[1]
SWMU 10	Retaining Wall and Adjacent Depress Track
SWMU 11	Leachate Tank Truck[1]
SWMU 12	Former Wastewater Pipe
SWMU 13	Retort Building
SWMU 14	Horizontal Tank (Retort Building)
SWMU 15	Former Drip Track Area
SWMU 16	Product Storage Area
SWMU 17	Former Sludge Disposal Area
SWMU 18	Former Tank Car Unloading Area
SWMU 19	Brick Incinerator[1]
SWMU 20 & 21	Roundhouse and Sewer Pipe
SWMU 22	Scrap Debris Pile[1]
AOC 1	Boiler Building
	Site-Wide Groundwater

[1] Locations unknown

FLOOD ZONE A

AECOM

Figure: 5.2.11-1

RCRA Permit Modification
BNSF Railway Company
Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/14/19

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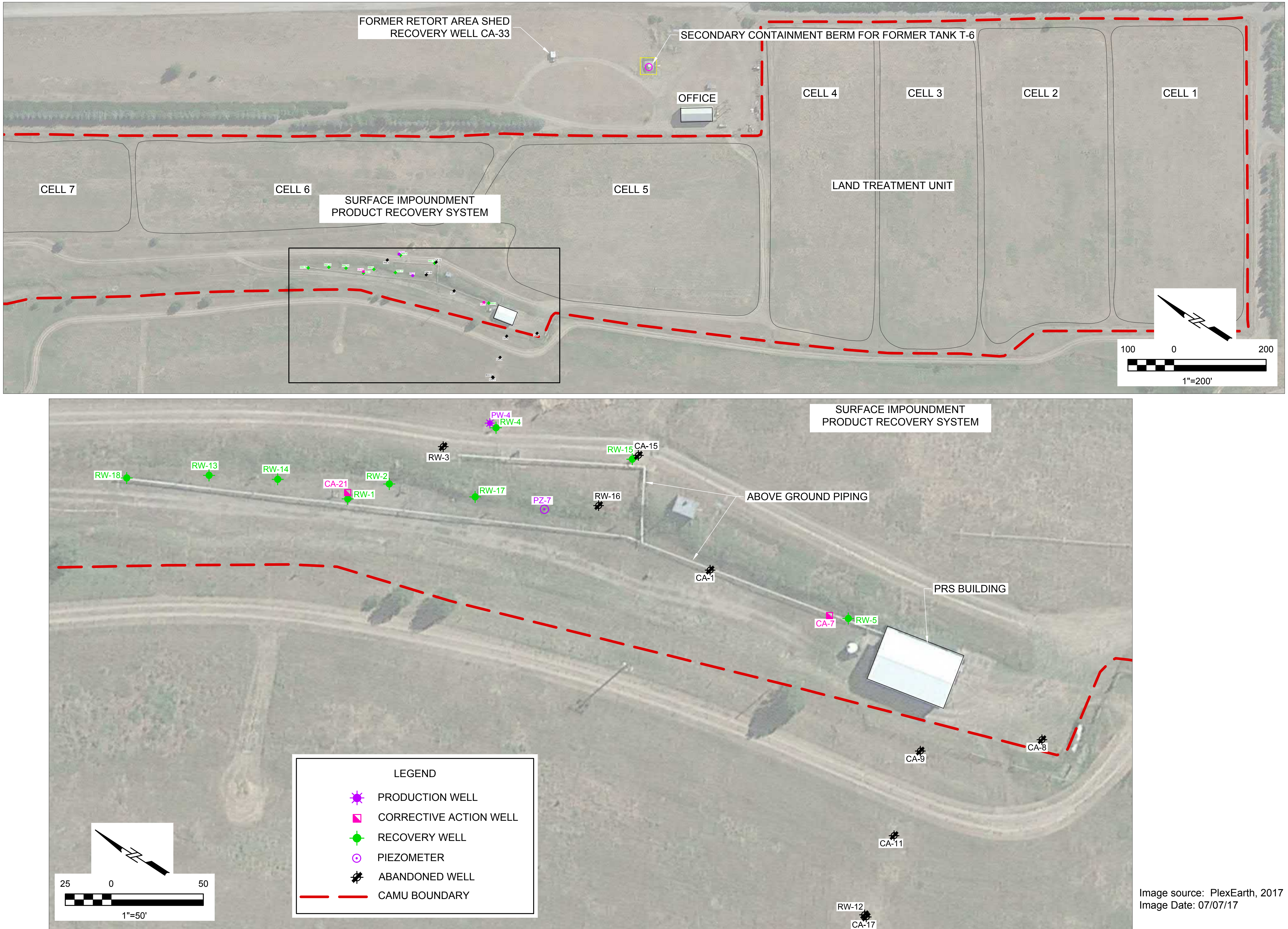

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Figure: 5.2.15-1

RECOVERY SYSTEM
WELL LOCATION MAP

RCRA Permit Modification
BNSF Railway Company
Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/14/19

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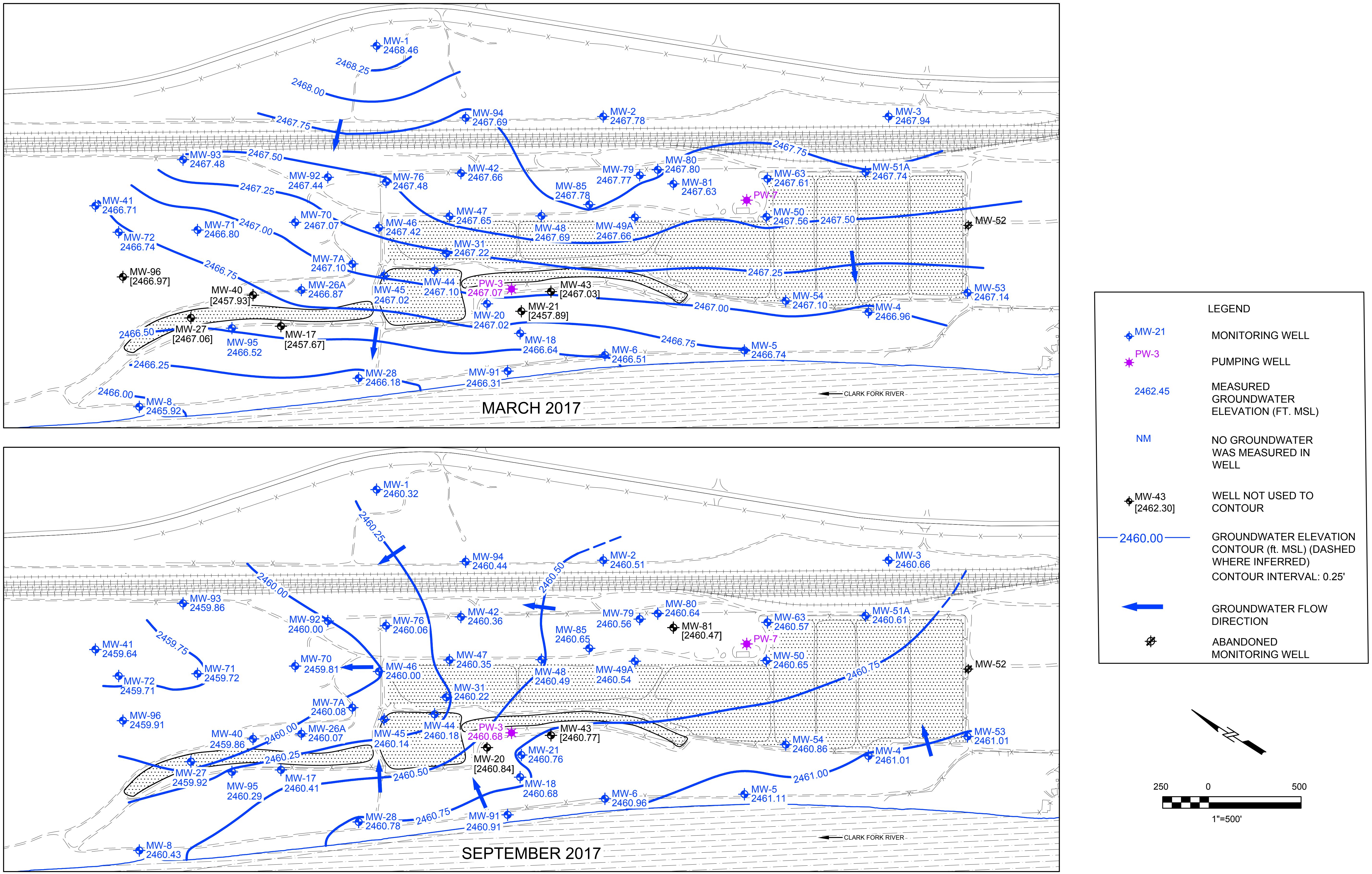

AECOM

Figure: 5.3.2-1

GENERALIZED POTENTIOMETRIC SURFACE CONTOURS
MARCH 27, 2017 & SEPTEMBER 11, 2017

RCRA Permit Modification
BNSF Railway Company
Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/14/19

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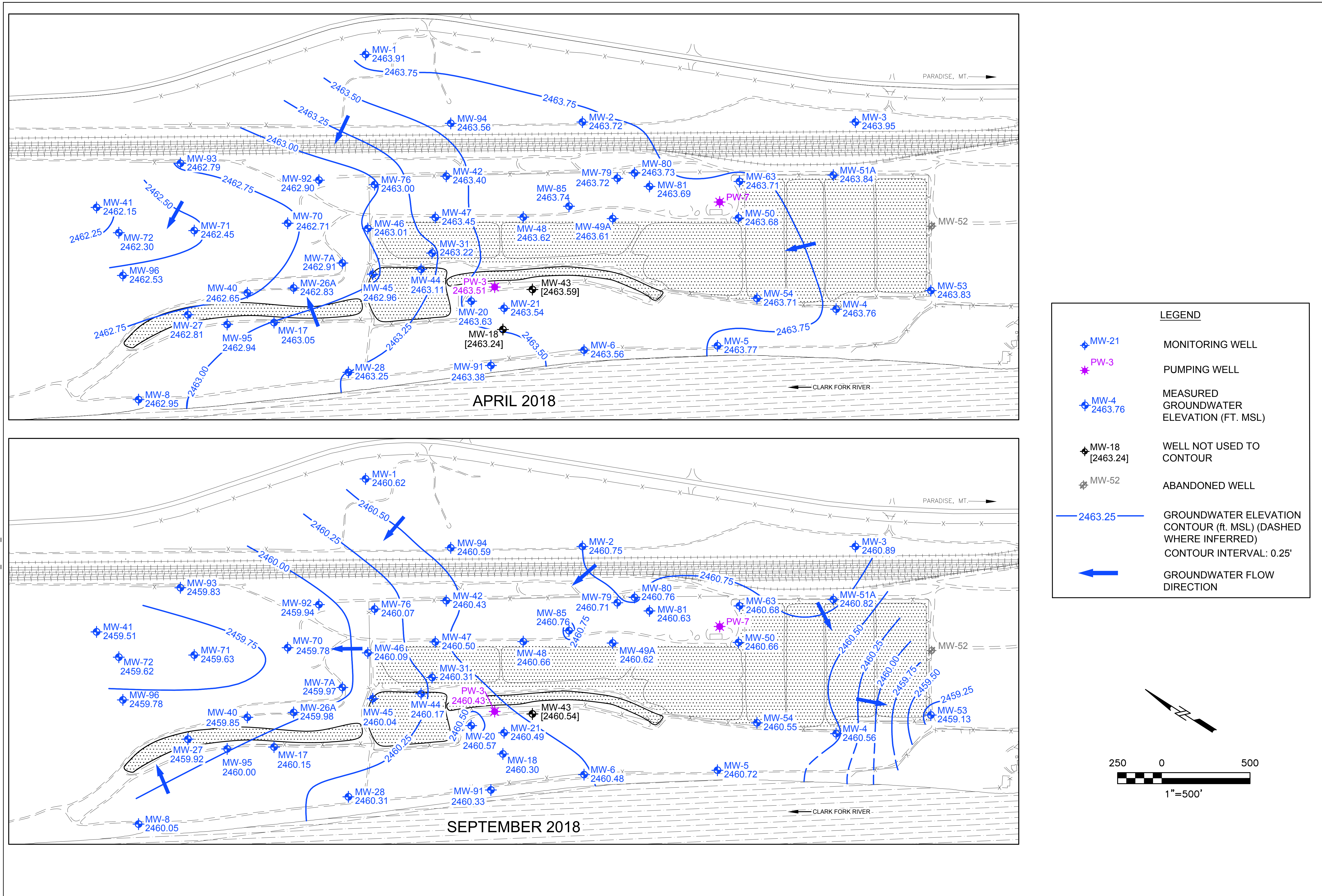

AECOM

Figure: 5.3.2-2

GENERALIZED POTENTIOMETRIC SURFACE CONTOURS APRIL 2, 2018 AND SEPTEMBER 6, 2018

RCRA Permit Modification
BNSF Railway Company
Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/14/19

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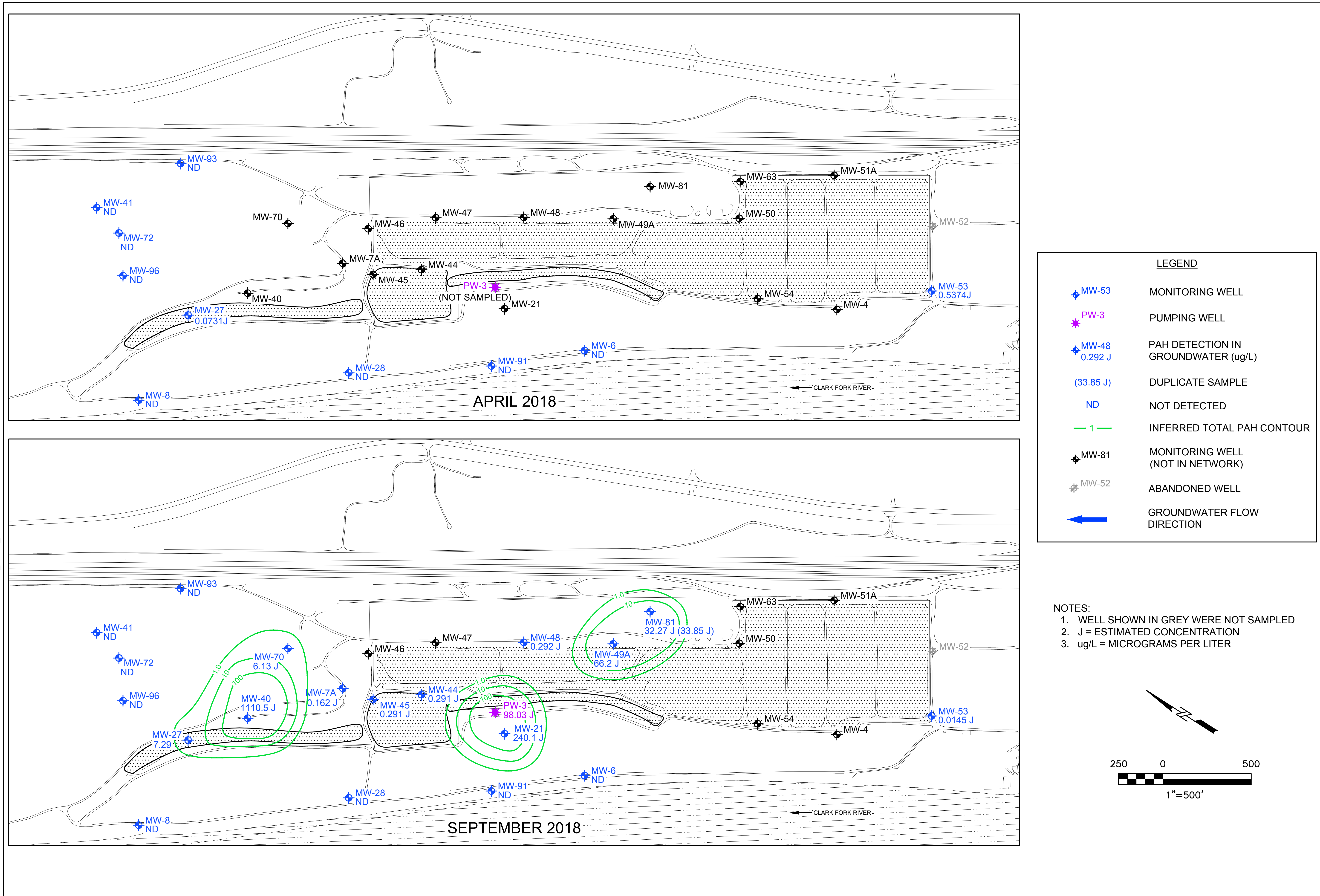

AECOM

Figure: 5.3.4-1

TOTAL PAH CONCENTRATIONS
APRIL AND SEPTEMBER 2018

RCRA Permit Modification
BNSF Railway Company
Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/14/19

Last saved by: SCHWARTZE(2019-03-14) Last Plotted: 2019-03-14
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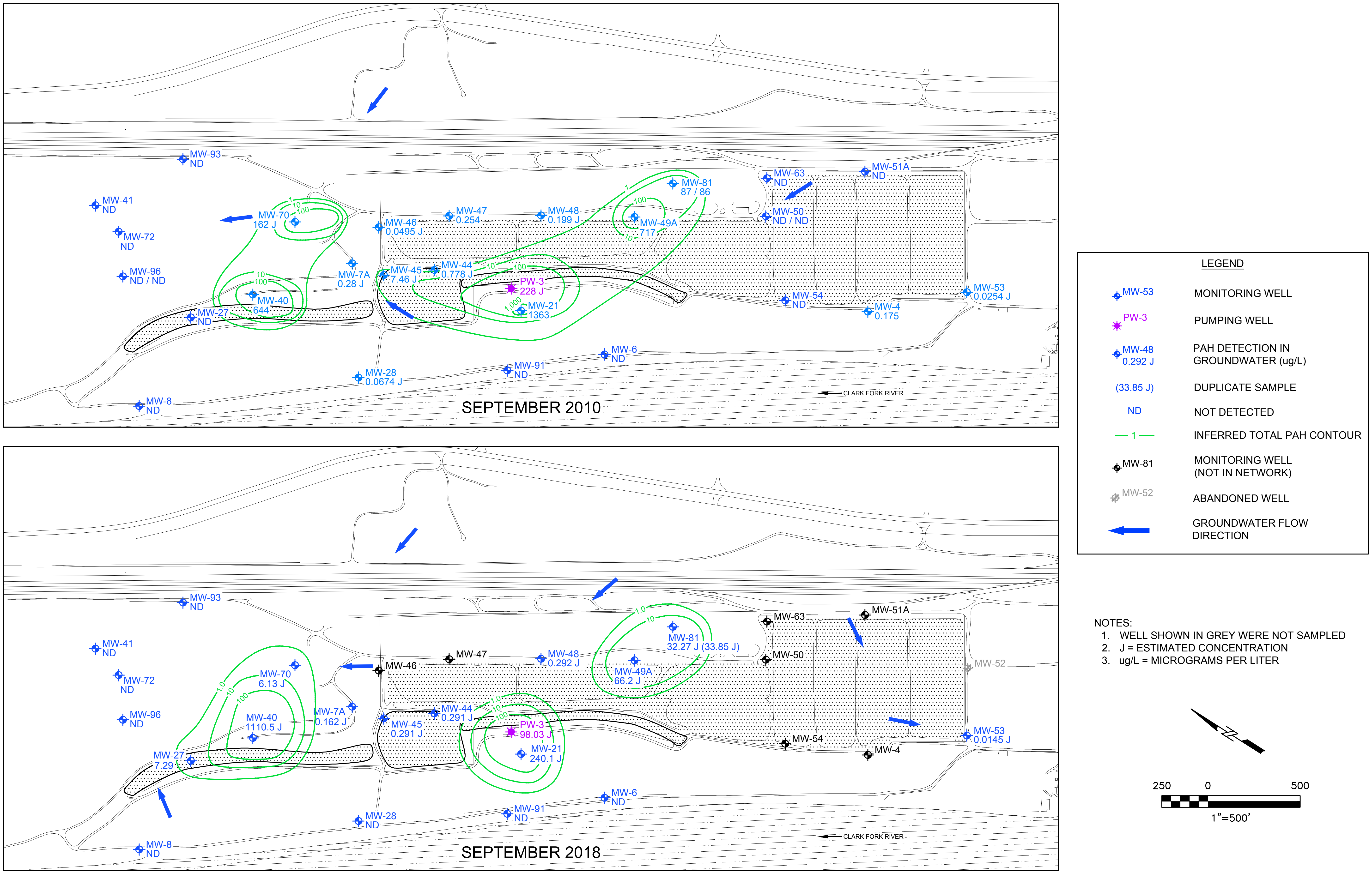

AECOM

Figure: 5.3.4-2

TOTAL PAH CONCENTRATIONS
SEPTEMBER 2010 AND SEPTEMBER 2018

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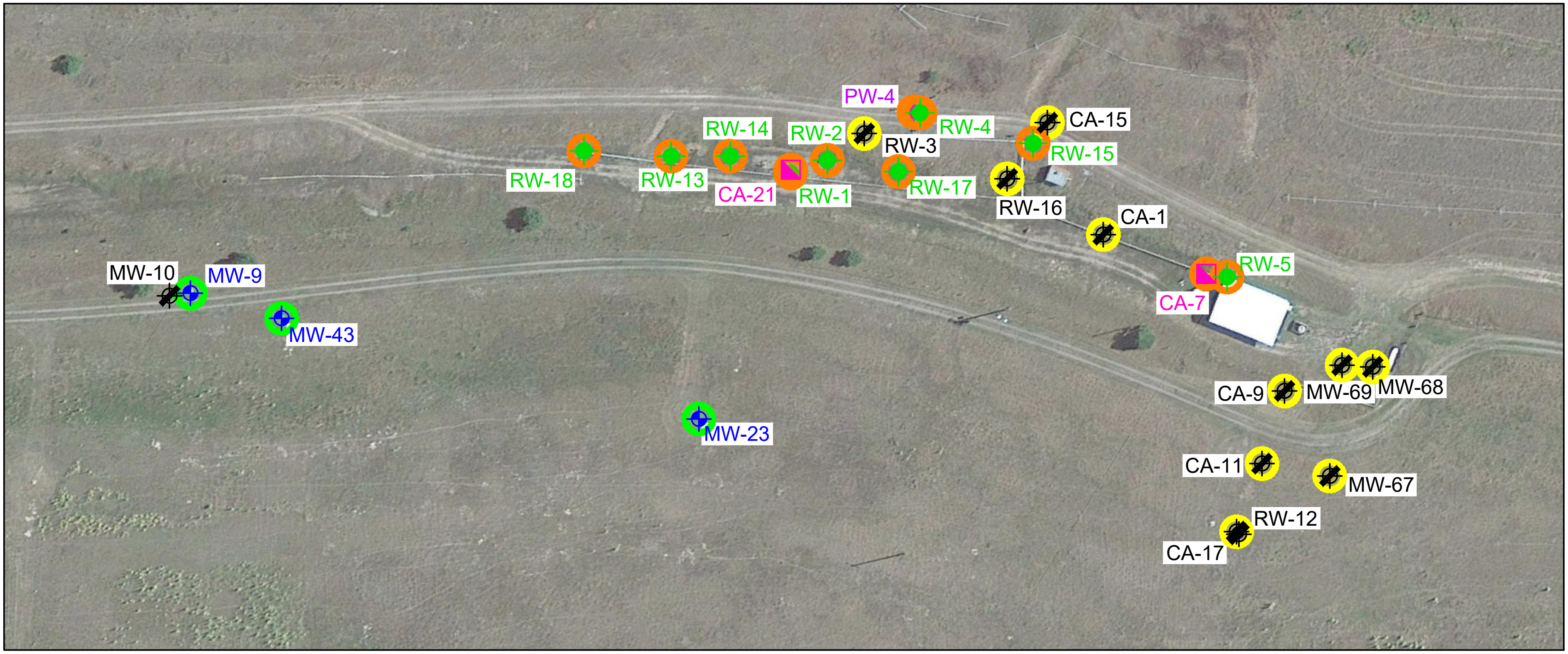

LEGEND

MONITORING WELL	WELL WITH MEASURABLE DNAPL
PRODUCTION WELL	ABANDONED WELL / TO BE ABANDONED WELL (MEASURABLE DNAPL HISTORICALLY)
CORRECTIVE ACTION WELL	WELL WITH NO MEASURABLE DNAPL
RECOVERY WELL	
ABANDONED WELL	

N

0 100' 200'

1" = 100'

Image source: PlexEarth, 2015 Image Date: 08/26/14

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WELLS WITH MEASURABLE DNAPL

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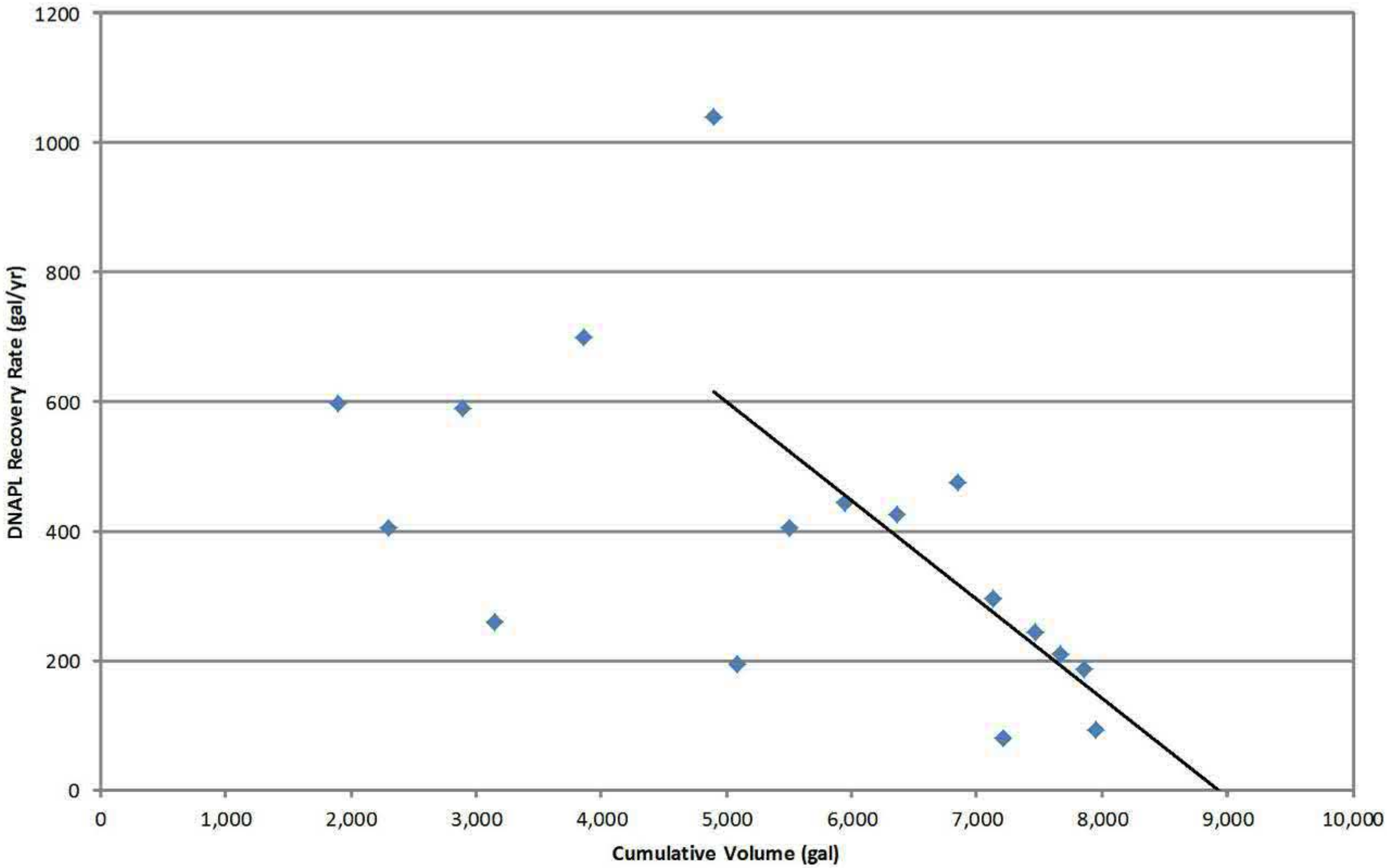
Figure: 5.3.7-1



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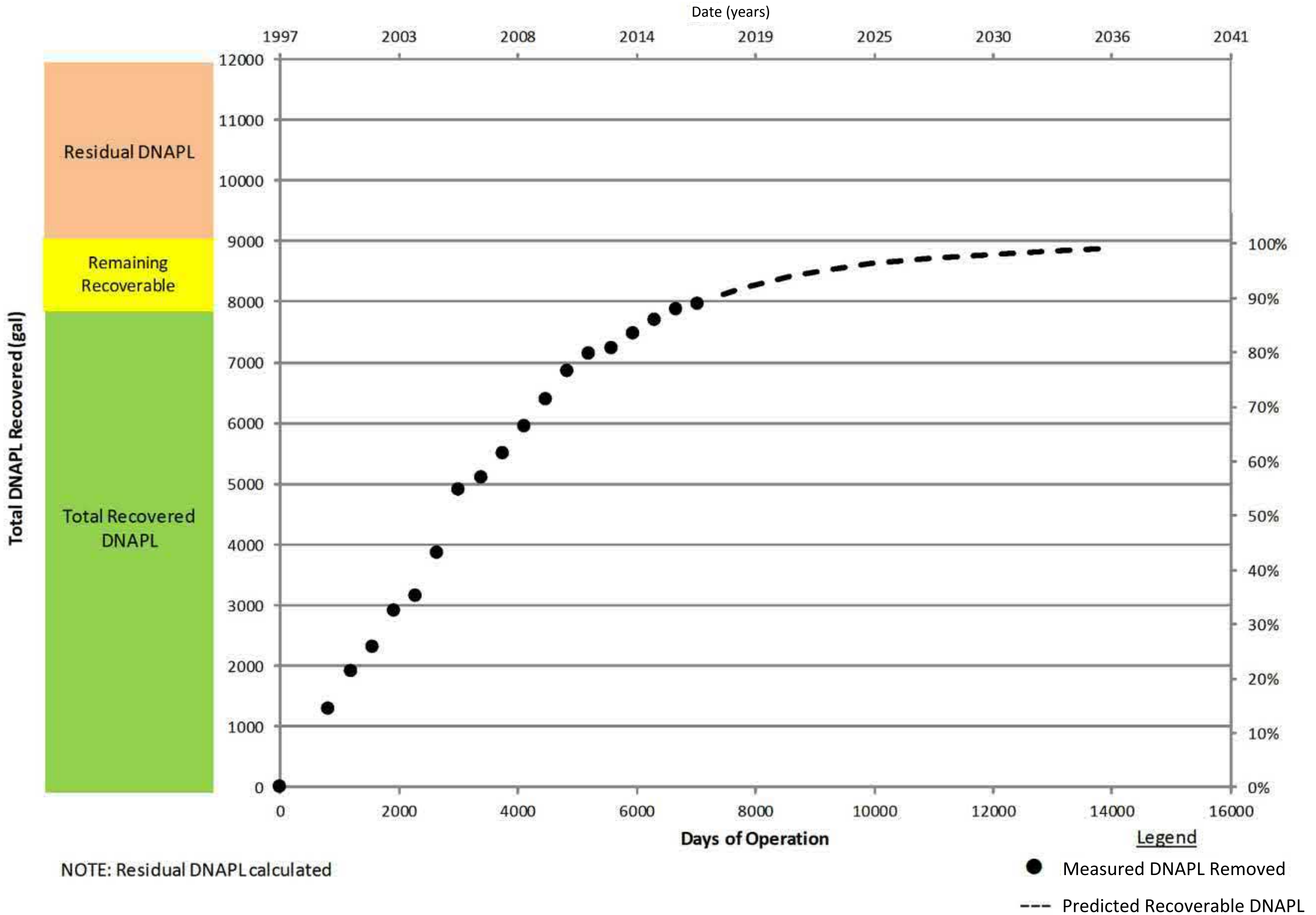
SURFACE IMPOUNDMENT AREA
DNAPL RECOVERY RATE VS. CUMULATIVE VOLUME

AECOM

Figure: 5.3.7-2



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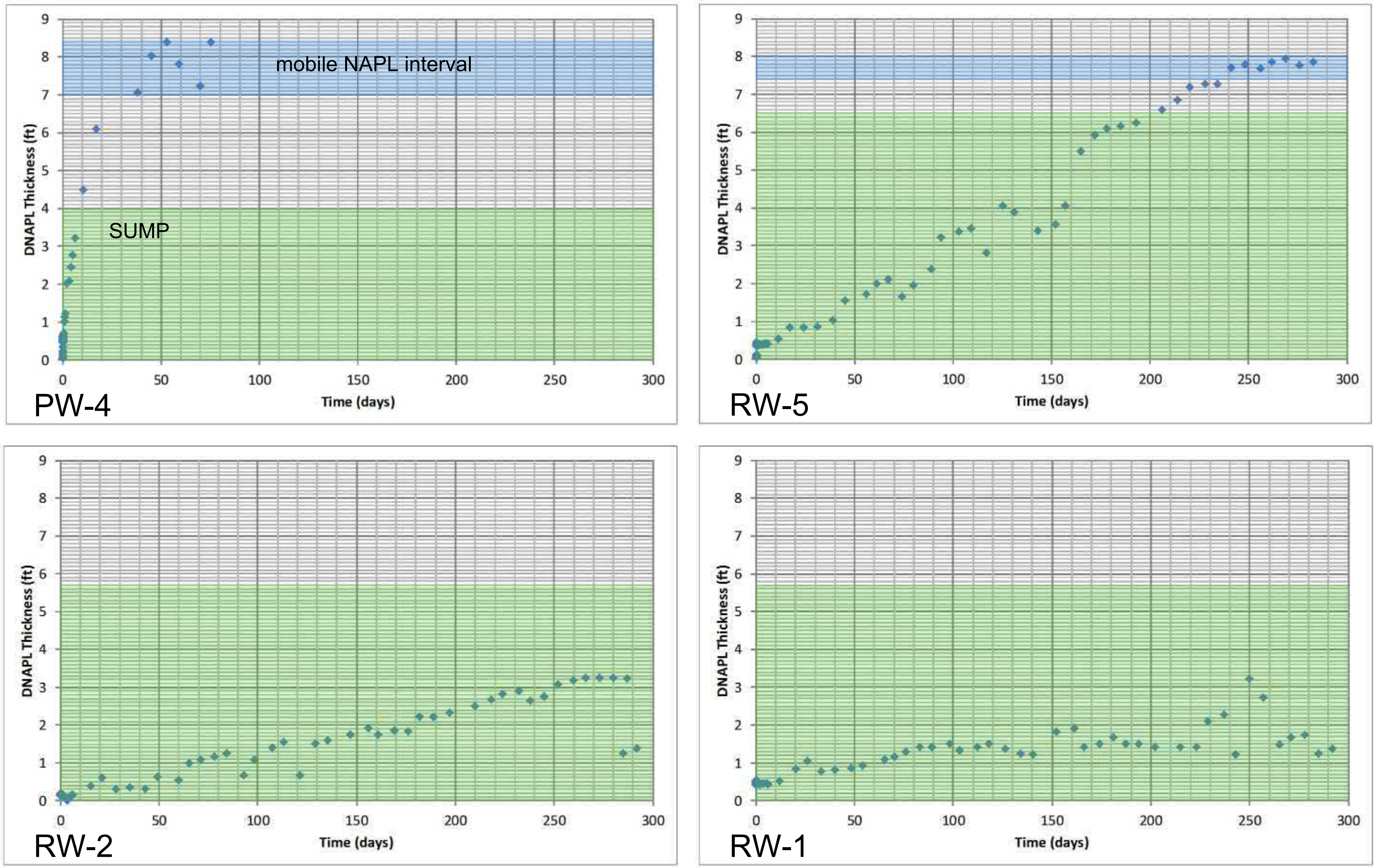
SURFACE IMPOUNDMENT AREA
DECLINE CURVE ANALYSIS

AECOM

Figure: 5.3.7-3



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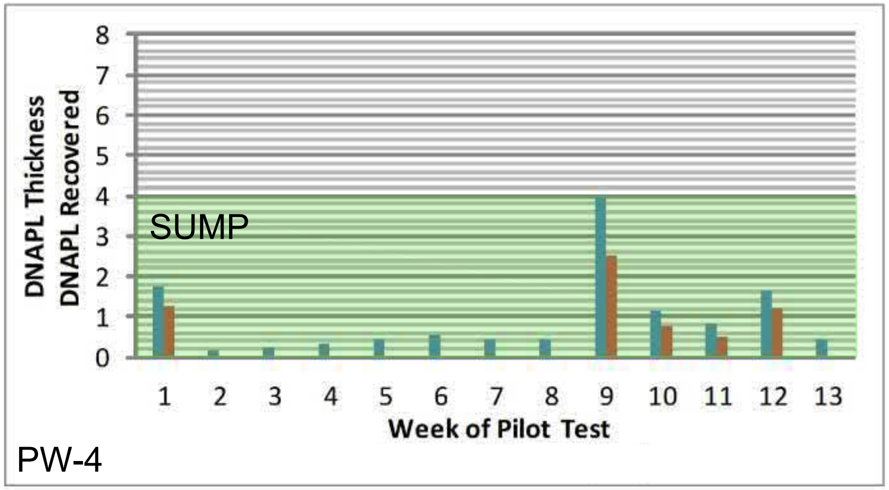
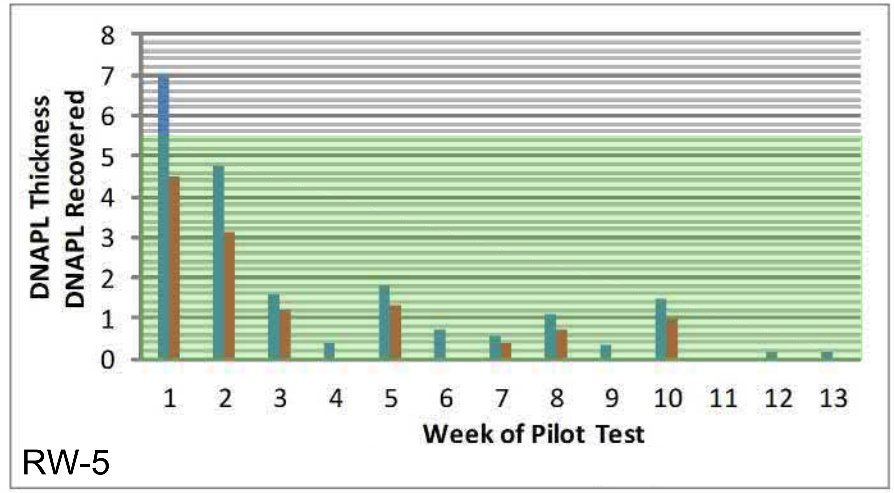
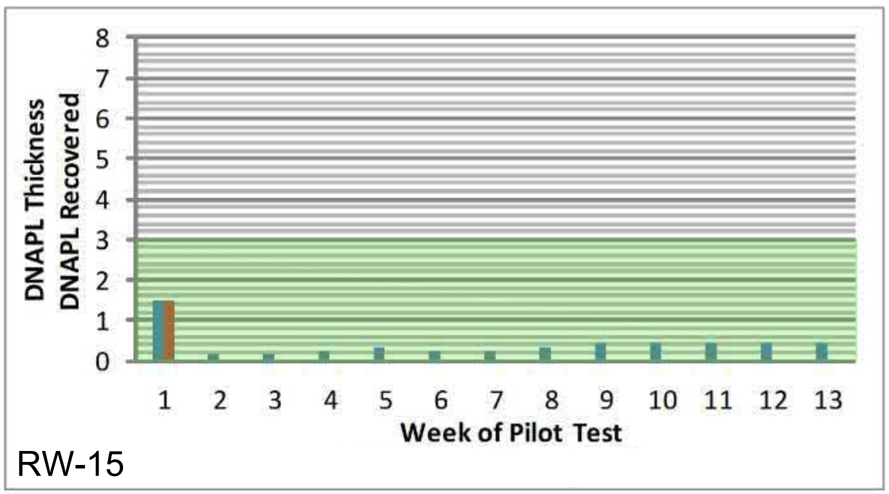
BAILDOWN TEST RESULTS
(PW-4, RW-1, RW-2, AND RW-5)

AECOM

Figure: 5.3.7-4







- DNAPL Thickness (feet)
- DNAPL Recovered (gallons)

Pilot test demonstrates alternative recovery method effectively removes DNAPL and maintains DNAPL within sump.

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DNAPL RECOVERY
PILOT TEST DATA

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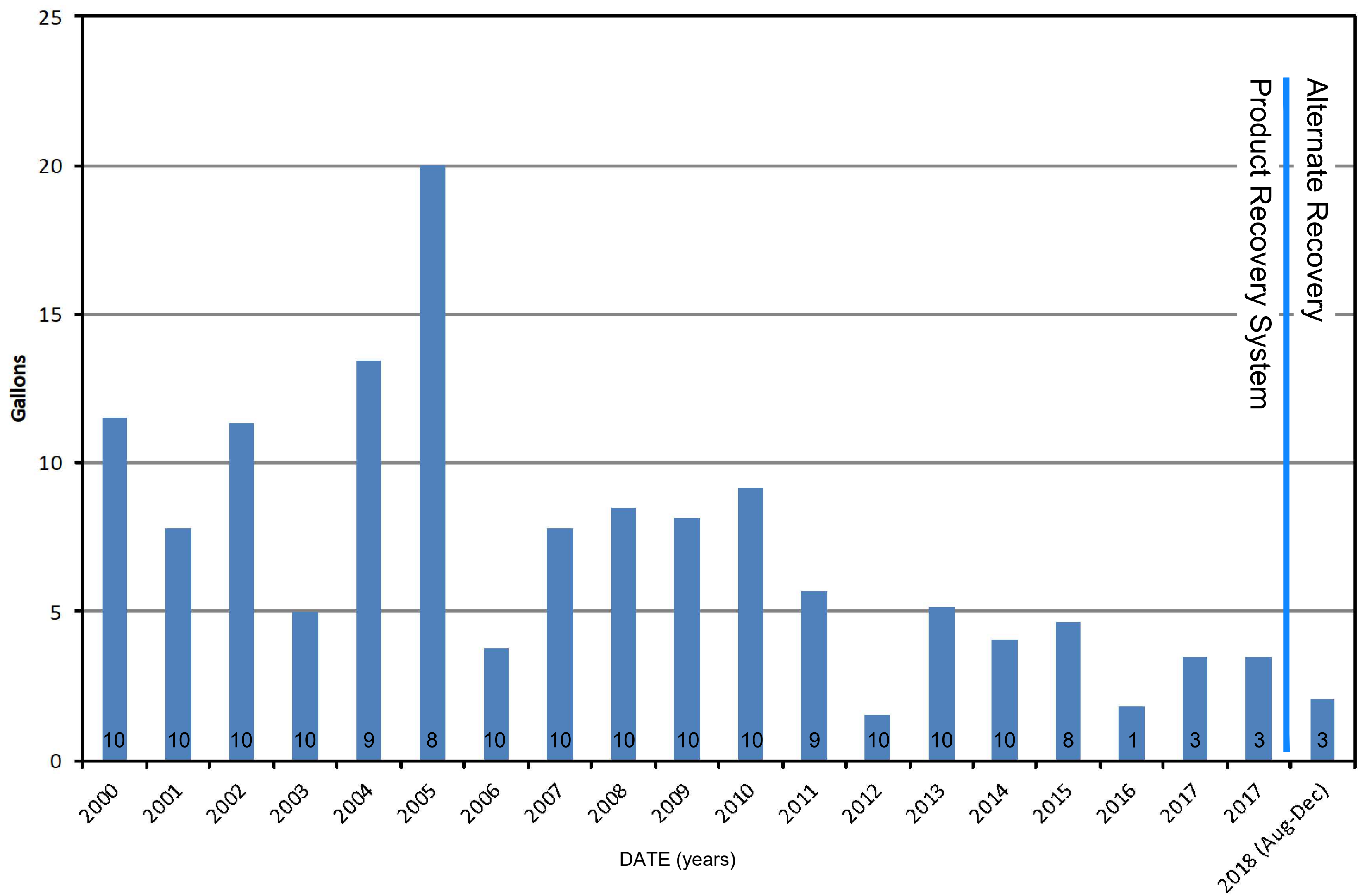
Figure: 5.3.7-5



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DNAPL RECOVERY
PILOT TEST RESULTS

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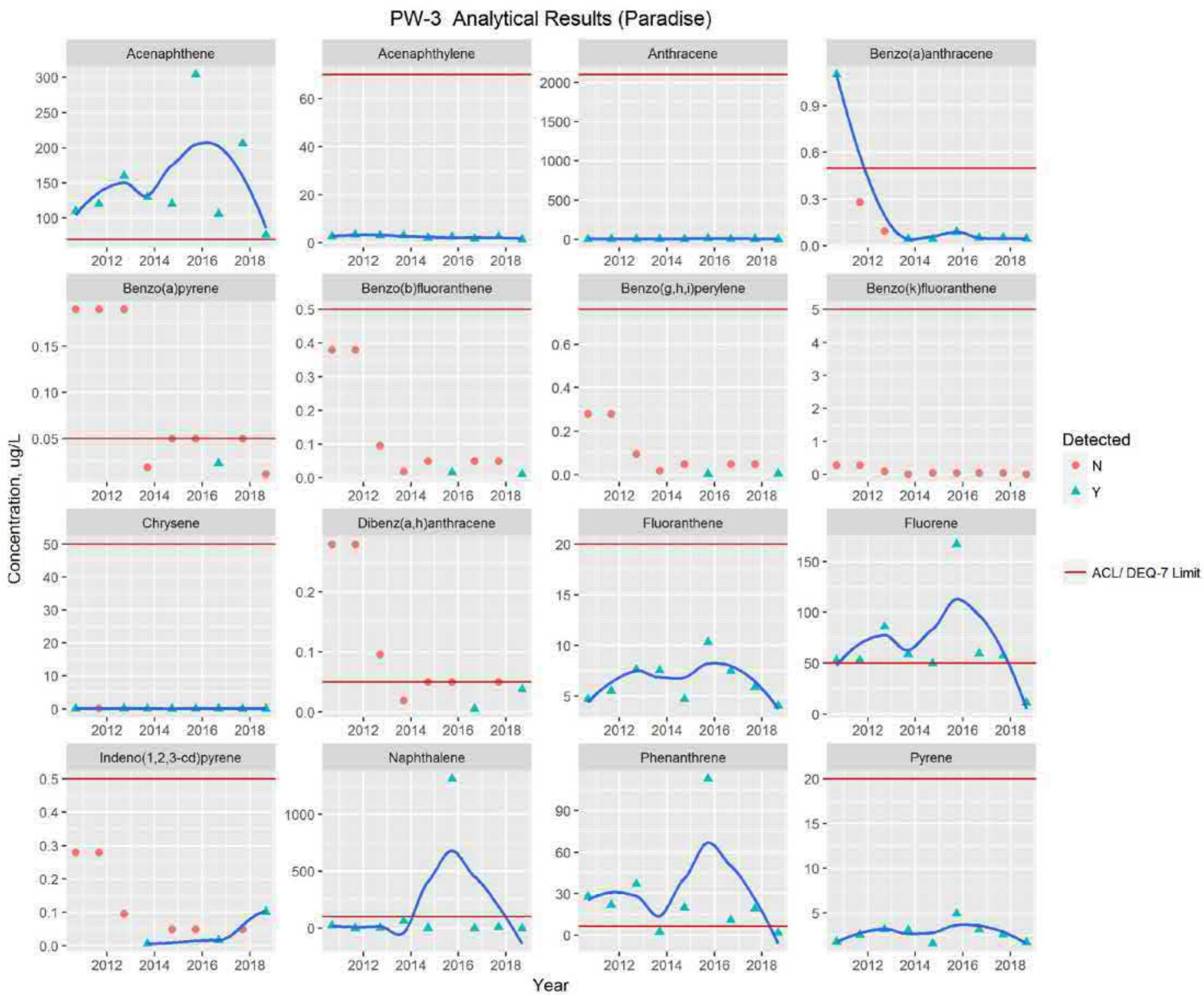
Figure: 5.3.7-6



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PAH Concentration Trends at PW-3

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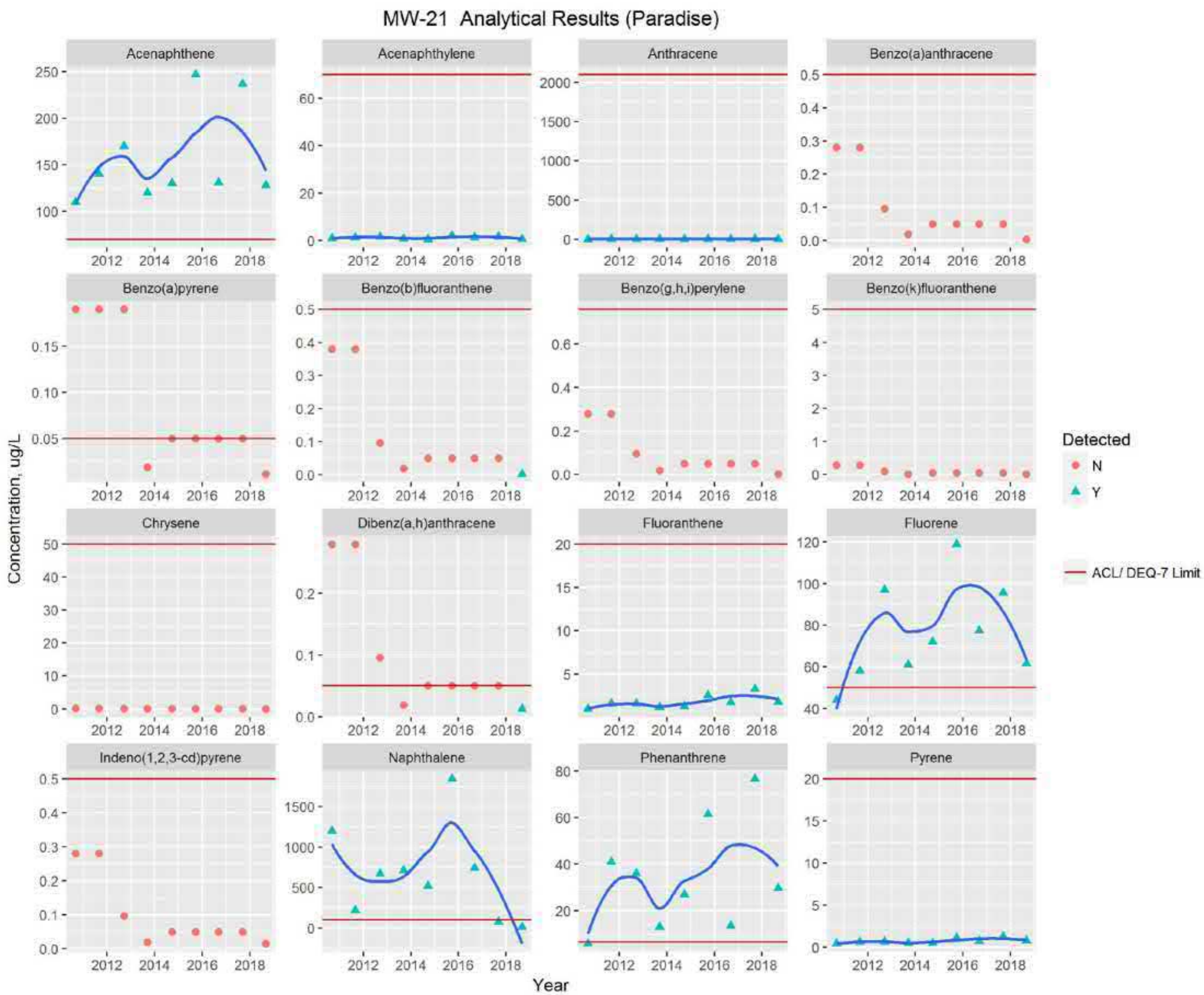
Figure: 5.5.8-1a



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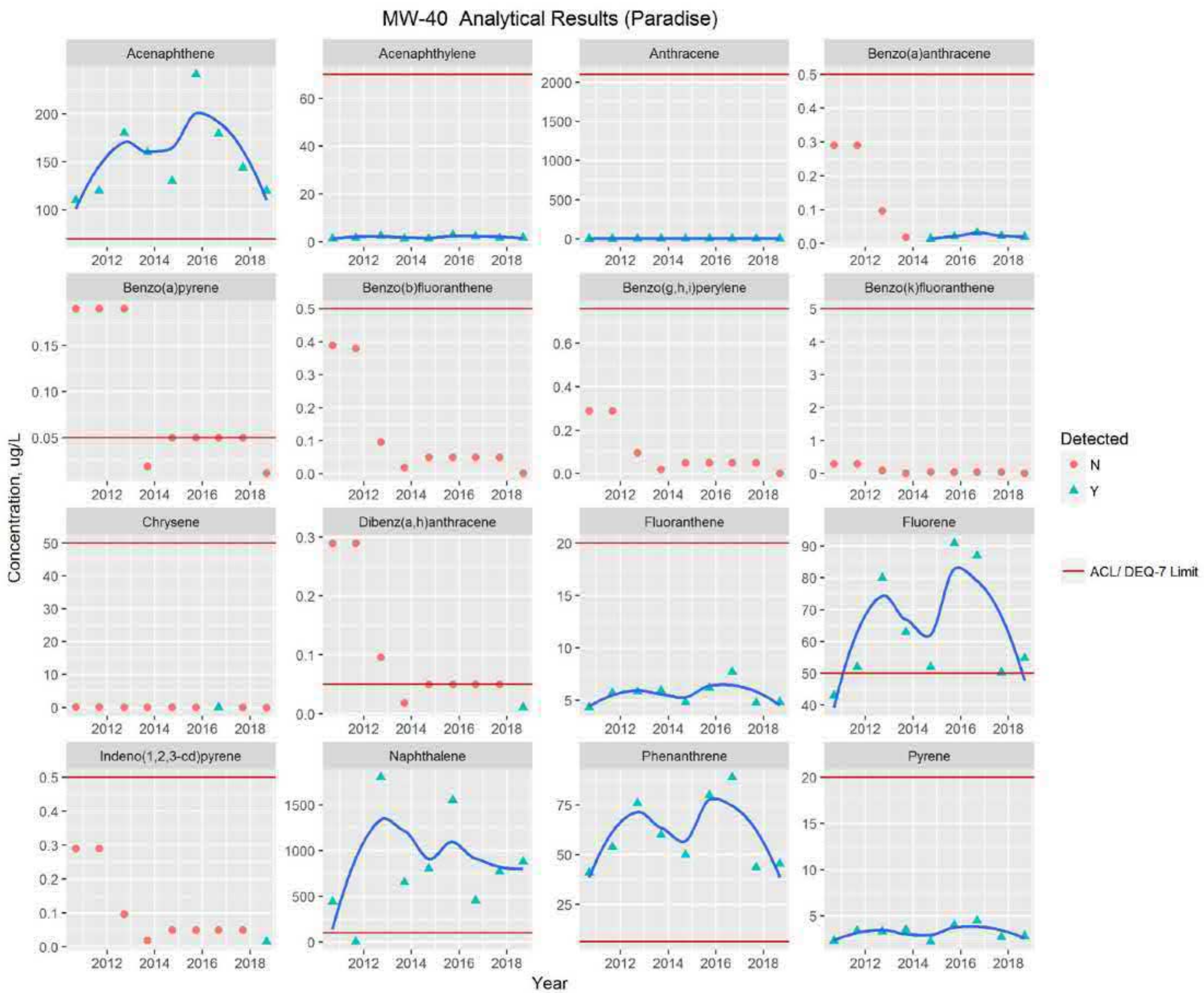
PAH Concentration Trends at MW-21

Figure: 5.5.8-1b



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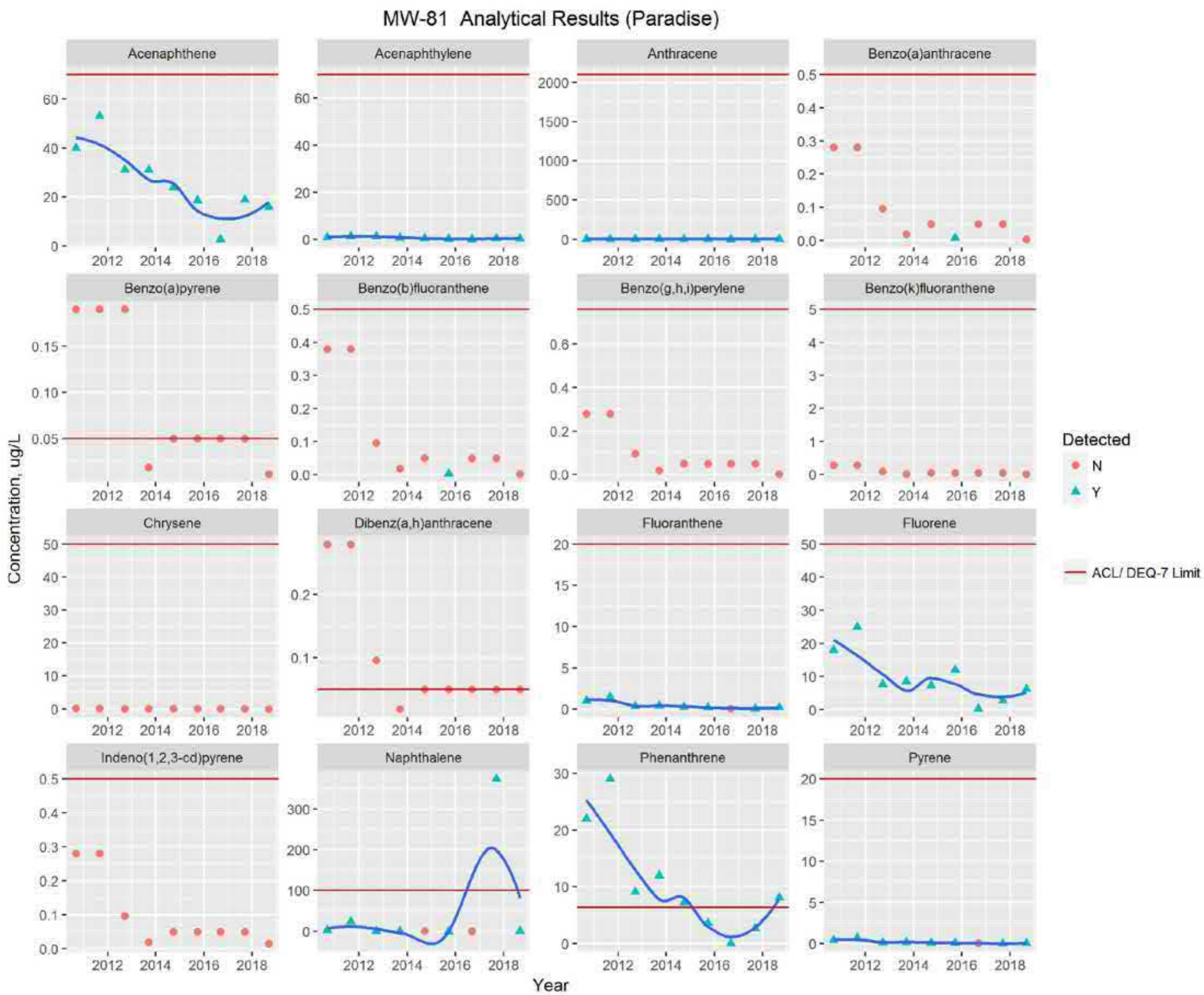
PAH Concentration Trends at MW-40

AECOM

Figure: 5.5.8-1c



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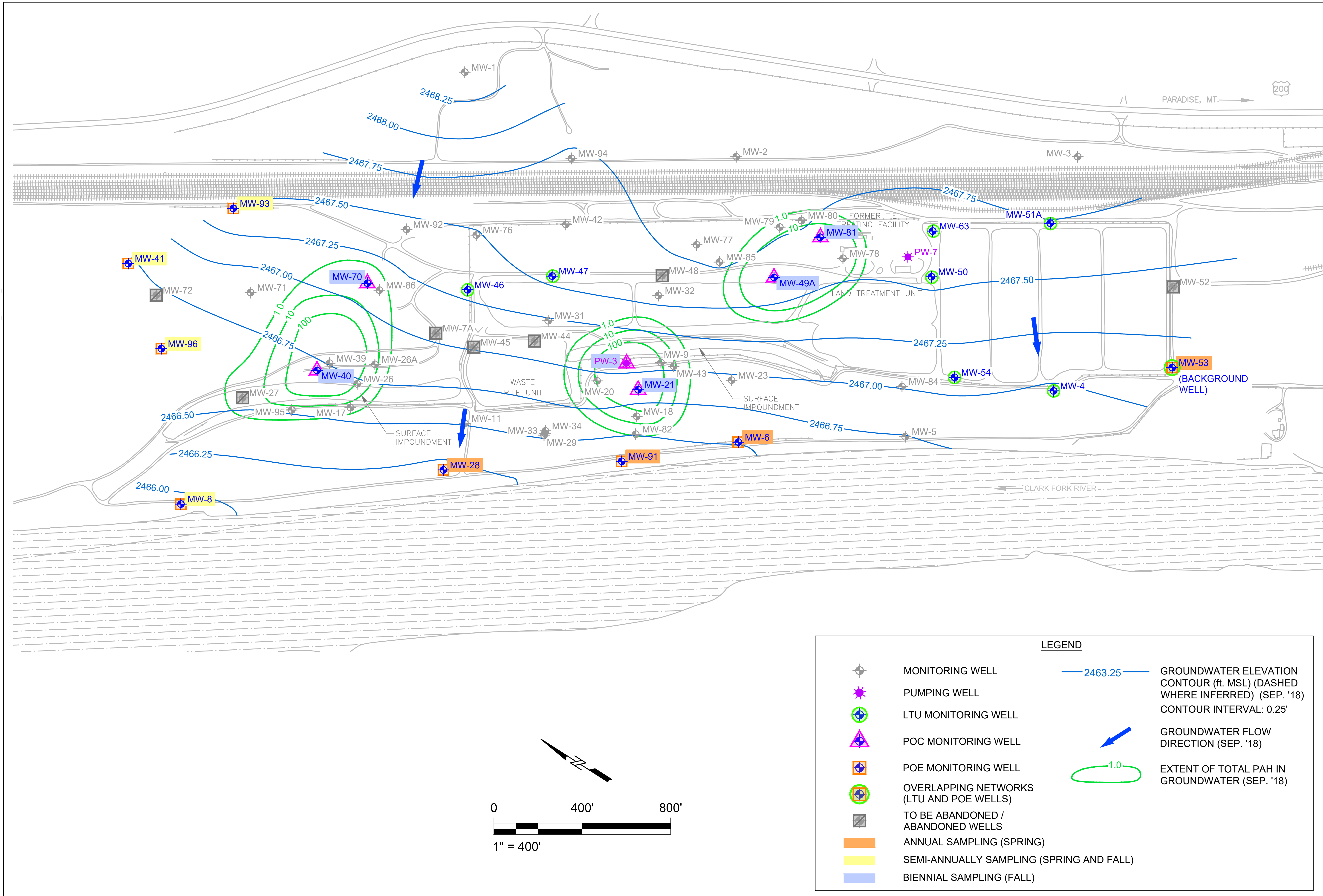
Project No.: 60596506 Date: 03/14/2019

PAH Concentration Trends at MW-81

Figure: 5.5.8-1d



AECOM

Figure: 5.3.8-2

COMPLIANCE MONITORING NETWORK AND FREQUENCY

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Project Management Initials: Designer: Checked: Approved: ANSI B 11" x 17"

Plates

LEGEND

- ① SWMU / AOC Designation
- LTU and POC Monitoring Well
- SI POC Monitoring Well
- SI POE Monitoring Well
- Background Well for LTU and SI Monitoring Networks
- Pumping Well
- Barb Wire Fence
- CAMU Boundary
- Property Boundary

LTU - Land Treatment Unit
POC - Point of Compliance
POE - Point of Exposure
SI - Surface Impoundment

SWMU/AOC NUMBER	SWMU/AOC NAME
SWMU 1	Surface Impoundment
SWMU 2	Waste Pile Unit
SWMU 3 & 4	Leachate Storage Tanks (2)[1]
SWMU 5	Land Treatment Demonstration Plots
SWMU 6 & 7	Open Landfills (2)
SWMU 8	Soil Drums
SWMU 9	Creosote Sludge Drums[1]
SWMU 10	Retaining Wall and Adjacent Depress Track
SWMU 11	Leachate Tank Truck[1]
SWMU 12	Former Wastewater Pipe
SWMU 13	Retort Building
SWMU 14	Horizontal Tank (Retort Building)
SWMU 15	Former Drip Track Area
SWMU 16	Product Storage Area
SWMU 17	Former Sludge Disposal Area
SWMU 18	Former Tank Car Unloading Area
SWMU 19	Brick Incinerator[1]
SWMU 20 & 21	Roundhouse and Sewer Pipe
SWMU 22	Scrap Debris Pile[1]
AOC 1	Boiler Building
	Site-Wide Groundwater

[1] Locations unknown

100 0 200
SCALE: 1" = 200'

AECOM

PLATE 1

TOPOGRAPHIC MAP

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Former Tie Treatment Facility, Paradise MT
Project No.: 60596506 Date: 03/07/19