Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, Montana
60147072
August 2010

Final Work Plan for Additional Data Collection

BNSF Former Tie Treatment Plant Somers, Montana

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Somers, Montana

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1.0 Introduction

This work plan (2010 Work Plan) outlines additional data collection at the BNSF Railway Company (BNSF) Former Tie Treatment Plant in Somers, Montana (Site), and has been prepared by AECOM Environment on behalf of BNSF. The 2010 Work Plan was requested by the United States Environmental Protection Agency (USEPA) and Montana Department of Environmental Quality (MDEQ), hereafter referred to as Agency or Agencies, in a July 15, 2009 letter to BNSF (USEPA 2009). A draft work plan was submitted in January 2010 for Agency review and reflected correspondence BNSF received from the Agencies in July and October 2009 as well as verbal comments made during a series of conference calls occurring in late 2009 and early 2010 between BNSF, the Agencies, and AECOM covering the approach for additional data collection. This revised 2010 Work Plan incorporates Agency comments dated April 19, 2010 to the draft work plan and also includes the revised draft prepared by the Agencies and submitted to BNSF on June 30, 2010. Written correspondence between the Agencies and BNSF pertaining to this Work Plan and the June 2010 draft version of the Work Plan with Agency comments are included in **Appendix D** of this Work Plan.

The USEPA is the lead agency for implementation of work under this 2010 Work Plan pursuant to the 1991 Consent Decree (CV91-32-M-CCL) (USA 1991). The USEPA Project Coordinator, in consultation with the MDEQ Project Officer, has the authority to halt, conduct or direct work approved in this Work Plan pursuant to the Consent Decree that is in the judgment of the USEPA Project Coordinator to be inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan, the 1989 Record of Decision (ROD) for the Site, the Consent Decree, or this Work Plan.

At the BNSF Former Tie Treating Plant in Somers, Montana, a dissolved creosote constituent groundwater plume was treated using a groundwater recovery system (GWTS) located in the former Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) lagoon and treated at an onsite groundwater treatment system (**GWTS – Figure 1**). However, BNSF requested termination of the GWTS in the Groundwater Treatment System Interim Shut-Down Plan (ENSR 2007) based on modeling results that indicated the GWTS provided only minimal creosote constituents removal and the unlikelihood for creosote-impacted groundwater from the Site to migrate to either the town well or Flathead Lake given the geologic conditions of the aquifer and the low mobility of the dissolved creosote constituents of concern (COCs) present onsite. Approval to shutdown GWTS operations for an interim period was granted in October 2007 (USEPA 2007) (**Appendix D**). Since that time, BNSF has collected quarterly monitoring data in accordance with the Groundwater Treatment System Interim Monitoring Plan (ENSR 2008) to evaluate the stability of the dissolved phase plume of COCs and to verify that the plume is naturally attenuating. Results have been reported in quarterly and annual interim monitoring reports (AECOM 2010, 2009, 2008).

Review of groundwater data collected during the interim monitoring period shows continuing phenol concentrations downgradient of the existing controlled groundwater area (CGA) and proposed technical impracticability (TI) boundaries. Recent investigations on the neighboring properties adjacent to the BNSF Somers Site (Applied Water Consulting 2010) also indicate that creosote and/or dissolved phase constituents above the cleanup levels established in the ROD are present in the subsurface beyond the proposed TI boundary.

In addition to the phenol and other creosote related impacts off-Site, there are two issues related to the construction of interim period monitoring wells: 1) monitoring wells S-85-5B, S-85-6B, and S-85-8A exceed zinc cleanup levels but are constructed with galvanized steel casing, which may be causing the zinc exceedances through dissolution or loss of the zinc coating used for galvanization; and 2) upgradient and background well S-3R and downgradient well S-6 have been dry during the interim monitoring period, preventing adequate collection of groundwater monitoring data. Monitoring well S-86-1 was monitored as a replacement background well starting in December 2009 and elevated zinc concentrations have been reported, As a result of the aforementioned issues, USEPA determined that additional work, as defined in Section III of the Consent Decree, is necessary and provided written notification of such additional work to BNSF's Project Coordinator on July 15, 2009. This 2010 Work Plan details the investigation agreed upon by the Agencies and BNSF Railway.

The objectives of the work discussed in this 2010 Work Plan are as follows.

1. Evaluate the extent of creosote and/or dissolved phase constituents in groundwater that may exceed cleanup levels set forth in the ROD (USEPA 1989) as amended through subsequent Explanation of Significant Differences (ESDs) (USEPA 1998, 1992). This will be achieved through the installation of additional borings and wells and collection of samples between the former CERCLA lagoon and wells S-84-15 and S-91-2.
2. Better assess the source of zinc in groundwater that exceeds the cleanup level in the ROD by replacing galvanized steel constructed wells S-85-5B, S-85-6B, S-85-8A, and S-86-1 with wells constructed of poly vinyl chloride (PVC).
3. Replace monitoring wells S-3R and S-6, which have been dry during recent years, with wells completed with a deeper screen interval.

Data obtained during implementation of this 2010 Work Plan will be used in accordance with the provisions outlined in the 1991 Consent Decree, the Data Quality Objectives (DQOs) outlined in **Appendix C** of this 2010 Work Plan and the Quality Assurance Project Plan included as **Appendix E** of this 2010 Work Plan. In the event of conflict between this 2010 Work Plan and Consent Decree, the Consent Decree shall preside.

The scope of work is presented in Chapter 2.0. Chapter 3.0 briefly discusses major components of the Quality Assurance Project Plan (QAPP). A Health and Safety Plan (HASP) that specifies employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 29 Code of Federal Regulations 1910.120(l)(1) and (l)(2) is discussed in Chapter 4.0. Chapter 5.0 includes the schedule for completing all activities associated with this 2010 Work Plan while Chapter 6.0 describes the reporting requirements for these activities. Chapter 7.0 contains the references consulted in the development of this 2010 Work Plan.

2.0 Scope of Work

This chapter presents the scope of work needed to meet the objectives of additional data collection specified in Chapter 1.0, including data collection locations, discussion of the borings and monitoring wells that will be installed, types of data that will be collected, field methods for collection, laboratory analytical methods, and data collection locations[1]. Data collection activities will be conducted in a manner consistent with the procedures set forth in the Project Operating Procedures (POPs) included in **Appendix A** of this 2010 Work Plan. The text procedures described in this 2010 Work Plan supersedes any POP text if the 2010 Work Plan and POP differ but are not intended to modify the Consent Decree. Field investigation activities will be conducted in a manner consistent with the procedures set forth in the Consent Decree and this 2010 Work Plan. The Site-specific HASP and Quality Assurance/Quality Control (QA/QC) Plan, also referred to as a QAPP, also will be followed while implementing the additional work outlined in this 2010 Work Plan. **Figure 1** presents the site layout and the locations and proposed borings and monitoring wells.

2.1 Extent of Creosote and/or Dissolved Phase Constituents and Proposed TI Boundary Location

Additional activities are proposed to determine the extent of the creosote and/or dissolved phase constituents downgradient of the source area originating from the former CERCLA lagoon toward monitoring wells S-84-15 and S-91-2 to fulfill the primary objective of this 2010 Work Plan. The data collected during implementation of this work plan and in future quarterly monitoring events also will help evaluate the stability of the plume and to verify that natural processes are present to aid in breaking down these constituents. The data also will help determine if the proposed TI and the existing CGA boundaries should be revised (**Figure 1**).

2.1.1 Boring Locations

Soil borings will be installed between existing wells S-93-5S and S-88-2 within the source area and well S-91-2 downgradient from the source area and proposed TI boundary to initiate field investigations that fulfill the primary objective and the first principal study question discussed in the DQOs in **Appendix C** of this 2010 Work Plan. Borings will be located as follows (**Figure 1**).

- Soil boring IB-1 is proposed to be installed approximately midway between S-93-5S and S-91-2 and will be located near Somers Road.
- Soil boring IB-2 is proposed to be installed approximately midway between S-88-2 and S-91-2. The location for this boring has been adjusted per Agency request and is outside the existing CGA.
- Soil boring IB-3 is proposed to be installed between the CERCLA lagoon borings CB-10 and CB-11 installed in 1991 as requested by the Agencies in their comments to the approach for the Somers field effort provided in an e-mail sent December 2, 2009.

Actual boring locations may vary due to existing structures, utility locations, and/or conditions set forth in access agreements discussed in Section 4.1 of this 2010 Work Plan. If the location varies more than 50 feet from the location proposed in this 2010 Work Plan, placement will be determined in consultation with the Agencies and will be documented in the 2010 Data Collection Results Report. Soil borings IB-1 and IB-3 will be installed first as observations during the installation of these borings may affect the placement of IB-2.

Proposed monitoring wells S-10-1, S-10-2, and S-10-3 will be installed based on the groundwater results obtained from IB-1, IB-2, and IB-3 (**Figure 1**). If any groundwater analytical result from boring IB-1, IB-2, and

[1] BNSF will provide data resulting from the field investigation, validated or unvalidated, to EPA upon request notwithstanding the schedule as specified in Section 5.0 of this Work Plan.

IB-3 exceed the groundwater target cleanup goals established in the ROD for the COCs at the Site, two wells (S-10-1 and S-10-2) will be installed downgradient of all the borings, outside the existing CGA, and upgradient of monitoring wells S-84-15 and S-91-2; while the third well (S-10-3) will be installed at the closest proximity to the existing CGA. If all results do not exceed the groundwater target cleanup goals established in the ROD, S-10-1A will be installed between borings IB-1/IB-3 and S-93-5S and S-10-2A will be installed between boring IB-2 and S-88-2 at the closest proximity to the existing CGA boundary. Precise well locations will be determined through consultation with the Agencies and will be documented in the 2010 Data Collection Results Report.

2.1.2 Installation and Sampling Methods

Borings will be installed and sampled per the following protocol.

- Borings will be developed using Sonic or hollow stem auger (HSA) drilling to approximately 65 to 70 feet below ground surface (bgs) or until evidence of contamination is no longer observed, whichever is greater (**POP 210**).
  - Each HSA section or the continuous Sonic core will be logged by a field scientist/engineer and recorded in the field logbook (**POP 210**).
  - Portions of the soil sample from each section or core will be placed in plastic bags and the headspace will be screened using a photo ionization detector (PID) after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook (**POP 310**).
  - A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized (**POP 006**). Any drilling mud or well development/purge liquid collected also must be properly contained and disposed of (**POP 006**). Soils and liquid will be managed as indicated in Section 4.2.
- Soil samples will be collected if evidence of creosote impacts (i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 parts per million [ppm]) is encountered above the groundwater table. The interval from which samples are collected will be recorded in the field logbook, and photos will be taken of the soil boring as appropriate (**POP 210**).
  - Samples will be collected from the continuous Sonic core or from split spoons, depending on the drilling method used, where PID readings or staining indicates the greatest area of impact. Samples will be collected in accordance with **POP 210**.
  - Samples will be sent to Pace Analytical Services, Inc. (Pace) in Minneapolis, Minnesota and will be analyzed for total and carcinogenic polycyclic aromatic hydrocarbons (TPAH and CPAH, respectively) by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020. Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110**.
  - Split samples will be made available to the Agencies and the property owner upon request; however, there is a finite amount of soil available during boring installation and there may be an insufficient volume to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners. The Agencies will follow proper methods established in **POP 110** and **POP 210** if split samples are taken.
- Discrete groundwater samples will be collected at 15-foot intervals from the start of the groundwater table to the end of the boring (**POP 210**, and **POP 230**).
  - Samples will be collected by either:
    1. Pulling back the sonic casing and installing a packer assembly or power punch into the exposed borehole and collecting groundwater at the desired depth. Samples collected using a

packer assembly would be collected from a stainless steel screen attached to a 2-inch diameter black pipe; the packer is inflated to isolate the desired depth interval and a bailer or peristaltic pump is used to collect the sample. Samples collected using a power punch would be collected by driving the sampler to the desired depth, pulling back on the sampler to expose the screen, and withdrawing the tool after a sufficient collection time has elapsed.
– or –

2. Advancing a power punch sampling tool past the drilling auger at the desired depth and collecting groundwater from a three-quarter inch screen exposed at the desired depth by using a small diameter bailer or a peristaltic pump or by the method described above in bullet 1.

– Samples will be sent to Pace and will be analyzed for PAH by 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020; results will be evaluated against the ROD cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc). Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110**.

– A 24-hour turnaround will be requested on groundwater samples collected from IB-1, IB-2, and IB-3 as results collected from these borings will determine the location of additional borings or monitoring wells.

– Groundwater sampling logs will be completed and/or notes will be added to the field logbook and presented in the 2010 Data Collection Results Report (**POP 230**). If a sufficient volume of water can be collected, field readings of temperature, pH, and conductivity will be collected and recorded in the field logbook or on the groundwater sampling log.

– Split samples will be made available to the Agencies and property owners upon request provided a sufficient volume of water can be collected from the boring.

- Borings will be abandoned following sample collection. Boring abandonment activities will be conducted in accordance with Montana Administrative Code 36.21.670. The boring will be filled with sealing material (bentonite) to within three feet of the surface to prevent vertical movement of groundwater in the bore hole. Any remaining hole will be filled with unimpacted or clean naturally occurring soils.

As indicated in Section 2.1.1, additional borings or monitoring wells will be installed based on the results obtained from samples collected from borings IB-1, IB-2, and IB-3. Wells will be installed and sampled per the following protocol.

- Wells will be drilled using Sonic or HSA drilling to approximately 65 to 70 feet bgs or until evidence of contamination is no longer observed, whichever is greater.
- Each HSA section or the continuous Sonic core will be logged by a field scientist/engineer and recorded in the field logbook **(POP 210)**.
- A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized (**POP 006**). Any drilling mud or well development/purge liquid collected also must be properly contained and disposed of (**POP 006**). Soils and liquids will be managed as indicated in Section 4.2.
- Portions of the soil sample will be placed in plastic bags and the headspace will be screened using a PID after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook **(POP 310**).
- Grab samples of soil will be collected if evidence of contamination is encountered above the water table (i.e., dark staining, hydrocarbon odors). Soil samples will be collected in accordance with **POP 210**.

- The interval from which samples are collected will be recorded in the field logbook and photos will be taken of the soil borings as appropriate.
  - Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020.
  - Split samples will be made available to the Agencies and the property owner upon request if sufficient volume is available to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners.
- As requested by the Agencies in the December 2, 2009, correspondence (**Appendix D**), a cross-section between existing wells and the new borings will be sketched. Geological, PID, and analytical data will be used to determine the appropriate groundwater sampling and screen placement intervals. The PID readings at the well locations and the information from the sketched cross sections will be used to select the most likely intervals where creosote impacts may be encountered. The sketched cross sections will be included with the descriptions of the work performed in the 2010 Data Collection Results Report.
- The wells will be completed as follows (**POP 006**):
  - Constructed with 2-inch diameter schedule 40 PVC casing and 0.010 inch slotted screen.
  - The wells will be screened over a 10-foot interval across the water table where evidence of creosote impacts is noted. If multiple zones of impacts are observed, screen placement will be determined through consultation with the Agencies. If no impacts are observed, the screen will be placed from 25 to 35 feet bgs since wells S-91-2 and S-88-2 are screened over a similar interval.
  - Surface completion will be done in consultation with the property owners. Completion may consist of a 2- to 3-foot stickup casing with a locking lid; bollards may be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well or the well may be completed as a flush-mount well.
- Groundwater samples will be collected from impacted intervals based on the cross-sections described above, field observations, and PID readings. If no impacts are observed, the well will be completed and developed and groundwater samples will be collected from the screened interval following well development. The depth to water will be measured and recorded prior to sample collection (**POP 110**, **POP 221**, **POP 230**, and **POP 231**).
  - Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020; results will be compared to the ROD cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc).
  - A normal turnaround time will be requested.
  - Split samples will be made available to the Agencies and/or property owners upon request provided a sufficient volume of water can be collected from the boring.

2.2 Galvanized Steel Constructed Well Replacement

Wells S-85-5B, S-85-6B, S-85-8A, and S-86-1 will be replaced with wells constructed with PVC casing and screen material to fulfill the secondary objective of this 2010 Work Plan. The replacement wells will be installed approximately 25 feet upgradient from the existing wells to ensure these wells are installed outside of the influence of zinc suspected to originate from the galvanized steel casing used to construct the original wells. The replacement wells will be installed at a similar depth as the original wells using 2-inch schedule 40 PVC. A 0.010 or 0.020 inch slotted screen will be used depending on the screen in the existing well that is being replaced. The well completion logs from S-85-5B, S-85-6B, S-85-8A, and S-86-1 are included in **Appendix B**. New well completion logs will be created for S-85-5B, S-85-6B, S-85-8A, and S-86-1 and have been designated S-85-5BR, S-85-6BR, S-85-8AR, and S-86-1R and will be provided in the 2010 Data Collection Results Report.

- The wells will be completed as follows (**POP 006**):
  - Constructed with 2-inch diameter schedule 40 PVC casing and 0.010- or 0.020-inch slotted screen depending on the screen in the existing well that is being replaced.
  - The replacement wells will be installed at a similar depth as the original wells.
  - A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized**.** Any drilling mud or well development/purge liquid collected also must be properly contained and disposed of. Soils and liquids will be managed as indicated in Section 4.2.
  - Completion may consist of a 2 to 3 foot stickup casing with a locking lid; bollards also may be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well.

The replacement wells will be sampled during the regularly scheduled sampling event following installation. Sample results collected during four consecutive events will be evaluated to determine compliance with the target cleanup goals for site COCs. The Agencies, in consultation with BNSF, also will determine if the proposed TI area around nested wells S-85-5A and S-85-5B is necessary.

Wells S-85-5B, S-85-6B, S-85-8A, and S-86-1 will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2. Where possible, the casing will be removed from the ground. In the event that the casing cannot be removed, it will be cut off 3 feet bgs. The well will then be filled with sealing material (bentonite) to within 3 feet of the surface. Any remaining hole will be filled with non-impacted or clean naturally occurring soils.

2.3 Background Well Replacement

Monitoring wells S-3R and S-4 were initially selected as the background wells for the Site in the FINAL Groundwater Treatment System Interim Monitoring Plan (Plan) submitted February 2008 (modified May 2008) (ENSR 2008). Well S-3R is also designated as the background well for the LTU network. Because wells S-3R and S-4 have contained an insufficient volume of water to allow reliable sample collection, the revised Work Plan submitted in October 2009 (ENSR 2009) designated well S-86-1 as the background well.

Well S-86-1 was sampled in December 2009 following extensive well development (**POP 221**). Analysis of samples collected from the well during the December 2009 event detected the presence of TPAHs and reported CPAH compounds above the ROD based target cleanup levels. In addition, well S-86-1 contained zinc concentrations of 20.5 mg/L during the March 2010 groundwater sampling event. As a result, the Agency deemed S-86-1 not acceptable as a background monitoring well since the objective of a background well is to monitor the quality of groundwater that is unimpacted by Site COCs.

A replacement well for S-3R will be installed similar to, but will be screened deeper than, S-3R (see **Appendix B** for the well completion log from S-3R) if the bedrock elevation allows and will be constructed with 2-inch schedule 40 PVC casing and 0.010 slotted screen (**Figure 1**). A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized (**POP 006**). Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of (**POP 006**). Soils and liquids generated during well installation will be managed as indicated in Section 4.2. Completion may consist of a 2- to 3-foot stickup casing with a locking lid; bollards may be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well.

A new well completion log will be created for S-10-3R and will be provided in the 2010 Data Collection Results Report. As the newly installed well is a background well and is being installed upgradient of the source area, impacted intervals are not expected to be encountered. Upgradient well S-3R will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2. Per Agency request, upgradient well S-4 will not be abandoned during this scope of work; the need to abandon this well will be determined through future consultation between the Agencies and BNSF.

Replacement well S-10-3R will be sampled during the regularly scheduled sampling events following installation as part of the plume stability network. Groundwater sample results will continue to be collected and reported quarterly during the remainder of the interim monitoring period. The newly installed well S-10-3R will also be used as the LTU network background well for the remainder of the post-closure monitoring period.

2.4 Well S-6 Replacement

Monitoring well S-6 is included in the interim monitoring period plume stability network and also sampled as part of the land treatment unit post-closure monitoring program. This well regularly has an insufficient volume of water in the well to collect samples; therefore, a deeper well will be installed to replace S-6 (S-6R). The boring for monitoring well S-6R will be installed and sampled in the same fashion as borings IB-1, IB-2, and IB-3.

If soil and groundwater samples from the boring do not indicate the presence of COCs above target cleanup levels, the well will be installed similar to but screened slightly deeper than S-6 (see **Appendix B** for the well completion log from S-6). Monitoring well S-6R will be constructed with 2-inch schedule 40 PVC casing and 0.010 slotted screen. A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized and any drilling mud or well development/purge liquid collected will be properly contained and disposed of **(POP 006)**. Soils and liquids generated during well installation will be managed as indicated in Section 4.2. Completion may consist of a 2- to 3-foot stickup casing with a locking lid; bollards may be placed around the completed wells if protection from vehicular traffic is needed to prevent damage to the well. A new well completion log will be created for S-6R and will be provided in the 2010 Data Collection Results Report. If impacted intervals are encountered, the screen may be placed at the impacted interval. Well S-6 will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2.

Samples will be collected from the replacement well if impacts are observed in the boring (i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm). A soil sample will be collected and analyzed as described in Section 2.1.2 if impacted soil is observed above the groundwater table. Groundwater samples will be collected as described in Section 2.1.2 if impacted intervals are observed below the water table. A normal turnaround time will be requested on all samples as no additional boring locations will be dependent on results obtained from boring S-6R.

Replacement well S-6R will be sampled during the regularly scheduled sampling events as part of the plume stability network following installation. Groundwater sample results will continue to be collected and reported quarterly during the remainder of the interim monitoring period.

2.5 Well Development

Monitoring wells installed in conjunction with this 2010 Work Plan will be developed following installation to remove silt and other fine-grained sediments that may accumulate within the monitoring well during installation. Development will be done by the drilling company through one or a combination of techniques including surging and pumping (**POP 221**).

- Pumping involves using a pump to evacuate water and silt from the well.
- With surging, a tool is used to scour the screened interval in an up and down repetitive motion, causing the groundwater to surge in and out through the screen and forcing fines out of the formation.

The monitoring wells will be developed until water is relatively free of sediment or until all of the groundwater has been removed. The 2010 Data Collection Results Report will indicate the development methods used.

Water generated during well development activities will be collected, drummed, and analyzed as indicated in Section 4.2.

2.6 Well Survey

All wells and boring locations will be surveyed by a licensed surveyor as part of the upcoming Agency Five-Year Review, which is scheduled to be completed by September 2011. Surveying will be provided by Montana licensed professional land surveyor. Surveying will be based on the horizontal datum of NAD 83 Montana State Plane Feet and the vertical datum of NAVD 88. Positional accuracy of the survey will meet the Accuracy Standards for ALTA/ACSM Land Title Surveys, as adopted by the American Land Title Association and the National Society of Professional Surveyors. The well elevations obtained will be incorporated in all future routine sampling and well gauging events.

3.0 Quality Assurance Project Plan

When sampling and analyzing samples, appropriate quality assurance/quality control and chain of custody procedures will be used in accordance with USEPA's "Requirements for Quality Assurance Project Plans" and any other pertinent USEPA guidance. These requirements are incorporated in the 1985 QA/QC Plan that was prepared for the Site during the remedial investigation process in 1985; the previously Agency-approved QA/QC Plan is included as **Appendix E** of this 2010 Work Plan. Major components of the QAPP or QA/QC Plan are discussed below. Deviations from these components during implementation of this 2010 Work Plan will be discussed in the 2010 Data Collection Results Report.

3.1 Decontamination

All sampling equipment will be subject to appropriate decontamination protocol (**POP 110**, **POP 120**). To assess the adequacy of decontamination procedures, rinsate or equipment blanks should be collected and analyzed for the same parameters as the field samples. In general, 1 rinsate blank will be collected per 20 samples.

3.2 Chain of Custody

All samples will be shipped overnight to the project laboratory. Sample collection, storage, and shipment will follow chain of custody protocol outlined in the QA/QC PLAN and **POP 110**.

3.3 Laboratory Data Validation and Usability

Data validation is a process of review of the analytical results and documentation against established criteria. The Laboratory Quality Control Officer is responsible for performing the validation.

The precision and accuracy of all data will be computed and compared to the control limits as part of the data validation process. The precision is determined from the analytical results of duplicate samples; accuracy is computed from spike recoveries.

The results of all other quality control checks will be reviewed in terms of the following criteria:

- Method blank values should be reasonably low, so that there is no evidence of contamination of reagents and glassware.
- Shipping or trip blank values should also be reasonably low, indicating that samples have been adequately protected from contamination.
- The daily calibration curves should be linear over their entire range, and all samples analyzed should be within that range.
- Surrogate recoveries (as applicable) should be within control limits.

If any of the above criteria are not met, the Laboratory Supervisor and Project Manager will be notified and will meet with the Laboratory Control Officer to discuss remedies and the status of the data.

For each batch of analyses, supporting documentation will be reviewed for completeness, correctness, and legibility.

3.4 AECOM Data Validation

The analytical data will be validated by a designated AECOM Quality Assurance officer. Validation will include reviewing the analytical results for the analysis performed and reported.

This will be performed to ensure that data were produced in accord with procedures outlined in this project plan. The following elements will be reviewed for compliance as part of the abbreviated data validation:

- Holding Times
- Instrument Calibration
- Method Blanks
- Matrix Spikes
- Laboratory Duplicates
- Laboratory Control Spikes
- Reporting Limits
- Analyte Identification
- Analyte Quantification
- Comparison of hardcopy results to Electronic Data Deliverable (EDD)

3.5 Data Quality Assessment

Information obtained through the implementation of this 2010 Work Plan will be evaluated through the Data Quality Assessment (DQA) process to determine if the data obtained are of adequate quality and quantity to support their intended use. The DQA process consists of five steps, as summarized below (USEPA 2000):

1. Review the DQOs (**Appendix C** of this 2010 Work Plan) and Sampling Design: DQO outputs will be reviewed to ensure that they are still applicable. The sampling analysis and data collection documentation will also be reviewed for completeness and consistency with DQOs.
2. Conduct a Preliminary Data Review: Data validation reports will be reviewed to identify any limitations associated with the analytical data. Basic statistics will be utilized by the laboratory where applicable and meaningful graphs of the data will be prepared. This information will be used to learn about the structure of the data and to identify patterns, relationships, or potential anomalies/outliers.
3. Select the Statistical Method: Select the appropriate procedures for summarizing and analyzing the data, based on the review of the performance and acceptance criteria associated with the project objectives, the sampling design, and the preliminary data review. Identify the key underlying assumptions associated with the statistical tests.
4. Verify the Assumptions of the Statistical Method: Evaluate whether the underlying assumptions hold, or whether departures are acceptable, given the actual data and other information about the study.
5. Draw Conclusion from the Data: Perform the calculations necessary to draw reasonable conclusions from the data. If the design is to be used again, evaluate the performance of the sampling design.

Uncertainty of validated data will be identified in the report and evaluated by the Site team identified in **Appendix C** to determine if the DQOs were met. In the event that the DQOs were not met, they will be reviewed to determine if they are achievable and may be revised if necessary, and the data may be further evaluated to determine the impact to the project. Data usability and limitations will be evaluated by the Site team.

4.0 Health and Safety

A HASP has been developed for the Somers site. The HASP is reviewed annually and updated as needed. The HASP contains emergency contact information and directions to the hospital, as well as information on hazards generally present on AECOM field sites. A copy of the HASP is included as **Appendix F** of this 2010 Work Plan and will remain on-site in the treatment building office throughout the data collection activities; all personnel working on site must read and sign the HASP. Task Hazard Analyses (THAs) have been prepared for tasks expected during the additional activities and are included in the HASP.

Safety equipment is available on site and personnel involved in the work activities need to be familiar with its proper use and location. Equipment includes the safety shower eyewash station and fire extinguishers. Minimum personal protective equipment (PPE) requirements include safety glasses with side shields, hard hats, and steel-toed boots. Gloves shall be worn when handling equipment and materials. Nitrile or other chemically impervious gloves shall be worn when working with contaminated liquids or sludges. Orange vests will also be worn when working around moving vehicles or near public roads.

Below is a list of general safety guidelines that will be followed during the additional data collection activities.

- All contractors will have completed the BNSF Contractor Orientation Training prior to conducting work on site. Annual certification is required.
- All manufacturers' recommended safety precautions for all chemicals will be followed. Refer to the Material Safety Data Sheets located in the HASP.
- A task or job hazard analysis will be conducted prior to performing interim monitoring tasks. If a THA already exists for the activity, it will be reviewed by all personnel involved in the task. New THAs will be filed in the HASP.
- All required PPE shall be worn while conducting work on site.
- Special precautions will be taken with moving liquids. This requires the use of protective clothing and maintaining a safe distance.
- When installing wells outside of the fenced Site, exclusion zones will be established around working areas to protect untrained and unqualified individuals.
- Utility locates will be conducted prior to installing borings and wells.
- All personnel are empowered to stop work activities if a deviation from planned activities occurs or if an unsafe condition is present.

4.1 Access Agreements

Owners of the property where borings and wells may be located will be contacted sufficiently in advance to allow time for obtaining access – no less than 30 days prior to commencing work. BNSF shall make best efforts to locate borings and wells away from structures and utilities. BNSF shall also use best efforts to obtain written access agreements to such property. Such agreements shall ensure access for the United States and it authorized representatives. If BNSF is unable to obtain access within that time frame, no later than 27 days prior to the time access is needed, BNSF shall notify USEPA of the failure to obtain access, and the efforts made to obtain it.

If BNSF is unable to obtain access, where USEPA has determined it to be necessary for carrying out the work under this 2010 Work Plan, USEPA may then assist BNSF in gaining access, to the extent necessary to effectuate the investigations described in this Work Plan, using such means as USEPA deems appropriate. USEPA may at its discretion also consider alternate locations, including but not limited to existing County rights-of-way on the property, as appropriate. If USEPA determines that placing the well/boring in a County right-of-way is acceptable (in the event a property owner refuses access), BNSF agrees it will make best efforts to obtain access for such placement from the County. Nothing in Section 4.1 is intended to modify the Consent Decree.

No personnel or individuals shall be allowed within the work area without prior approval. Property owners will be notified of the work activities and health and safety concerns. Access to the work area will be controlled with barricades, temporary fencing, or other means to limit entry. The AECOM field manager will be responsible for ensuring unauthorized access to the work area is prevented.

If a monitoring well is installed off of BNSF owned property, an access agreement will be drafted with which the property owner will grant BNSF and the Agencies access to the well for future monitoring and operation and maintenance.

4.2 Data Collection-Derived Waste Management

Waste material including but not limited to soils and liquids generated during the field work will be containerized and stored within the fenced area of the Somers Site until appropriate disposal can be arranged. “Waste Material” shall mean: 1) any “hazardous substance” under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); 2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); 3) any “solid waste” under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and 4) any “hazardous waste” under State law.

4.2.1 Soils

A composite sample will be collected from the containerized soil and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, zinc by EPA Method 6020 and potentially other methods required to appropriately profile the waste. Soil cuttings that are non-hazardous will be spread on the ground surface within the fenced area of the Site. If soil cuttings are determined to be hazardous waste (F034), they will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

4.2.2 Liquids

Liquid produced during sampling and decontamination activities will be collected, drummed, and analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020. Liquid that does not exceed the ROD target cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc) will be poured onto the ground surface within the fenced area of the Site. If collected liquid exceeds the ROD target cleanup level, the drums will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

5.0 Schedule

The schedule for the scope of work included in his Work Plan is as follows:

- Final Draft Work Plan for Additional Data Collection submittal – July 30, 2010 (submittal of Attachments by August 31, 2010).
- Receive Agency approval of Work Plan – August 20, 2010.
- Access Agreements in Place – No later than September 30, 2010.
- Complete Field Activities – October 31, 2010.
- Submit Draft 2010 Data Collection Results Report – December 31, 2010.
- Submit Final 2010 Data Collection Results Report – 30 days after receipt of Agency comments.

6.0 Reporting

Upon completion of field activities and receipt of analytical results, 2010 Data Collection Results Report shall be prepared and submitted to the Agencies for review and approval. The draft report, due on December 31, 2010, will include but not be limited to the following information:

- Description of all activities conducted under this 2010 Work Plan
- Deviations to the planned work
- Access agreements
- Evaluation of data quality
- Boring and/or well logs
- Analytical results for both soils and groundwater, in summary table format, including comparison to the cleanup levels in the ROD
- Water levels measured
- Cross sections and lithology diagrams
- Copies of field logbooks and photos taken
- Field data
- COC concentration contour diagrams

The final 2010 Data Collection Results Report shall be submitted 30 days after receipt of Agency comments, and shall include a formal response to Agency comments.

7.0 References

AECOM. 2010. Second Annual Interim Monitoring Report. BNSF Former Tie Treatment Plant. Somers, Montana. May 2010.

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_____. 2007. Groundwater Treatment System Interim Shut-Down Plan. October 2007.

USEPA. 2009. Letter to David M. Smith, BNSF. RE: Agency Comments on the Revisions to the Interim Monitoring Plan Resulting from Comments on the Annual Report, BNSF Former Tie Treatment Plant, Somers, Montana. July 15, 2009.

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_____.1998. Explanation of Significant Differences, Burlington Northern (Somers Plant) Site, Flathead County, Montana. July 1998.

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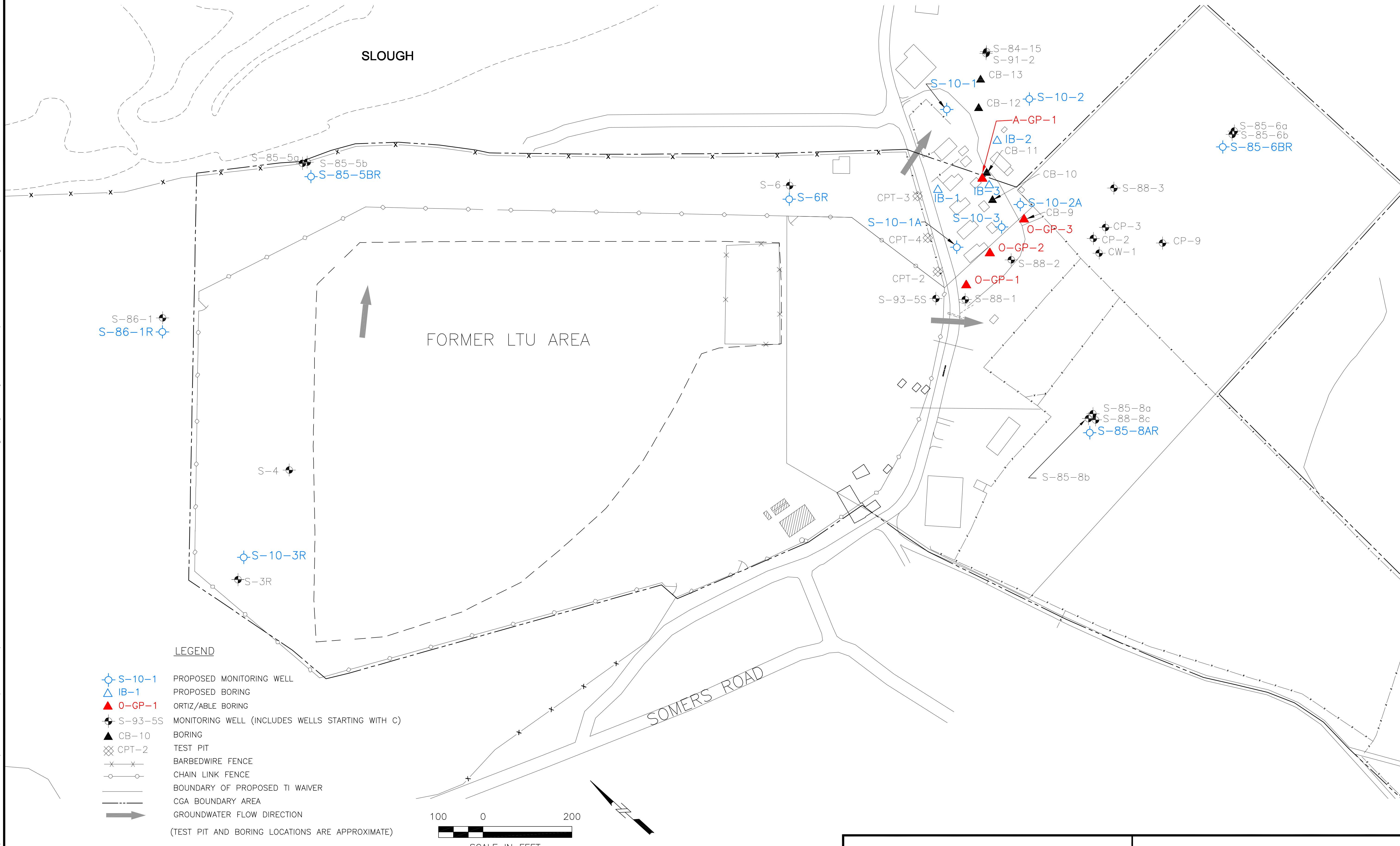
USA. 1991. Consent Decree for Remedial Design/Remedial Action (Civil Action No. CV-91-32-M-CCL). United States of America District Court Missoula Division. February 1991.



AECOM

BNSF RAILWAY COMPANY
SOMERS, MONTANA (60147072-510)

ADDITIONAL DATA COLLECTION SITE MAP

DATE: 8/25/10 | DRWN: LP/FTC

FIGURE 1

File: S:\CADD\CADD FORT COLLINS\BNSF Somers\60147072\ADDITIONAL DATA COLLECTION SITE MAP 8-10.dwg Layout: Layout1 User: paull Plotted: Aug 30, 2010 - 11:17am Xref's:

Appendix A

Project Operating Procedures (POPs)

1.0 Scope and applicability

1.1 Purpose and Applicability

1.1.1 This Project Operating Procedure (POP) provides guidance for installing groundwater monitoring wells. Monitoring wells are installed to monitor the depth to groundwater, to measure aquifer properties, and to obtain samples of groundwater for chemical analysis.

1.1.2 This POP is applicable to installation of single monitoring wells within a borehole. The construction and installation of nested, multilevel or other special well designs are not covered within this POP as these type of wells are not frequently constructed. This POP applies to both overburden and bedrock monitoring wells.

1.1.3 Some states and United States Environmental Agency (USEPA) Regions have promulgated comprehensive guidelines for monitoring well construction and for subsurface investigation procedures. Deviations from this POP to accommodate other regulatory requirements should be reviewed in advance of the field program and must be documented in the field project notebook when they occur.

1.2 General Principles

1.2.1 Monitoring well construction and installation generally involves drilling a borehole using conventional drilling equipment, installing commercially available well construction and filter/sealing materials, and development of the well prior to sampling. This POP covers well construction and installation methods only.

2.0 Health and safety considerations

2.1 Monitoring well installation may involve chemical hazards associated with materials in the soil or groundwater being investigated; and always involves physical hazards associated with drilling equipment and well construction methods. When wells are to be installed in locations where the aquifer and/or overlying materials may contain chemical hazards, a Health and Safety Plan (HASP) must be prepared and approved by the Health and Safety Officer before field work commences. This plan must be distributed to all field personnel and must be adhered to as field activities are performed.

3.0 Interferences

Not Applicable

4.0 Equipment and materials

4.1 Well Construction Materials

4.1.1 Well construction materials are usually provided by the drilling subcontractor and most often consist of commercially available flush-threaded well screen and riser pipe constructed of PVC or stainless steel with a minimum 2-inch inside diameter. The length of the screen and the size of the screen slots should be specified in the project-specific work plan.

4.2 Well Completion Materials

4.2.1 Well completion materials include silica sand, bentonite, cement, protective casings and locks. Completion materials are generally provided by the drilling subcontractor.

4.3 Other required materials include the following:

- Potable water supply
- Fiberglass or steel measuring tape
- Water level indicator
- Well completion log (Figure 1)
- Waterproof marker or paint (to label wells)
- Health and Safety supplies
- Equipment decontamination materials
- Field project notebook/pen

5.0 Procedures

5.1 General Preparation

5.1.1 Borehole Preparation

- Standard drilling methods should be used to achieve the desired drilling/well installation depths specified in the project-specific work plan.
- Rotary drilling methods requiring bentonite-based drilling fluids, if selected, should be used with caution to drill boreholes that will be used for monitoring well installation. The bentonite mud builds up on the borehole walls as a filter cake and permeates the adjacent formation, potentially reducing the permeability of the material adjacent to the well screen.
- An attempt should be made to recover the quantity of fluid or water that was introduced, either by flushing the borehole prior to well installation and/or by overpumping the well during development.

5.1.2 Well Material Decontamination

- Although new well materials (well screen and riser pipe) generally arrive at the site boxed and sealed within plastic bags, it is sometimes necessary to decontaminate the materials prior to their use. Well materials should be inspected by the project geologist/engineer upon delivery to check cleanliness. If the well materials appear dirty, or if local or regional regulatory guidance requires decontamination, then well material decontamination should be performed by the drilling subcontractor.

5.2 Well Construction Procedure

5.2.1 Depth Measurement

- Once the target drilling depth has been reached, the drilling subcontractor will measure the total open depth of the borehole with a weighted, calibrated tape measure. Adjustments of borehole depth can be made at this time by drilling further or installing a small amount of sand filter material to achieve the desired depth. If drilling fluids were used during the drilling process, the borehole should be flushed at this time using potable water. The water table depth may also be checked with a water level indicator if this measurement cannot be obtained with the calibrated tape.

5.2.2 Centralizers

- To install a well centered within the borehole, it is recommended that centralizers be used. Centralizers are especially helpful for deep well installations where it may be difficult to position the well by hand. Centralizers may not be necessary on shallow water table well installations where the well completion depth is within 25 feet of the ground surface.

5.2.3 Well Construction

- The well screen and riser pipe generally are assembled by hand as they are lowered into the borehole. Before the well screen is inserted into the borehole, the full length of the slotted portion of the well screen as well as the unslotted portion of the bottom of the screen should be measured with the measuring tape. These measurements should be recorded on the well construction diagram.
- After the above measurement has been taken, the drilling subcontractor may begin assembling the well. As the assembled well is lowered, care should be taken to ensure that it is centered in the hole if centralizers are not used. The well should be temporarily capped before filter sand and other annular materials are installed.

5.2.4 Filter Sand Installation

- The drilling contractor shall fill the annular space surrounding the screened section of the monitoring well with the filter pack material to at least two feet above the top of the screen. Furthermore, a tremie pipe will be used for filter pack installation regardless of well depth. In general, the filter pack should not extend more than 3 feet above the top of the screen to limit the thickness of the monitoring zone. If coarse filter materials are used, an additional 1-foot thick layer of fine sand should be placed immediately above the filter pack to prevent the infiltration of sealing components (bentonite or grout) into the filter pack. As the filter pack is placed, a weighted tape should be lowered in the annular space to verify the depth to the top of the layer. Depending upon depth, some time may be required for these materials to settle.

5.2.5 Bentonite Seal Installation

- A minimum 2-foot thick layer of bentonite pellets or slurry seal will be installed by the drilling subcontractor immediately above the well screen filter pack in all monitoring wells. The purpose of the seal is to provide a barrier to vertical flow of water in the annular space between the borehole and the well casing. Bentonite is used because it swells significantly upon contact with water. Pellets generally can be installed in shallow boreholes by pouring them very slowly from the surface. If they are poured too quickly, they may bridge at some shallow, undesired depth. As an option, powdered bentonite may be mixed with water into a very thick slurry and a tremie pipe used to inject the seal to the desired depth.

5.2.6 Annular Grout Seal Installation

- This grout seal should consist of a bentonite/cement mix with a ratio of bentonite to cement of between 1:5 and 1:20. The grout ratio should be chosen based on site conditions with a higher percentage of bentonite generally used for formations with higher porosity. Grout slurry should be pumped into the annular space using a side discharging tremie pipe located about 2 feet above the sand pack. Side discharge will help preserve the integrity of the sand pack. If pellets or chips are used, they will be allowed to hydrate following manufacture's recommendations prior to grout installation, typical of industry practice. If a slurry seal is used; it shall consist of a high-solids bentonite grout that is specifically designed for monitoring well installation. The bentonite/cement grout shall be mixed in accordance with the guidance provided by the manufacturer to the recommended density. The density shall be measured with a mud scale and recorded by the drilling contractor.
- In situations where the monitoring well screen straddles the water table, the seal will be in the unsaturated zone and pure bentonites (pellets or powder) will not work effectively as seals without hydration. Dry bentonite may be used if sufficient time to hydrate the seal is allowed. Seal hydration requires the periodic addition of clean water. Optionally, seals in this situation may be a cement/bentonite mixture containing up to 10 percent bentonite by weight. This type of mixture shall be tremied to the desired depth in the borehole.
- The borehole annulus will be grouted with seal materials to within 3 feet of the ground surface. Drill cuttings, even those known not to be contaminated, will not be used as backfill material.

5.2.7 Well Completion

- The drilling subcontractor will cut the top of the well to the desired height and install a vented (if possible), locking cap. The upper portion of the well casing can optionally be drilled to allow venting. Well casings are usually cut to be a certain height above ground surface (typically 2.5 to 3 feet) or are cut to be flush with the ground surface.

5.2.8 Protective Casing/Concrete Pad Installation

- The drilling subcontractor will install a steel guard pipe on the well as a protective casing. The borehole around the guard pipe will be dug out to an approximate 2 to 3-foot radius to a minimum depth of 1 foot at the center and 6 inches at the edges. After installing the protective casing, the excavation will be filled with a concrete/sand mix. The surface of the concrete pad will be sloped so that drainage occurs away from the well. Flush-mount protective casings may not require an extensive concrete pad and should be completed such that they are slightly mounded above the surrounding surface to prevent surface water from running over or ponding on top of the casing. It should be noted, however, that in areas subject to snowfall, flush-mount casings may have to be installed so that they are entirely flush with the ground surface as they may be damaged by snow plows.

- Above-ground protective casings should also be vented or should have non-air tight caps. Road box installations should not be vented. Installation of additional guard pipes may be necessary around above-ground well completions in traffic areas. Protective casings should be lockable to prevent unauthorized access.

5.2.9 Well Numbering

- The project geologist/engineer will number each well casing with an indelible marker or paint to identify the well. This is particularly important with nested or paired wells to distinguish between shallow and deep wells. The well should be labeled on both the outside of the protective casing and inside beneath the protective casing lid.

5.2.10 Measuring Point Identification

- The project geologist/engineer will mark the measuring point from which water level measurements will be made at a specific location along the upper edge of the well casing. PVC wells can easily be notched with a utility knife or saw. Stainless steel wells (or PVC wells) can be marked with a waterproof marker on the outside of the well casing with an arrow pointing to the measuring point location. The measuring point is the point which will require surveying during the well elevation survey task.

5.2.11 Well Measurements

- Upon completion, the following well measurements should be taken by the project geologist/engineer and recorded on the well construction diagram (Figure 1):
    - Depth to static water level if water level has stabilized,
    - Total length of well measured from top-of-well casing,
    - Height of well casing above ground surface,
    - Height of protective casing above ground surface,
    - Depth of bottom of protective casing below ground surface (may be estimated).

- Well screen filter pack, bentonite seal and annular seal thicknesses and depths should also be recorded on the well construction diagram.

5.2.12 Disposal of Drilling Wastes

- Drill cuttings and other investigation-derived wastes such as drilling mud or well development/purge water must be properly contained and disposed of. Site-specific requirements for collection and removal of these waste materials should be outlined within the project-specific work plan. Containment of these materials should be performed by the drilling subcontractor.

5.2.13 Well Development

- At some point after installation of a well and prior to use of the well for water-level measurements or collection of water quality samples, development of the well shall be undertaken in accordance with POP 007 (Monitoring Well Development). Well development may be performed by the drilling subcontractor if contracted to do so, or by the project geologist/engineer or other project staff.

5.2.14 Well Elevation Survey

- At the completion of the well installation program, all monitoring wells are usually surveyed to provide, at a minimum, the top-of-casing measuring point elevation for water level monitoring purposes. Other surveyed points may include: ground surface elevation, top of protective casing elevation, and well coordinate position. Well elevation surveys are usually conducted by a surveying subcontractor.

6.0 Quality assurance / quality control

6.1 Field personnel should follow specific quality assurance guidelines as outlined in the site-specific QAPP. The following aspects of monitoring well design and installation procedures depend on project-specific objectives which maybe addressed in the QAPP or in the project-specific work plan:

- Borehole drilling method and diameter,
- Type of construction materials for well screen, riser, filter pack and seals,
- Diameter of well materials,
- Length of well screen,
- Location, thickness, and composition of annular seals, and
- Well completion and surface protection requirements.

6.2 Certain quality control measures should be taken to ensure proper well completion.

6.3 The borehole will be checked for total open depth, and extended by further drilling or shortened by backfilling, if necessary, before any well construction materials are placed.

6.4 Water level and non-aqueous phase liquid (NAPL) presence will be checked during well installation to ensure that the positions of well screen, sand pack, and seal, relative to water level, conform to project requirements.

6.5 The depth to the top of each layer of packing (i.e., sand, bentonite, grout, etc.) will be verified and adjusted if necessary to conform to project requirements before the next layer is placed.

6.6 If water or other drilling fluids have been introduced into the boring during drilling or well installation, samples of these fluids may be required for analysis of chemical constituents of interest at the site.

7.0 Data and records management

7.1 All well construction data will be recorded on the Well Completion Log (Figure 1). All wells will be referenced onto the appropriate site map. A field notebook and/or boring log will be used as additional means of recording data. In no case will the notebook or boring log take the place of the well construction diagram.

8.0 Personnel qualifications and training

8.1 Well construction and installation requires a moderate degree of training and experience as numerous drilling situations may occur which will require field decisions to be made. It is recommended that inexperienced personnel be supervised for several well installations before working on their own. Experienced drillers are also of great assistance with problem resolution in the field. Field personnel should be health and safety certified as specified by OSHA (29 CFR 1910.120(e)(3)(i)) to work on sites where hazardous waste materials are considered to be present.

8.2 Drilling Subcontractor

- Any well drilling services or pump installation/repair services will be performed by a Montana Department of Natural Resources and Conservation licensed drilling contractor (according to Montana Administrative Codes 36.21). It is the responsibility of the drilling subcontractor to provide the necessary equipment for well construction and installation. Well construction materials should be consistent with project requirements.

8.3 Surveying Subcontractor

- It is the responsibility of the surveying subcontractor to provide one or more of the following well measurements: ground surface elevation, horizontal well coordinates, top of well casing elevation (i.e., top-of-casing, or measuring point elevation), and/or top of protective casing elevation.

8.4 Project Geologist/Engineer

- It is the responsibility of the Project Geologist/Engineer to directly oversee the construction and installation of the monitoring well by the drilling subcontractor to ensure that the well-installation specifications defined in the project-specific work plan are adhered to, and that all pertinent data are recorded on the appropriate forms.

8.5 Project Manager

- It is the responsibility of the Project Manager to ensure that each project involving monitoring well installation is properly planned and executed.

9.0 Revision history

Revision	Date	Changes
1	August 2010	Version 1

AECOM

Boring and Well Construction Log

Boring #:

Sheet 1 of 1

Project:	Contractor: **AECOM drilling subcontractor**	Location: **Somers, Montana**
Project #:	Operator:	Northing: Easting:
Client:	Drill Rig Type:	Surface Elevation (ft AMSL):
Start Date & Time:	Method:	Total Depth (ft):
Finish Date & Time:	Boring ID:	Logged By:

Sample					Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
Analytical Sample	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)					
					0				
					5				
					10				
					15				
					20				
					25				
					30				

Remarks and Datum Used:

AECOM
207 North Broadway, Suite 315
Billings, Montana 59101
Phone: (406) 652-7481
Fax: (406) 652-7485

Depth to Water Table (ft):

BNSF Somers Project Operating Procedure (POP) 110 Packing and Shipping Samples

1.0 Purpose and Applicability

BNSF Railway Company (BNSF) Somers Project POP 110 describes proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination, and provide a clear record of sample custody from collection to analysis. Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, Job Hazard Analysis (JHA), Safety Task Analysis Review (STAR), or Site-Specific Health and Safety Plan (HASP) will take precedence over the procedures described in this document.

The Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (1976) (RCRA) regulations (40 CFR Section 261.4 (d)) specify that samples of solid waste, water, soil, or air collected for the purpose of testing are exempt from regulation when any of the following conditions apply:

- Samples are being transported to a laboratory for analysis
- Samples are being transported to the collector from the laboratory after analysis
- Samples are being stored:
    - By the collector prior to shipment for analysis
    - By the analytical laboratory prior to analysis
    - By the analytical laboratory after testing but prior to return of sample to the collector or pending the conclusion of a court case

Samples collected by AECOM are generally qualified for these exemptions. BNSF Somers POP 110 deals only with these sample types. If you have any additional questions about shipping requirements contact the AECOM Environment, Health and Safety (EHS) Department.

2.0 Responsibilities

The field sampling coordinator is responsible for the enactment and completion of the chain-of- custody and the packaging and shipping requirements outlined here and in project-specific sampling plans.

3.0 Health and Safety

This section presents the generic hazards associated with packing and shipping samples and is intended to provide general guidance in preparing site-specific health and safety documents. The Site-Specific HASP and THAs will address additional requirements and will take precedence over this document. Note that packing and shipping samples usually requires Level D personal protection unless there is a potential for airborne exposure to site contaminants. Under circumstances where potential airborne exposure is possible respiratory protective equipment may be required based on personal air monitoring results. Upgrades to Level C will be coordinated with your Site Safety and Health Officer (SSHO) or EHS Coordinator.

Health and safety hazards with packing and shipping of samples include the following:

- Exposure to sample preservatives – Know the types of sample preservatives sent to you by the analytical laboratory. Understand the potential exposures (inhalation, ingestion skin contact) and use chemically impervious gloves to protect your hands from acids in particular.

- Anticipate the potential for spills – Glass containers are subject to breakage and if dropped on the floor will create a spill. Know how to contain the spill, have spill response materials available, and understand the proper disposal methods for spilled materials. Wear personal protective equipment (PPE) to clean up the spill as appropriate (Level C or D).

- Broken glass – Be aware of the possibility for broken glass in previously used coolers. Inspect the cooler before you place samples in it and clean out any broken glass safely (i.e. with a small brush).

- Coolers can be heavy – Use proper lifting techniques to pick up loaded coolers. Bend your legs and lift with a straight back to avoid a back injury.

- Do not use your teeth to cut tape to size, use a tape dispenser.

4.0 Supporting Materials

The following materials must be on hand and in sufficient quantity to ensure that proper packing and shipping methods and procedures may be followed:

- Chain-of-custody forms and tape

- Sample container labels
- Coolers or similar shipping containers
- Duct tape or transparent packaging tape
- Zip-lock type bags
- Protective wrapping and packaging materials
- Ice
- Shipping labels for the exterior of the ice chest
- Transportation carrier forms (Federal Express, Airborne, etc.)
- PPE as specified in the Site-Specific HASP
- Material Safety Data Sheets (MSDSs) for any chemicals or site-specific contaminants (including sample preservatives)
- A copy of the Site-Specific HASP

5.0 Methods and Procedures

All samples must be packaged so they do not leak, break, vaporize, or cause cross-contamination of other samples. Waste samples and environmental samples (e.g., groundwater, soil, etc.) should not be placed in the same shipping container. Each individual sample must be properly labeled and identified. A chain-of-custody record must accompany each shipping container. When refrigeration is required for sample preservation, samples must be kept cool during the time between collection and final packaging.

All samples must be clearly identified immediately upon collection. Each sample bottle label (Figure 1) will include the following information:

- Client or project name, or unique identifier, if confidential
- A unique sample description
- Sample collection date and time
- Sampler's name or initials
- Indication of filtering or addition of preservative, if applicable
- Analyses to be performed

After collection, identification, and preservation (if necessary), the samples will be maintained under chain-of-custody procedures as described below.

5.1 Chain-Of-Custody

A sample is considered to be under custody if it is in one's possession, view, or in a designated secure area. Transfers of sample custody must be documented by chain-of-custody forms (Figure 2). The chain-of-custody record will include, at a minimum, the following information:

- Client or project name, or unique identifier, if confidential
- Sample collector's name
- AECOM's mailing address and telephone number
- Designated recipient of data (name and telephone number)
- Analytical laboratory's name and city
- Description of each sample (i.e., unique identifier and matrix)
- Date and time of collection
- Quantity of each sample or number of containers
- Type of analysis required
- Date and method of shipment

Additional information may include type of sample containers, shipping identification air bill numbers, etc.

When transferring custody, both the individual(s) relinquishing custody of samples and the individual(s) receiving custody of samples will sign, date, and note the time on the form. If samples are to leave the collector's possession for shipment to the laboratory, the subsequent packaging procedures will be followed.

5.2 Packing for Shipment

To prepare a cooler for shipment, the sample bottles should be inventoried and logged on the chain-of-custody form. At least one layer of sorbent protective material should be placed in the bottom of the container. Be careful for any broken glass. A heavy-duty plastic bag, if available, should be placed in the shipping container to act as an inner container. As each sample bottle is logged on the chain-of-custody form, it should be wrapped with protective material (e.g., bubble wrap, matting, plastic gridding, or similar material) to prevent breakage. The protective material should be secured with tape. The sample should then be placed in a zip-lock type bag. Each sample bottle should be placed upright in the heavy-duty plastic bag inside the shipping container. Each sample bottle cap should be checked during wrapping and tightened, if needed. Avoid over tightening, which may cause bottle cap to crack and allow leakage. Additional packaging material, such as bubble wrap, should be spread throughout the voids between the sample bottles.

Most samples require refrigeration as a minimum preservative. To ensure that samples are received by the laboratory within required temperature limits, place cubed ice directly over packed samples, making sure that ice is present on all sides of each sample (a 2-inch layer of ice should be present on top of the samples prior to shipment).

If applicable, secure the inner heavy-duty bag with clear packing tape. This will prevent water from leaking out of the package, thus stopping shipment (package handling companies will not ship a leaking package).

Place the original completed chain-of-custody record in a zip-lock type plastic bag and place the bag on the top of the contents within the cooler or shipping container. Alternatively, the bag may be taped to the underside of the container lid. Retain a copy of the chain-of-custody record with the field records.

Close the top or lid of the cooler or shipping container and rotate/shake the container to verify that the contents are packed so that they do not move. Add additional packaging if needed and reclose. Place signed and dated chain-of-custody seal (Figure 3) at two different locations (front and back) on the cooler or container lid and overlap with transparent packaging tape. The chain-of-custody seal should be placed on the container in such a way that opening the container will destroy the tape. Packaging tape should encircle each end of the cooler at the hinges. Use proper lifting techniques when picking up the cooler.

Sample shipment should be sent via an overnight express service that can guarantee 24-hour delivery. Retain copies of all shipment records as provided by the shipper.

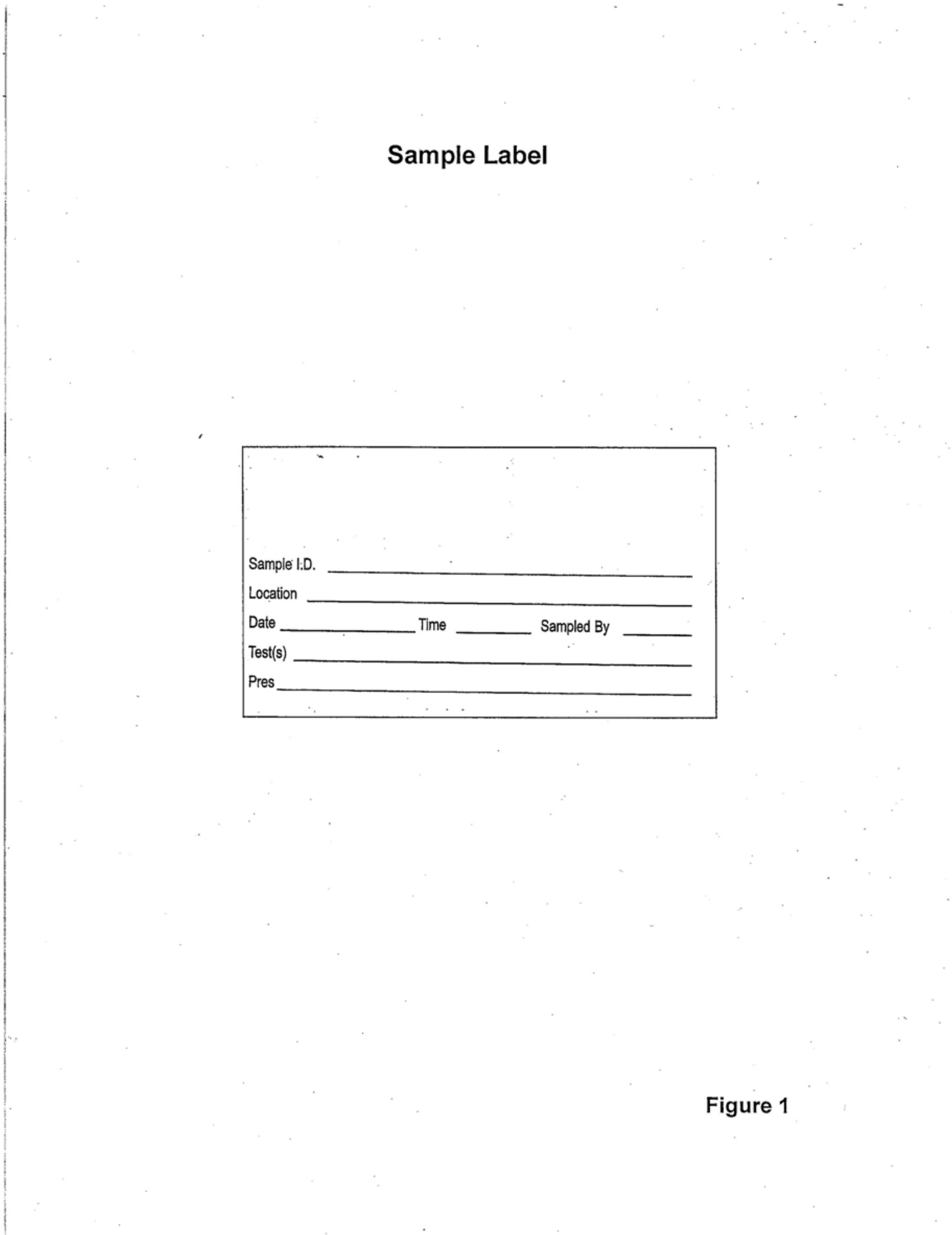
6.0 Quality Assurance/Quality Control

Recipient of sample container should advise shipper and/or transporter immediately of any damage to the container, breakage of contents, or evidence of tampering.

7.0 Documentation

The documentation for support of proper packaging and shipment will include AECOM or the laboratory chain-of-custody records and transportation carrier's airbill or delivery invoice. All documentation will be retained in the project files.

Figure 1 Sample Label



Sample Label

Sample I.D. ______________________

Location ______________________

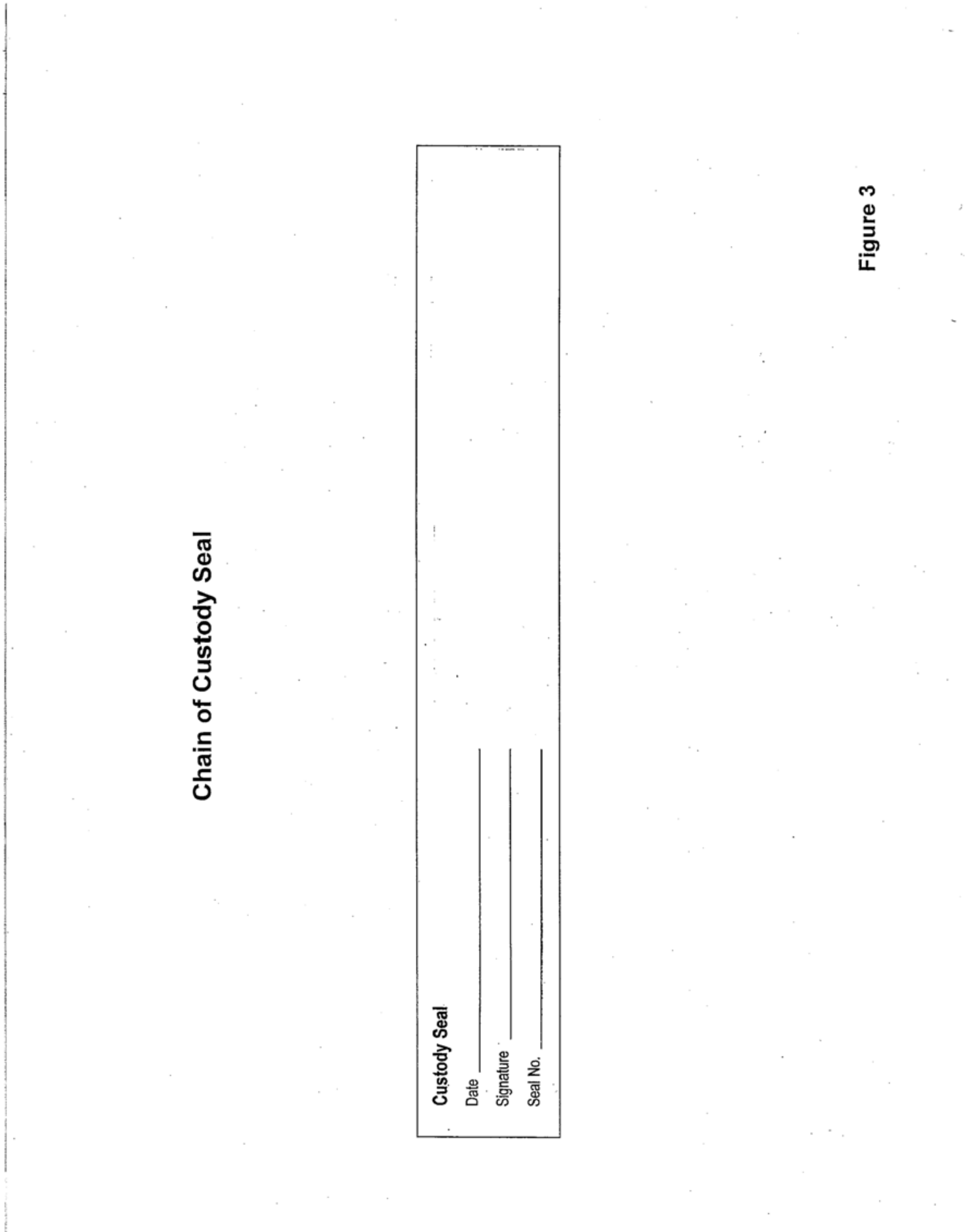
Date ____________ Time ________ Sampled By ________

Test(s) ______________________

Pres ______________________

Figure 1

Figure 2 Chain-of-Custody Record

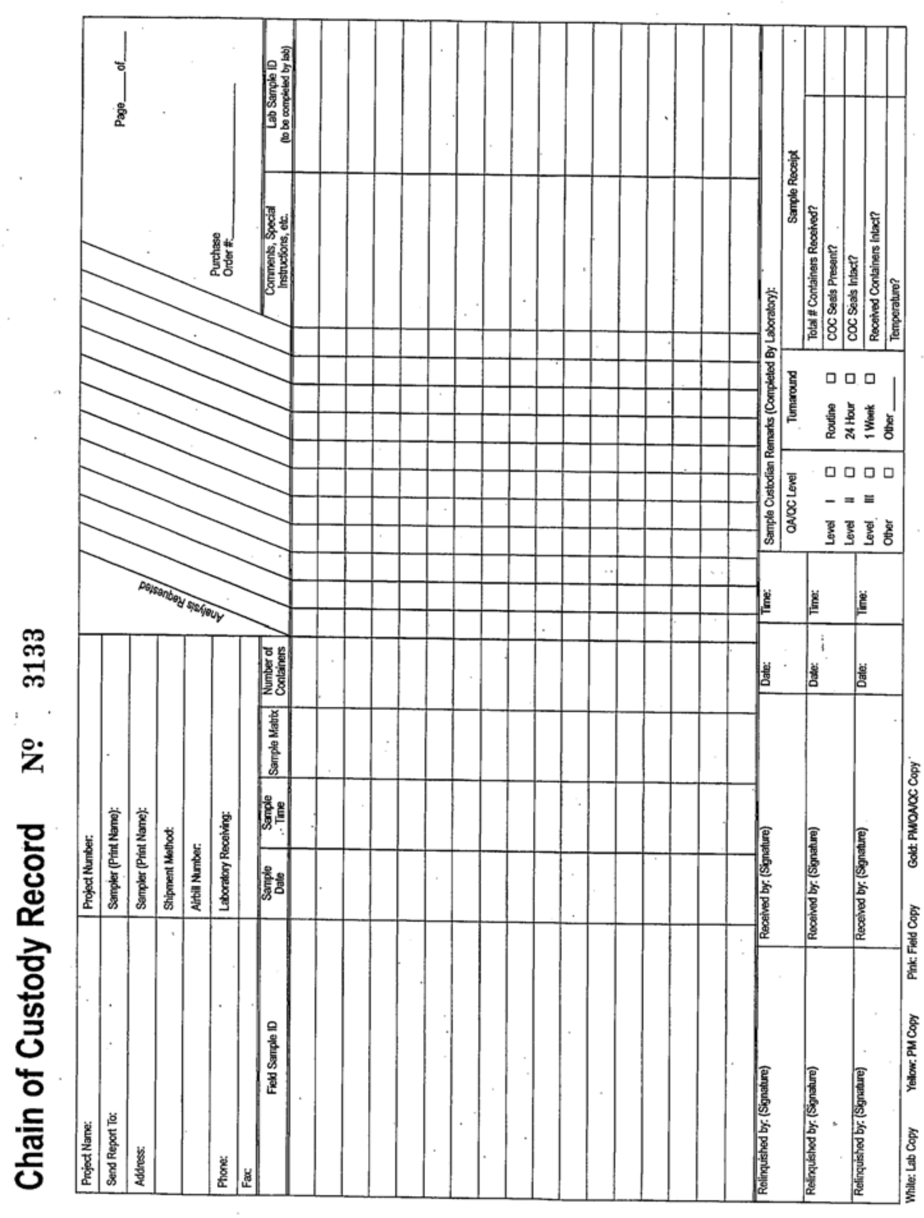


Chain of Custody Seal

Custody Seal
Date ______
Signature ______
Seal No. ______

Figure 3

Figure 3 Chain-of-Custody Seal



Chain of Custody Record Nº 3133

Project Name:	Project Number:
Send Report To:	Sampler (Print Name):
Address:	Sampler (Print Name):
	Shipment Method:
	Airbill Number:
Phone:	Laboratory Receiving:
Fax:	

Analysis Requested

Page____of____

Purchase Order #:____________

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level	Turnaround	Sample Receipt	
Level I ☐	Routine ☐	Total # Containers Received?	
Level II ☐	24 Hour ☐	COC Seals Present?	
Level III ☐	1 Week ☐	COC Seals Intact?	
Other ☐	Other _____	Received Containers Intact?	
		Temperature?	

White: Lab Copy Yellow: PM Copy Pink: Field Copy Gold: PM/QA/QC Copy

Figure 2

BNSF Somers Project Operating Procedure (POP) 120 Decontamination

1.0 Purpose and Applicability

BNSF Railway Company (BNSF) Project POP 120 describes the methods to be used for the decontamination of items that may become contaminated during field operations. Decontamination is performed as a quality assurance measure, and as a safety and health precaution. It prevents cross-contamination between samples and also helps maintain a clean working environment. Equipment requiring decontamination may include hand tools, monitoring and testing equipment, personal protective equipment (PPE), or heavy equipment (e.g., loaders, backhoes, drill rigs, etc.).

Decontamination is achieved mainly by rinsing with liquids, which may include soap and/or detergent solutions, tap water, distilled water, and methanol or isopropyl alcohol. Equipment may be allowed to air dry after being cleaned or may be wiped dry with paper towels or chemical-free cloths.

All sampling equipment will be decontaminated prior to use and between each sample collection point. Waste products produced by the decontamination procedures, such as rinse liquids, solids, rags, gloves, etc., will be collected and disposed of properly, based on the nature of contamination and site protocols. Any materials and equipment that will be reused must be decontaminated or properly protected before being taken off site.

Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, AECOM Safety, Health, and Environment (SHE) Manual, Task Hazard Analysis (THA), or Site-Specific Health and Safety Plan (HASP) will take precedence over the procedures described in this document.

2.0 Responsibilities

It is the responsibility of the field sampling coordinator to ensure that proper decontamination procedures are followed and that all waste materials produced by decontamination are properly managed. It is the responsibility of any subcontractors (e.g., drilling or sampling contractors) to follow the designated decontamination procedures that are stated in their contracts and outlined in the project HASP. It is the responsibility of all personnel involved with sample collection or decontamination to maintain a clean working environment and to ensure that no contaminants are inadvertently introduced into the environment, tracked out of the contamination reduction zone (CRZ), or passed from one sample point to another.

3.0 Health and Safety

This section presents the generic hazards associated with decontamination and is intended to provide general guidance in preparing site-specific health and safety documents. The Site-Specific HASP and THAs will address additional requirements and will take precedence over this document. Note that decontamination usually requires Level D personal protection unless there is a potential for airborne exposures to site contaminants. Under circumstances where potential airborne exposure is possible respiratory protective equipment may be required based on personal air monitoring results. Upgrades to Level C will be coordinated with your Site Safety and Health Officer (SSHO) or SHE Coordinator.

Health and safety hazards potentially involved decontamination include the following:

- Skin contact with decontamination solvents. Wear solvent impervious gloves when decontaminating equipment. Methanol and isopropanol are approved but use the solvents sparingly and dispense only from pre-labeled polypropylene solvent wash bottles. Whenever possible use an aqueous based non-toxic cleaning agents in lieu of solvents. **Hexane is prohibited from use for decontamination.**

- Avoid contact with site contaminants. Exposure to contaminated media is possible when either removing contaminated personal protective equipment (PPE) or decontaminating heavy equipment. Take care to prevent slips and falls when scrubbing over boots in the CRZ and remove PPE using proper "inside-out" techniques to minimize airborne exposure to potentially contaminated particulate. In addition to Level D PPE, wear a face shield when brushing off heavy equipment or using a pressure washer. Consult the Corporate EHS Manual for additional precautions.

- Decontamination pad liquids. If large volumes of rinsates are generated, wash water must be properly characterized prior to disposal. Avoid contact and wear PPE during liquids transfer.

4.0 Supporting Materials

The following materials should be on hand in sufficient quantity to ensure that proper decontamination methods and procedures are followed:

- Cleaning liquids and dispensers (phosphate-free soap and/or detergent solutions, tap water, distilled water, deionized water, reagent grade methanol or isopropyl, etc.)

- PPE, as defined in the project HASP

- Paper towels or chemical-free cloths
- Disposable chemically impervious gloves
- Waste-storage containers (e.g., drums, boxes, plastic bags)
- Drum labels, if necessary
- Cleaning containers (e.g., plastic and/or galvanized steel pans or buckets)
- Cleaning brushes
- Plastic sheeting
- Material Safety Data Sheets (MSDSs) for any chemicals or site-specific contaminants and decontamination solvents
- A copy of the Site-Specific HASP (consult for heavy equipment decontamination)

5.0 Methods and Procedures

The extent of known contamination will determine the degree of decontamination required. When the extent of contamination cannot be readily determined, cleaning should be done according to the assumption that the equipment is highly contaminated.

Standard operating procedures listed below describe the method for full field decontamination. If different technical procedures are required for a specific project, they will be spelled out in the project plans.

Such variations in decontamination may include all or an expanded scope of these decontamination procedures:

- Remove gross contamination from the equipment by brushing and then rinse with tap water.
- Wash with detergent or soap solution (e.g., Alconox and tap water).
- Rinse with tap water or distilled water.
- Rinse with reagent grade methanol or isopropyl alcohol.
- Rinse with deionized water (distilled water is an acceptable substitute if deionized water is unavailable).
- Repeat entire procedure or any parts of the procedure as necessary.

- After decontamination procedure is completed, avoid placing equipment directly on ground surface to avoid re-contamination.

Downhole drilling equipment, such as augers and split spoons, will be decontaminated with pressurized hot water or steam wash, followed by a fresh water rinse. No additional decontamination procedures will be required if the equipment appears to be visually clean. If contamination is visible after hot water/steam cleaning, then a detergent wash solution with brushes (if necessary) will be used. Items heavily contaminated with product may require more aggressive decontamination techniques. If the items cannot be discarded, consult your EHS coordinator to obtain guidance in this regard.

6.0 Quality Assurance/Quality Control

To assess the adequacy of decontamination procedures, rinsate blanks should be collected and analyzed for the same parameters as the field samples. Specific number of blanks will be defined in the project-specific sampling plan. In general, one rinsate blank will be collected per 20 samples.

7.0 Documentation

Field notes describing procedures used to decontaminate equipment/personnel and for collection of the rinsate blanks will be documented by on-site personnel. Field notes will be retained in the project files.

BNSF Somers Project Operating Procedure (POP) 210 Soil Sample Collection

1.0 Purpose and Applicability

BNSF Railway Company (BNSF) Somers Project POP 210 describes methods used to obtain soil samples for physical testing, stratigraphic correlations, and chemical analysis. Soil samples may be obtained in conjunction with surface sampling, test pit excavation, soil boring, and monitoring well installation programs. These procedures provide specific information for determining the physical makeup of the surface and subsurface environment, as well as how to estimate the extent and magnitude of soil contamination, if present. BNSF Somers Project POP 210 will discuss sampling of the subsurface material by augers and split spoons, and within test pits by backhoes and hand tools.

Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, Job Hazard Analysis, Safety Task Analysis Review, or Site-Specific Health & Safety Plan will take precedence over the procedures described in this document.

2.0 Responsibilities

The project geologist/engineer will be responsible for the proper use and maintenance of all types of equipment used for obtaining soil samples. The geologist/engineer will determine the location, total depth, and overall size of each surface sample collection point and test pit, and the location and depth of all subsurface borings based on the project specific sampling plan. The project geologist/engineer will be responsible for locating any subsurface utilities or structures, and disseminating this information to the contractor prior to commencing the sampling program. The location of overhead utilities and obstructions relative to the sampling locations will also be noted. In addition, a Task Hazard Analysis will be conducted to assess any other potential health and safety hazards associated with soil sample collection.

It shall be the responsibility of the project geologist/engineer to observe all activities pertaining to soil sampling and subsurface investigations to ensure that all the standard procedures are followed properly, and to record all pertinent data on a field log or field book. The collection, handling, and storage of all samples will be the responsibility of the geologist/engineer.

It is the responsibility of the contractor to provide safe and well-maintained equipment for obtaining subsurface samples in borings and for decontamination of the equipment. Test pit construction, split-spoon sampling, and subsurface augering will be conducted by the contractor. In addition, the contractor will be responsible for containment of cuttings, if required.

3.0 Health and Safety

This section presents the generic hazards associated with soil sampling techniques and is intended to provide general guidance in preparing site-specific health and safety documents. The Site-Specific Health & Safety Plan, and Task Hazard Analyses will address additional requirements and will take precedence over this document. Note that sample collection usually requires Level D personal protection unless there is a potential for airborne exposures to site contaminants.

Health and safety hazards include but are not limited to the following:

Hollow Stem Auger Drilling

- Heavy equipment operation
- Pinch points
- Rotating parts
- Loose clothing
- Heavy lifting
- Air quality (i.e., chemical, dust, explosive conditions)
- Hazardous materials (exposure and release)
- Pressurized lines
- High noise levels
- Utilities (underground or overhead)
- Hoisting
- Overhead hazards
- Hand hazards

Rotary Drilling (Mud/Air)

- Same as above
- Increased noise hazard
- Increased dust hazard (air rotary)
- Cyclones/Diverters (pressurized lines should be anchored with whip-stops)
- Investigation derived waste containment
- Blow protect inspection/replacement
- Sample collection (i.e., there are increased hazards when taking samples from air rotary rigs resulting from overhead hazards (cyclones), pressurized lines, increased noise, and air quality at sample collection outlets. Field personnel must be aware of these hazards and initiate engineered controls to limit these hazards.)

Rotosonic Drilling

- Same as above
- Elevated work platform
- Maneuvering rig and support truck

If site/project conditions warrant the use of other drilling techniques, hazards associated with these techniques will be evaluated by amendment in the site-specific Health & Safety Plan, Job Hazard Analyses, or Safety Task Analysis Reviews. Drill rig inspections, if applicable, will be completed prior to initiating soil sampling.

4.0 Supporting Materials

In addition to materials provided by the contractor, the geologist/engineer will provide:

- Sample bottles/containers and labels
- Boring or test pit logs
- Field notebook
- Chain-of-custody forms
- Depth-measurement device
- Stakes and fluorescent flagging tape
- Decontamination solution
- Camera for photographing sections
- Sampling equipment (e.g., knives, trowels, shovels, hand augers, aluminum foil, etc.)
- Plastic garbage bags
- Material Safety Data Sheets (MSDSs) for any chemicals or site specific contaminants
- A copy of the site-specific Health and Safety Plan

5.0 Methods and Procedures

Specific sampling equipment and methodology will be dictated by characteristics of the soil to be sampled, type of soil samples required, and by the analytical procedures to be employed.

There are two types of samples that may be required by the project sampling plan, grab or composite. A grab sample is collected from a specific location or depth and placing it in the appropriate sample container. A composite sample consists of several discrete locations (or depths) mixed to provide a homogeneous, representative sample. To ensure that the sample is representative, the soil volume and collection method from each discrete location should be as identical as possible. It should be noted that samples analyzed for volatile organic compounds cannot be composited since it is necessary to expose the soil to the atmosphere prior to transfer into the sample container.

The sampling depth interval in borings is typically one sample for every five feet with additional samples taken at the discretion of the project geologist/engineer when significant color, textural, or odor changes are encountered. Deviations in the standard operating procedure will be covered in the project specific sampling plans.

Most subsurface explorations by AECOM will be on privately owned land, often an industrial facility. Prior to commencing subsurface exploration, AECOM will work with the facility manager to locate any subsurface utilities or structures and discuss any pertinent health and safety issues. Utility companies, (electric, gas, water, phone, sewer, etc.) who may have equipment or transmission lines buried in the vicinity, will also be notified. Many regions have organizations, which represent all utilities for these notification purposes. Allow enough time after notification (typically three working days) for the utilities to respond and provide locations of any equipment, which may be buried on site. Overhead lines must also be kept in consideration when a drilling rig is used. As a rule of thumb, the rig and derrick should be at least 25 feet away from overhead lines unless special shielding and grounding are provided. In addition, consult the site-specific health and safety documentation.

5.1 General Applications

General locations shall be mapped by the field geologist/engineer using a stationary structure as the reference point. Specific locations for test pits and sampling locations will be documented by survey or by using topographic maps and/or plans. A preliminary log of the test pit, or boring shall be prepared in the field by the field geologist/engineer. A sketch of the test pit may be necessary to depict the strata encountered. Before measuring the depth to groundwater, if encountered, the field geologist/engineer will allow sufficient time for stabilization of the water table in the excavation or boring. All information shall be recorded on the field log or the field book.

5.2 Subsurface Sampling

Note: AECOM employees conducting these operations must have completed a drilling safety course.

The casing shall be of the flush-joint or flush-couple type and of sufficient size to allow for soil sampling, coring, and/or well installation. All casing sections shall be straight and free of any obstructions. Hollow-stem augers or solid-flight augers with casing may be used according to specific project requirements.

Generally subsurface soil samples shall be obtained using a split-tube type sampler (split spoon), however, other devices (Shelby tubes, continuous samples, core, etc.) may be used as specified in the project specific sampling plan. Split-spoons come in a variety of sizes with the most standard having a 2-inch OD, a 1 3/8-inch ID and a 24-inch long barrel with an 18-inch sample capacity. Split spoons shall be equipped with a check valve at the top and a flap valve or basket-type retainer at the bottom. Samples shall be obtained using the standard penetration test (SPT), which allows for qualitative determination of mechanical properties and aids in identification of material type. The number of hammer blows shall be recorded on the boring log for each six-inch drive distance.

The soil sampler shall be opened immediately upon removal from the casing. If the recovery is inadequate (i.e., most of the penetrated material was not retained inside the soil sampler), a note will be made on the boring log stating that "no recovery" was possible at that depth. In the event that gravels or other material prevent penetration by the split spoon, samples may be collected from the auger flights. Slowly remove the auger and collect the sample at the point corresponding to the required depth. Samples collected in this manner must be documented on the boring log.

Subsurface groundwater samples may be obtained from the borings. Groundwater samples may be collected using a peristaltic pump lowered into hollow-stem augers, through a power punch sampling technique, or through a packer assembly.

Depth discrete samples would be best collected through use of the power punch or packer techniques. Samples collected using a power punch would be collected by driving the sampler to the desired depth, pulling back on the sampler to expose the screen, and withdrawing the tool after a sufficient collection time has elapsed. Alternatively, a sample may be collected from the exposed screen by using a small diameter bailer or a peristaltic pump to collect the groundwater entering the screen. Samples collected using a packer assembly would be collected from a stainless screen attached to a two inch diameter black pipe; the packer would be inflated to isolate the desired depth interval and a bailer or peristaltic pump would be used to collect the sample.

Photographs of specific geologic features or sample location may be required for documentation purposes. A scale or item providing a size perspective should be placed in each photograph. The frame number and picture location shall also be documented in the field book. All equipment will be decontaminated following BNSF Somers Project POP 120 between sample locations and sample depths unless otherwise specified in the project specific sampling plan.

Upon completion of the boring, backfill may be required. The backfill may consist of native material, hydrated bentonite chips/pellets, Portland cement/bentonite grout, or other low permeability material as specified in the project specific sampling plan. All applicable state/federal regulations concerning plugging of boreholes should be reviewed prior to the commencement of field activities.

5.3 Sample Logging

To ensure consistent descriptions of soil or rock material, the following criteria should be included on the sampling logs:

- Soil or rock type
- Depth ranges, recorded in feet
- Grain size
- Roundness
- Sorting
- Moisture
- Color
- Remarks

Examples of soil types would be gravel, sand, silt, or clay. Soil types should be based on the Unified Soil Classification System (USCS). Examples of rock types include limestone, shale, claystone, siltstone, and sandstone. Soil/rock classifications determined in the field may be subject to change based upon laboratory tests. Factors to consider before changing a field determination include the expertise of the field geologist/engineer and laboratory personnel, representative character of the tested sampling, labeling errors, etc. Any changes made after this consideration shall be discussed and incorporated in the project report.

Grain size, roundness, and degree of sorting should also be included on the log if they are discernable. In addition to composition, blow counts and the length of the sample recovered should also be recorded on the sampling log. The degree of sample moisture should be described as dry, moist, and wet.

The color(s) or range of color(s) of the soil or rock type should be defined. If a Munsell color chart is used, the number designation of the color will also be recorded in the description. Other classifiers may include odor and mottling.

Remarks should include anything pertinent to the sample description or sample collection that is not described above. Other information to be placed on the logs as appropriate is:

- PID readings (with associated calibration information)
- Appearance of contamination (consistency)
- Degree of fracturing or cementation in the rock
- Drilling equipment used (rod size, bit type, pump type, rig manufacturer and model, etc.)
- Special problems and their resolution (hole caving, recurring problems at a particular depth, sudden tool drops, excessive grout takes, drilling fluid losses, lost casing, etc.)
- Dates for start and completion of borings
- Depth of first encountered free water
- Definitions of special abbreviations used on log

5.4 Sample Handling

Specific procedures pertaining to the handling and shipment of samples shall be in accordance with BNSF Somers Project POP 110. A clean pair of gloves and decontaminated sampling tools will be used when handling the samples during collection to prevent cross contamination. A representative sample will be placed in the sampling container. Sample containers (jars or bags) shall be labeled with the following information:

- Client or project name, or unique identifier, if confidential
- Unique sample description (i.e., test pit, boring, or sampling point number and horizontal/vertical location)
- Sample collection date and time
- Sampler's name or initials
- Analyses to be performed

These data shall be recorded on the field logs and/or field book. Larger bulk samples shall be placed in cloth bags with plastic liners or plastic five-gallon buckets. Sample bags shall be marked with the information listed above.

6.0 Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) requirements include, but are not limited to, blind field duplicates, blind rinsate blanks, and blind field blanks. These samples will be collected on a frequency of one QA/QC sample per 20 field samples or a minimum of one QA/QC sample per day unless otherwise specified in the project specific sampling plan.

7.0 Documentation

Documentation may consist of all or part of the following:

- Test pit or boring log
- Sample log sheets
- Field log book
- Chain-of-custody forms
- Shipping receipts
- Health & Safety forms (Job Hazard Analysis, Safety Task Analysis Review, and/or Site Specific Health & Safety Plan amendments)
- PID calibration records

All documentation shall be placed in the project files and retained following completion of the project.

8.0 References

Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells, EPA/600/4-89/034, published by National Water Well Association, 1991.

RCRA Ground Water Monitoring Technical Enforcement Guidance Document, published by National Water Well Association, 1986.

A Compendium of Superfund Field Operations, EPA 540/P-87/001, published by the Office of Emergency and Remedial Response, Office of Waste Programs Enforcement, US EPA, 1987.

Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies, EPA/600/R-92/128, published by the Environmental Research Center, 1992.

Boring and Well Construction Log

Boring #:
Sheet 1 of 1

Project:	Contractor: AECOM drilling subcontractor	Location: Somers, Montana
Project #:	Operator:	Northing: Easting:
Client:	Drill Rig Type:	Surface Elevation (ft AMSL):
Start Date & Time:	Method:	Total Depth (ft):
Finish Date & Time:	Boring ID:	Logged By:

Sample					Depth (ft.)	Lithology	USCS Symbol	Soil and Rock Description	Well Diagram
Analytical Sample	Sample Type	Blows/ 6 inch	% Rec	PID (ppm)					
					0				
					5				
					10				
					15				
					20				
					25				
					30				

Remarks and Datum Used:

AECOM
207 North Broadway, Suite 315
Billings, Montana 59101
Phone: (406) 652-7481
Fax: (406) 652-7485

Depth to Water Table (ft):

BNSF Somers Project Operating Procedure (POP) 221 Groundwater Well Development

1.0 Purpose and Applicability

BNSF Railway Company (BNSF) Somers Project POP 221 describes the method for developing groundwater monitoring wells. Well development is the process of cleaning the face of the borehole and the formation around the outside of the well screen to permit groundwater to flow easily into the monitoring well.

Monitoring wells must be developed for the following reasons:

- To restore the natural permeability of the formation adjacent to the borehole to permit the water to flow into the screen easily
- To remove the clay, silt, and other fines from the formation so that during subsequent sampling the water will not be turbid or contain suspended matter which can easily interfere with chemical analysis
- To remove any contamination or formation damage that may have occurred as a result of well drilling

Well development is necessary for all newly completed wells and may be required for wells which have been left dormant for some time or have accumulated significant quantities of sediment in the well, gravel pack, or surrounding formation.

Well development should remove clay particles deposited on the surface of the formation along with sufficient quantity of water to ensure the removal of fluids introduced into the formation during drilling or prolonged inactivity. The development process should also effectively loosen and remove finer particles from the formation matrix.

During any drilling process the side of the borehole becomes smeared with clays or other fines. This plugging action substantially reduces the permeability and retards the movement of water into the well screen. If these fines are not removed, especially in formations having low permeability, it then becomes difficult and time consuming to remove sufficient water from the well before obtaining a fresh groundwater sample because the water cannot flow easily into the well. Existing wells may also require development due to the buildup of sediments in the well or surrounding formation, or accumulation of excessive quantities of light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL) in the well due to inactivity.

Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, Task Hazard Analysis (THA), or Site-Specific Health & Safety Plan (HASP) will take precedence over the procedures described in this document.

2.0 Responsibilities

The field sampling coordinator will have responsibility to oversee and ensure that all monitoring well development is performed in accordance with the project specific sampling program and this POP. It shall be the responsibility of the field sampling coordinator to observe all activities pertaining to development to ensure that all the standard procedures are followed properly, and to record all pertinent data on a field log or field book. The field sampling coordinator must ensure that all field workers are fully apprised of this POP.

3.0 Health and Safety

This section presents the generic hazards associated with monitoring well development and is intended to provide general guidance in preparing site-specific health and safety documents. The site-specific HASP and THA will address additional requirements and will take precedence over this document. Note that monitoring well development usually requires Level D personal protection unless there is a potential for exposure to airborne site contaminants.

Health and safety hazards include but are not limited to the following:

- Slip, trips, and falls in tall grasses over obstacles and berms near well locations. Review terrain hazards prior to conducting these operations. Ensure there is a safe means of access/egress to the wellhead.

- Dermal exposure to potentially contaminated groundwater. Ensure that proper personal protective equipment (PPE) is used to mitigate the impact of splashes of groundwater to skin and/or eyes.

- Exposure to site contaminants. If there is product in the well (especially gasoline) take all precautions necessary to prevent fire/explosion and/or exposure to airborne vapors.

- Ergonomics. Use appropriate ergonomic techniques when inserting or retrieving equipment for the wells to preclude injury to the arms, shoulders or back.

4.0 Supporting Materials

The list below identifies the types of equipment which may be used for a range of monitoring well development applications. A project specific equipment list will be selected based upon project objectives, the depth to ground water, purge volumes, and well construction. Types of sampling methods and equipment are as follows:

- Surge block
- Air lift
- Bailers and bailer cord
- Pump (centrifugal, bladder, peristaltic) and discharge line
- Conductivity/temperature/pH meter(s)
- Water-level measurement equipment
- Field data sheets and field book
- Buckets and intermediate containers
- Paper towels or chemical-free cloths
- Decontamination materials

5.0 Methods and Procedures

Well development is accomplished by causing the natural formation water inside the well to move vigorously in and out through the screen. The suspended sediment is then removed from the well by bailing or pumping. Several techniques may be employed in developing a well. To be effective, all require reversals or surges in flow to avoid bridging by particles. These surges can be created by using surge blocks, air lifts, bailers, or pumps. The use of water other than the natural formation water is not recommended during well development. If water is added, the amount should be noted on the field forms or in the project field book. Water quality analyses should be conducted so that comparisons can be made with subsequent natural groundwater data.

Before developing the well, water depth, LNAPL or DNAPL depth (if present), and well depth will be measured using an electronic or mechanical device. If a measurable amount of LNAPL or DNAPL is detected, the well shall be bailed or pumped prior to development in an attempt to remove the material. This procedure should reduce the opportunity of LNAPL or DNAPL being forced back into the filter pack and formation during development. Approximately 10 well volumes (calculated from the length of the water column and the well casing diameter) should be removed from the well during development. The discharge from the well should be continuously monitored and development should be continued until a particulate free discharge is apparent and the field parameters (pH, conductivity, and temperature) have stabilized within 10 percent of the previous reading. Field parameters should be recorded on the well development record after each volume is removed. All materials and equipment used in conjunction with development must be free of any contamination prior to use and all provisions made to prevent the introduction of contaminants during development. Well depths will be measured following development to determine whether sand or silt has accumulated in the well. If material has accumulated, it will be removed with a bailer.

Regardless of the method employed, any discharges from the well must be properly disposed of depending on the nature of the liquid removed from the well. Additionally, all materials and equipment placed into the well in conjunction with development must be free of any contamination prior to use. Decontamination procedures should be consistent with those described in BNSF Somers POP 120.

5.1 Surge Block

A surge block is a round plunger with pliable edges that will not catch on the well screen. For two-inch diameter wells, the surge block can be constructed of two aluminum plates 1.75 inches in diameter surrounding a thin section of neoprene rubber approximately 2 inches in diameter. The surge block assembly is lowered by hand down the well by connecting sections of one-half inch threaded PVC pipe. Once within the screen interval, the block is rapidly raised and lowered to agitate the water within the well.

If the surge block method is employed, development can be continued using a nitrogen driven bladder pump to evacuate the well. The bladder pump is lowered down the well and is connected to a section of teflon tubing. The nitrogen supply is turned on to activate the pump and discharge liquid from the well.

5.2 Air Lift

Compressed air pumped down a pipe inside the well casing can be used to blow water out of the monitoring well. If air is applied to the well intermittently and for short periods then the water is only raised inside the casing rather than blown out and will fall back down the casing causing the desired backwashing action. Finally, blowing the water out will remove the fines brought into the screen by the agitating action.

Considerable care must be exercised to avoid injecting air into the well screen. Such air can become trapped in the formation outside the well screen and alter subsequent chemical analyses of water samples. For this reason, the bottom of the air pipe should never be placed down inside the screen.

Another consideration is the submergence factor. Submergence is the feet of water above the bottom of the air pipe while pumping (blowing water out) divided by the total length of the air pipe. Submergence should be on the order of at least 20 percent.

5.3 Bailer

A bailer, sufficiently heavy so that it will sink rapidly through the water, can be raised and lowered through the well screen. The resulting agitation action of the water is similar to that caused by a surge block. The bailer, however, has the added advantage of removing the fines each time it is brought to the surface and emptied. Bailers can be custom-made for small diameter wells and can be hand-operated in shallow wells.

5.4 Pumping

Starting and stopping a pump so that the water is alternately pulled into the well through the screen and backflushed through the screen is an effective development method. Periodically pumping the waste will remove the fines from the well and permit checking the progress to ensure that development is complete.

6.0 Quality Assurance/Quality Control

Quality Assurance/Quality Control Plan requirements include the stabilization of field parameters to within 10 percent of the previous reading. A particulate free discharge is desirable but may not be possible based on the composition of the lithology in which the well is completed.

7.0 Documentation

The monitoring well development will be documented to provide a summary of the procedures, site conditions, and field parameters with corresponding purge volumes. Such documentation shall include:

- Field notebook
- Monitoring well development
- Health & Safety forms (JHA, STAR, and/or Site-Specific HASP amendments)

All documentation shall be placed in the project files and retained following completion of the project.

8.0 References

Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells, EPA 600/4-89/034, published by National Water Well Association, 1989.

CRA Ground Water Monitoring Technical Enforcement Guidance Document, published by National Water Well Association, 1986.

A Compendium of Superfund Field Operations, EPA 540/P-87/001, published by the Office of Emergency and Remedial Response, Office of Waste Programs Enforcement, US EPA, 1987.

BNSF Somers Project Operating Procedure (POP) 230 Groundwater Sampling

1.0 Purpose and Applicability

BNSF Railway Company (BNSF) Somers Project POP 230 describes methods used to obtain the collection of valid and representative groundwater samples from monitoring wells. Specific project requirements as described in an approved Work Plan, Task Hazard Analysis (THA), or Site-Specific Health & Safety Plan (HASP) will take precedence over the procedures described in this document.

2.0 Responsibilities

The field sampling coordinator will have the responsibility to ensure that all groundwater sampling is performed in accordance with the project-specific sampling program and this POP. In addition, the field sampling coordinator must ensure that all field workers responsible for conducting groundwater sampling activities are fully apprised of this POP and other pertinent project documents.

3.0 Health and Safety

This section presents the generic hazards associated with low flow groundwater sampling and is intended to provide general guidance in preparing site-specific health and safety documents. The site-specific HASP and THA will address additional requirements and will take precedence over this document. Note that low flow groundwater sampling usually requires Level D personal protection unless there is a potential for exposure to airborne site contaminants.

Health and safety hazards include but are not limited to the following:

- Slip, trips, and falls in tall grasses over obstacles and berms near well locations. Review terrain hazards prior to conducting these operations. Ensure there is a safe means of access/egress to the wellhead.

- Dermal exposure to potentially contaminated groundwater. Ensure that proper personal protective equipment (PPE) is used to mitigate the impact of splashes of groundwater to skin and/or eyes.

- Exposure to site contaminants. If there is product in the well, take all precautions necessary to prevent fire/explosion and/or exposure to airborne vapors.
- Ergonomics. Use appropriate ergonomic techniques when inserting or retrieving equipment for the wells to preclude injury to the arms, shoulders or back.

4.0 Supporting Materials

The following section includes basic types of materials and equipment necessary to complete groundwater sampling activities. Project specific equipment will be selected based upon project objectives and site conditions (e.g., the depth to groundwater, purge volumes, analytical parameters, well construction, and physical/chemical properties of the analytes).

4.1 Project Documentation and Set-Up

- Work Plan
- Sampling Plan
- Quality Assurance Project Plan
- POP 231
- HASP
- Project Contact List
- Laboratory, and other subcontractor, work orders (signed)

4.2 Purging/Sample Collection

The following equipment will be used to purge monitoring wells and collect groundwater samples:

- Low flow peristaltic sampling pump
- Teflon and polyethylene tubing
- Water level measurement equipment
- In-line water quality meter (e.g., flow-through cell) with individual temperature, pH, specific conductance, dissolved oxygen (DO), salinity, and oxidation-reduction potential (ORP) probes
- Turbidity meter

- Sample containers, labels and preservation solutions (if necessary)
- Coolers and ice
- Material Safety Data Sheets (MSDSs) for any chemicals or site-specific contaminants
- Field data sheets and log book
- Decontamination equipment
- Paper towels
- Well keys
- Disposable gloves
- Tubing cutters
- Plastic sheeting
- Personal protective equipment
- Cloth towel(s) or other suitable insulating material to insulate the flow-through cell
- Buckets and intermediate containers

5.0 Methods and Procedures

The following sections describe the methods and procedures required to collect representative groundwater samples.

5.1 Water-Level Measurement

After unlocking and/or opening a monitoring well, the first task will be to obtain a water-level measurement. A static-water level will be measured in the well prior to purging and sample collection. The water level is needed for estimating the purge volume and also may be used for mapping the potentiometric surface of the groundwater. Whenever possible, water level measurements will be collected at all of the wells on-site within 24 hours of each other, or a period reasonable to site conditions. Water-level measurements will be collected using an electronic or mechanical device following the methods described in POP 231.

The location of the measurement point for water level measurements for each well should be clearly marked on the outermost casing or identified in previous sample collection records. This point usually is established on the well casing itself, but may be marked on the protective steel casing in some cases. In either case, it is important that the marked point coincide with the same point of measurement used by the surveyor. If the measuring point from previous investigations is not marked, the water level measuring point should be marked on the north side of the well casing and noted in the groundwater sampling form. The location should be described on the groundwater sampling form.

After opening the well, the field sampler will check for indications of an airtight seal resulting in a pressure difference within the well compared to ambient conditions. If this is the case, the field sampler will allow a minimum of 5 minutes for the water level to stabilize before collecting a down-hole measurement. To obtain a water level measurement, the field sampler should lower a decontaminated mechanical or an electronic sounding unit into the monitoring well until the audible sound of the unit is detected or indicates water contact. At this time, the precise measurement should be determined by repeatedly raising and lowering the tape or cable to converge on the exact measurement. The water-level measurement should be entered on the groundwater sampling form. The water-level measurement device shall be decontaminated immediately after use following the procedures outlined in POP 120.

5.2 Purging and Sample Collection Procedures

Wells may be purged and sampled using low-flow sampling techniques.

Purging must be performed for all wells prior to sample collection. A low flow, electric driven pump (e.g., peristaltic pump) may be used to purge water. The inlet of the peristaltic pump tubing will be lowered into the well slowly and carefully to a depth corresponding with the approximate midpoint of the screened interval of the aquifer, or 1 to 2 feet below the water level in the well, whichever is greater. A depth-to-water measurement device will be lowered into the well to monitor drawdown. The pump will be turned on at a flow rate of about 200 milliliters per minute (mL/min). The flow rate will be adjusted up or down to maximize flow, yet ensure minimum drawdown. Efforts will be made to limit drawdown to 0.5 foot. If the well recharge is not adequate enough to maintain proper water levels, the well will be pumped dry. The well will be sampled after water level in the well has recovered.

If the well being sampled is newly installed and developed or has been redeveloped, sampling can be initiated as soon as the groundwater has re-equilibrated, is free of visible sediment, and the water quality parameters have stabilized. Since site conditions vary, even between wells, a general rule-of-thumb is to wait 24 hours after development to sample a new well. Wells developed with stressful measures (e.g., backwashing, jetting, compressed air, etc.) may require as long as a 7-day interval before sampling.

Groundwater will be pumped from the well into a sealed and insulated flow-through assembly containing probes to measure the water temperature, pH, turbidity, conductivity, ORP, and DO using a Water Quality Meter.

The flow-through assembly must be placed as close as possible to the well to be sampled. The tubing that connects the well discharge to the flow-through cell must be as short as possible. The flow-through assembly must be insulated with a cloth towel or other suitable insulating material to minimize fluctuations in the water quality readings.

It is essential to properly calibrate the Water Quality Meter for the specific parameters being monitored, according to the procedures identified in the instrument manual. Calibration procedures and results must be documented in the site field notebook.

Field parameters values will be recorded on the Groundwater Sampling Form (attached) or in the site field notebook along with the corresponding purge volume. After passing through the flow-through chamber, the water will be discharged into a container of known volume where the pumping rate will be measured with a watch. When the container is full, the water will be properly disposed following Site protocols.

Groundwater samples will be collected for laboratory analysis when the groundwater has stabilized; and the change between successive readings of temperature, pH and conductivity are less than 10 percent. This may occur prior to removal of three well volumes. Stabilization of groundwater measurements is considered indicative of sampling fresh formation water and is a more reliable indicator of purging than removal of a standard volume of water.

Each sample container will be slowly filled by pouring sample water gently down the inside of the container with minimal turbulence. During sample collection, the tubing will not be allowed to contact the sample containers.

Sample labels and chain of custody will be filled out and include the following information at a minimum: sample location, sample name, sampler name or initials, requested analysis, preservative, date and time. Proper packaging and shipment of samples will minimize the potential for sample breakage, leakage, or cross contamination and will provide a clear record of sample custody from collection to analysis.

Non-dedicated equipment will be decontaminated between each well. Note that the peristaltic pump does not require decontamination because it does not contact the groundwater.

5.3 Field Parameter Monitoring

Field personnel should familiarize themselves with the field parameters to be monitored. Certain field parameters such as DO and ORP should correlate to each other. If available, historical sampling forms should be reviewed prior to sampling for an initial understanding of the range of values previously obtained at each sample location. Often it is useful to photocopy the past sampling forms and have them available in the field for comparison purposes. Understanding the past results and current conditions can indicate well damaged or if meters are working properly.

5.4 Sample Preparation and Filtration

Prior to transport or shipment, groundwater samples may require preparation and/or preservation. Field preparation includes preservation in the form of chemical additives and temperature control. Specific handling and preservation requirements will be in accordance with POP 110 and the project-specific sampling plans. A clean pair of gloves and decontaminated sampling tools will be used when handling the samples during collection to prevent cross contamination.

In general, groundwater samples will need to be placed on ice and inside coolers to protect the samples from the sun and to decrease their temperature to or below 4 degrees Celcius.

Field personnel should contact the laboratory prior to going out into the field to ensure necessary lab containers are available and sample preservation procedures are followed. Items such as preservative safety and clear versus opaque jars are examples of items that should be discussed with the laboratory. Sample receiving dates also should be discussed with the laboratory.

6.0 Field Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) requirements dictated by the project specific sampling plans include, but are not limited to, blind field duplicates, equipment rinse blanks (ERB), and field blanks. These samples will be collected at the following frequencies:

- Duplicate – 1 per 10 samples
- ERB – 1 per day of sample collection activities or per type of field equipment used to collect samples only when non-dedicated sampling methods are used
- Field Blank – as determined for the project
- Trip Blanks – shall be included with all VOCs, methane and other samples that consist of dissolved gas phase compounds.

7.0 Documentation

Various documents will be completed and maintained as a part of groundwater sample collection. These documents will provide a summary of the sample collection procedures and conditions, shipment method, analyses requested, and the custody history. These documents may include:

- Field book
- Groundwater sampling forms
- Sample labels
- Chain of custody
- Shipping receipts
- Sample nomenclature protocol

All documentation will be stored in the project files. Sample nomenclature protocol should be discussed with the project data management personnel to ensure consistency between sampling events.

Groundwater Sampling Form

Project/Site: ______________________

Well ID: _____________

Sampler(s): __________

Well Condition

Bump Posts: ______________________ Visibility: _____________ Secured: ____________________

Well Label: ________________________ Surface Pad: __________

Fluid Level/Purge Volume Information

Date: _______________ Time: _______________

Purge Method: __________

Depth to water (ft): _________

Depth to product (ft): _______

Total depth (ft): __________

Water column thickness (ft): ________

One Purge Volume (gal): _________

Groundwater Field Parameters

Date: ____________ Start Time: ___________

Time	Volume Evacuated (gal)	pH (SU)	SpCond. (mS/cm) or (µS/cm)	Temp. (°C)	Dis. Ox. (ppm) or (mg/L)	ORP (mV)	Turb. (NTU)	Sample Appearance/Description

Meter Calibration Information

Probes	Date	Time	Comments
DO Calibration			
pH and SpC Calibration			
ORP Calibration			
Turbidity			

Sample Collection and Analytical Information

Date: _____________ Time: _______________

Laboratory: ______________________ COC Seal: ______ Shipped by: ___________

Shipping Container: _____________ Field Instrument(s): ______________________________

Check Box**	Parameters	Method	Container(s)	Preservative	Comments
☐					
☐					
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Comments: ____

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BNSF Somers Project Operating Procedure (POP) 231 Water-Level Measurements

1.0 Purpose and Applicability

BNSF Railway Company (BNSF) Somers Project POP 231 describes the measurement of water levels in groundwater monitoring wells or piezometers. Water-level measurements are fundamental to groundwater and solute transport studies. Water-level data are used to indicate the directions of groundwater flow and areas of recharge and discharge, to evaluate the effects of manmade and natural stresses on the groundwater system, to define the hydraulic characteristics of aquifers, and to evaluate stream-aquifer relations. Measurements of the static-water level are also needed to estimate the amount of water to be purged from a well prior to sample collection.

Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, Task Hazardous Analysis (THA), or Site-Specific Health and Safety Plan (HASP) will take precedence over the procedures described in this document.

2.0 Responsibilities

The field sampling coordinator will have the responsibility to oversee and ensure that all procedures are performed in accordance with the project-specific sampling program and this POP.

3.0 Health and Safety

This section presents the generic hazards associated with the collection of water-level measurements. The site-specific HASP, and THA will address additional requirements and will take precedence over this document. Appropriate personal protective equipment (PPE) must be worn as determined in the Site-Specific HASP, which typically consists of Level D protection. Under circumstances where potential airborne exposure is possible respiratory protective equipment may be required based on personal air monitoring results. Upgrades to Level C will be coordinated with your Site Safety and Health Officer (SSHO) or Environment, Health, and Safety (EHS) Coordinator.

Health and safety hazards during groundwater level measurements may involve:

- Slip, trips, and falls in tall grasses over obstacles and berms near well locations. Review terrain hazards prior to conducting these operations. Ensure that you have safe means of access/egress to the wellhead.

- Exposure to site contaminants. If there is product in the well (especially gasoline) take all precautions necessary to prevent fire/explosion and/or exposure to airborne vapors.

- Ergonomics. Use appropriate ergonomic techniques when inserting or retrieving equipment for the wells to preclude injury to the arms, shoulders or back.

If the well is suspected of being contaminated, or has a history of contamination, the static water-level measurements should be made while wearing appropriate personal protective equipment (PPE). The air in the wellhead may also be sampled for organic vapors using a Photo Ionization Detector (PID). The results shall be recorded in the Fluid-Level Monitoring Log or the project field book. This would be the first indication of the presence of a non-aqueous phase liquid (NAPL). If the potential for fire or explosion exists, use of the probe ground wire is required.

4.0 Supporting Materials

This section identifies the types of equipment that may be used for measurement of groundwater levels. Based on project objectives, observed or probable well contamination, and well construction, a project-specific equipment list will be determined from the following equipment:

- Water-level and/or product-level measuring device
- Distilled water dispenser bottle
- Methanol or isopropyl in properly labeled dispenser bottles
- Plastic sheeting
- PPE as specified in the Site-Specific HASP
- Fluid-level monitoring logs and field book
- Paper towels or chemical-free cloths
- Material Safety Data Sheets (MSDSs) for any chemicals or site-specific contaminants
- A copy of the Site-Specific HASP

5.0 Methods and Procedures

When taking a series of fluid-level measurements at a number of monitoring wells, it is generally good practice to go in order from the least- to the most contaminated well. Additionally, the measurement of all site wells should be done consecutively and before any sampling activities begin. This will ensure the data are representative of aquifer conditions. All pertinent data should be entered in the Fluid-Level Monitoring Log or the project field book.

5.1 Well Evaluation

Upon arrival at a monitoring well, the surface seal and well protective casing should be examined for any evidence of frost heaving, cracking, or vandalism. All observations should be recorded in the fluid-level monitoring log or the project field book.

The area around the well should be cleared of weeds and other materials prior to measuring the static-water level (avoid contact with poison ivy or other allergenic plants). A drop cloth or other material (e.g., plastic garbage bag) should be placed on the ground around the well, especially if the ground is disturbed or potentially contaminated. This will save time and work for cleaning equipment or tubing if it falls on the ground during preparation or operation. The well protective casing should then be unlocked and the cap removed.

5.2 Measuring Point Location

The measuring point location for the well should be clearly marked on the outermost casing or identified in previous sample collection records. This point is usually established on the well casing itself, but may be marked on the protective steel casing in some cases. In either case, it is important that the marked point coincide with the same point of measurement used by the surveyor. If not marked from previous investigations, the water-level measuring point should be marked on the north side of the well casing and noted in the Fluid-Level Monitoring Log or the project field book. Monitoring well measurements for total depth and water level should be consistently measured from one reference point so that these data can be used for assessing trends in the groundwater.

5.3 Water-Level Measurement

Water-level measurements shall be made using an electronic or mechanical device. Several methods for water-level measurement are described below. The specific method to be used will be defined in the project-specific sampling plan.

5.3.1 Graduated Steel Tape

The graduated steel-tape method is considered an accurate method for measuring the water level in nonflowing wells. Steel surveying tapes in lengths of 100, 200, 300, 500, and 1,000 feet are commonly used; a black tape is better than a chromium-plated tape. The tapes are mounted on hand-cranked reels up to 500-foot lengths; for greater depth, a motor-driven tape drive is usually required. A slender weight is attached to the ring at the end of the tape to ensure plumbness and to permit some feel for obstructions.

The lower few feet of tape is chalked by pulling the tape across a piece of blue carpenter's chalk. The wet chalk mark identifies the portion of the tape that was submerged. Lower the graduated steel-tape from the measuring point at the top of the well until a short length of the tape is submerged. The weight and tape should be lowered into the water slowly to prevent splashing. Submergence of the weight and tape may temporarily cause the water level to rise in wells or piezometers having very small diameters. This effect can be significant if the well is in materials of very low hydraulic conductivity.

Under dry surface conditions, it may be desirable to pull the tape from the well by hand, being careful not to allow it to become kinked, and reading the water mark before rewinding the tape onto the reel. In this way, the watermark on the chalked part of the tape is rapidly brought to the surface before the wetted part of the tape dries. In cold regions, rapid withdrawal of the tape from the well is necessary before the wet part freezes and becomes difficult to read. Read the tape at the measuring point, and then read the watermark on the tape. The difference between these two readings is the depth to water below the measuring point. Errors resulting from the effects of thermal expansion of tapes and of stretch due to the suspended weight of the tape and plumb weight can become significant at high temperatures and for measured depths in excess of 1,000 feet.

The observer should make two measurements. If two measurements of static-water level made within a few minutes do not agree within 0.01 or 0.02 foot in observation wells having a depth to water of less than a couple hundred feet, continue to measure until the reason for the lack of agreement is determined or until the results are shown to be reliable. Where water is dripping into the well or covering the well casing wall, it may be impossible to get a good watermark on the chalked tape.

Water-level measurement should be entered in the fluid-level monitoring log or the project field book. The water-level measurement device shall be decontaminated immediately after use.

5.3.2 Electrical Methods

Many types of electrical instruments are available for water-level measurement; most operate on the principle that a circuit is completed when two electrodes are immersed in water. Electrodes are generally contained in a weighted probe that keeps the tape taut while providing some shielding of the electrodes against false indications as the probe is being lowered into the well. Before lowering the probe into the well, the circuitry can be checked by dipping the probe in water and observing the indicator (a light, sound, and/or meter).

To obtain a water-level measurement, slowly lower the decontaminated probe into the monitoring well until the indicator (light, sound, and/or meter) shows water contact. At this time, the precise measurement should be determined by repeatedly raising and lowering the tape or cable to converge on the exact measurement.

In wells having a layer of NAPL floating on the water, the electric tape will not respond to the oil surface and, thus, the fluid level determined will be different than would be determined by a steel tape. The difference depends on how much NAPL is floating on the water. Dual media tapes are recommended in that instance to measure both NAPL and water levels using the same measuring device. The procedure is discussed in Section 5.4.

Water-level measurement should be entered in the fluid-level monitoring log or the project field book. The water-level measurement device shall be decontaminated immediately after use.

5.3.3 Airline

The airline method is especially useful in pumped wells where water turbulence may preclude using more precise methods. A small diameter air-type tube of known length is installed from the surface to a depth below the lowest water level expected. Compressed air is used to purge the water from the tube. The pressure, in pounds per square inch (psi), needed to purge the water from the airline multiplied by 2.31 (feet of water for one psi) equals the length in feet of submerged airline. The depth to water below the center of the pressure gage can be easily calculated by subtracting the length of airline below the water surface from the total length of airline (assuming the air line is essentially straight).

Accuracy depends on the precision to which the pressure can be read. The accuracy of an airline or pressure gage measurement depends primarily on the accuracy and condition of the gage. It is normally within 1 foot of the true level as determined by means of a steel-tape measurement. The airlines themselves, however, have been known to become clogged with mineral deposits or bacterial growth, or to develop leaks and consequently yield false information. A series of airline measurements should be checked periodically by the use of a steel tape or an electric water-level indicator.

The airline and any connections to it must be airtight throughout the entire length. A long-term increase in airline pressure may indicate gradual clogging of the airline. A relatively sudden decrease in airline pressure may indicate a leak or break in the airline. Airline pressures that never go above a constant low value may indicate that the water level has dropped below the outlet orifice of the airline. To minimize the effect of turbulence, the lower end of the airline should be at least 5 feet above or below the pump intake. Corrections should be made for fluid temperatures much different from 20° C and for vertical differences in air density in the well column for cases where the depth to water is very large.

5.4 Procedures for Immiscible Fluids

At those facilities where monitoring to determine the presence or extent of immiscible fluids is required, the sampler will need to use special procedures for the measurement of fluid levels. The procedures required will depend on whether light NAPL (LNAPL) that form lenses floating on top of the water table or dense NAPL (DNAPL) that sink through the aquifer and form lenses over lower permeability layers are present.

In the case of LNAPL, measurements of immiscible fluid and water level usually cannot be accomplished by using normal techniques. For example, a chalked steel-tape measurement will only indicate the depth to the immiscible fluid (not the depth to water) and a conventional electric water-level probe will not generally respond to nonconducting immiscible fluids.

To circumvent these problems, the use of special techniques and equipment can be specified. These techniques have been specially developed to measure fluid levels in wells containing LNAPL or DNAPL, particularly petroleum products. One method is similar to the chalked steel-tape method. The difference is the use of a special paste or gel rather than ordinary carpenters chalk. Such indicator pastes, when applied to the end of the steel tape and submerged in the well, will show the top of the oil as a wet line and the top of the water as a distinct color change. Another method, similar to the electric-tape method, uses a dual purpose probe and indicator system. The probe can detect the presence of any fluid (through the wetting effect) and can also detect fluids that conduct electricity. Thus, if a well is contaminated with low density, nonconducting LNAPL such as gasoline, the probe will first detect the surface of the gasoline, but it will not register electrical conduction. However, when the probe is lowered deeper to contact water, electrical conduction will be detected. The detection of a DNAPL would be similar.

5.5 Measurement of Total Depth

During water-level measurement, the total depth of the well may also be measured. This measurement gives an indication of possible sediment buildup within the well that may significantly reduce the screened depth. The same methods used for measuring water levels (e.g., steel tape or electrical probes) may be used to measure the total well depth. The most convenient time to measure the total well depth is immediately following measurement of the water level and prior to removing the measurement device completely from the well. The measurement device (steel tape or electrical probe) is lowered down the well until the measurement tape becomes slack indicating the weighted end of the tape or probe has reached the bottom of the well. While the probe remains touching the bottom and the tape pulled taut, the total well depth shall be recorded into the field book.

6.0 Quality Assurance/Quality Control

To ensure that accurate data are collected, repeated measurements of the fluid depths should be made. The readings should be within 0.01 to 0.02 feet of each other. A secondary check, if data are available, is to compare previous readings collected under similar conditions (e.g., summer months, wells pumping, etc.).

7.0 Documentation

Data will be recorded into the fluid-level monitoring log form, the project field book, or, if groundwater sampling, the groundwater sample collection record. Additional comments, observations, or details will also be noted. These documents will provide a summary of the water-level measurement procedures and conditions and will be kept the in project files.

Fluid-Level Monitoring Log

Site Location:	**Project Name:**
Personnel:	**Project No.:**
Gauging Instrument:	**Date(s):**

Well Number	Date	Time	Total Depth (Feet)	Depth to Water (Feet)	Depth to Product – (Feet)	Thickness of Product (Feet)	Remarks

BNSF Somers Project Operating Procedure (POP) 310 Headspace Screening

1.0 Purpose and Applicability

BNSF Somers Project POP 310 describes the basic techniques for using headspace analysis to screen for volatile organics in contaminated soils using a portable Photo Ionization Detector (PID) or Flame Ionization Detector (FID).

Specific project requirements as described in an approved Work Plan, Sampling Plan, Quality Assurance Project Plan, Task Hazard Analysis (THA), or Site-Specific Health and Safety Plan (HASP) will take precedence over the procedures described in this document.

2.0 Responsibilities

The project manager/task manager is responsible for overseeing work activities to ensure that field screening is performed and documented in accordance with the methods described here and in the project-specific sampling plan. In addition, a THA will be conducted to assess any potential hazards associated with headspace screening. Copies of THA forms are available in the Site-Specific HASP.

3.0 Health and Safety

This section presents the generic hazards associated with headspace screening and is intended to provide general guidance in preparing site-specific health and safety documents. The Site-Specific HASP and THA will address additional requirements and will take precedence over this document. Note that headspace screening usually requires Level D personal protection unless there is a potential for airborne exposure to site contaminants. Under circumstances where potential airborne exposure is possible respiratory protective equipment may be required based on personal air monitoring results. Upgrades to Level C will be coordinated with your Site Safety and Health Officer (SSHO) or Environment, Health, and Safety (EHS) Coordinator.

Health and safety hazards and corresponding precautions include, but are not limited to, the following:

- Dermal contact with contaminated soil. Personnel should treat all soil as potentially contaminated and wear chemically impervious gloves. Minimize skin contact with soil by using sampling instruments such as stainless steel spades or spoons. Do not touch any exposed skin with contaminated gloves.

- Inhalation hazards. Appropriate air monitoring should be conducted to ensure that organic vapor concentrations in the breathing zone do not exceed action levels as specified in the Site-Specific HASP. When ambient temperatures are low enough to require warming samples using the vehicle heater, the vehicle's windows should be opened enough to prevent the build-up of any organic vapors. Use the PID or FID to verify the airborne concentrations in the vehicle remain below applicable action levels. Note that many volatile organic compounds (VOCs) are flammable and all precautions must be observed to eliminate any potential ignition sources.

- Shipping limitations. Follow applicable regulations when shipping FID/PID equipment. When shipping an FID by air, the hydrogen tank must be bled dry. Calibration gas canisters are considered dangerous goods and must be shipped according to IATA and DOT regulations. Consult your EHS Coordinator and check with your shipping company to determine the correct shipping procedures.

4.0 Supporting Materials

The following materials must be on hand in good operating condition and/or in sufficient quantity to ensure that proper field analysis procedures may be followed.

- Calibrated PID/FID instrument
- Top-sealing "Zip-Loc" type plastic bags – *or* – 16 ounces of soil or "mason-" type glass jars and aluminum foil
- Project field book and/or boring logs
- PPE as specified in the Site-Specific HASP
- Material Safety Data Sheets (MSDSs) for any chemicals or site-specific contaminants
- A copy of the Site-Specific HASP

5.0 Methods and Procedures

5.1 Preparation

Review available project information to determine the types of organic vapors that will likely be encountered to select the right instrument. The two basic types of instruments are FIDs and PIDs.

FIDs work well with organic compounds that have relatively lightweight molecules, but may have problems detecting halogenated compounds or heavier organic compounds; FIDs can detect methane for example. Since the FID uses a flame to measure organic compounds, ensure that work is conducted in an atmosphere, which is free of combustible vapors. If ambient temperatures are below 40°F, the flame of the FID may be difficult to light.

When using a PID, select an instrument that can measure the ionization potential of the anticipated contaminants of concern. PIDs work well with a range of organic compounds and can detect some halogenated hydrocarbons; PIDs cannot detect methane. The correct ultraviolet (UV) light bulb must be selected according to the types of organic vapors that will likely be encountered. The energy of the UV light must equal or exceed the ionization potential of the organic molecules that the PID will measure. The NIOSH *Pocket Guide to Chemical Hazards* is one source for determining ionization potentials for different chemicals. Bulbs available for PIDs include 9.4 eV, 10.6 (or 10.2) eV, and 11.7 eV bulbs. The 10.6 eV bulb is most commonly used as it detects a fairly large range of organic molecules and does not burn out as easily as the 11.7 eV bulb. The 9.4 eV bulb is the most rugged, but detects only a limited range of compounds. Under very humid or very cold ambient conditions, the window covering the UV light may fog up, causing inaccurate readings. Ask your EHS coordinator about correction factors when high humidity conditions exist.

After selecting the correct instrument, calibrate the PID/FID according to the manufacturer's instructions. Record background/ambient levels of organic vapors measured on the PID/FID after calibration and make sure to subtract the background concentration (if any) from your readings. Check the PID/FID readings against the calibration standard every 20 readings or at any time when readings are suspected to be inaccurate, and recalibrate, if necessary. Be aware that, after measuring highly contaminated soil samples, the PID/FID may give artificially high readings for a time.

5.2 Top-Sealing Plastic Bag

Place a quantity of soil in a top-sealing plastic bag and seal the bag immediately. The volume of soil to be used should be determined by the project manager or field task manager. The volume of soil may vary between projects but should be consistent for all samples collected for one project. Ideally, the bag should be at least $1/10^{th}$-filled with soil and no more than half-filled with soil. Once the bag is sealed, shake the bag to distribute the soil evenly. If the soil is hard or clumpy, use your fingers to gently work the soil (through the bag) to break up the clumps. Do not use a sampling instrument or a rock hammer since this may create small holes in the plastic bag and allow organic vapors to escape. Alternatively, the sample may be broken up before it is placed in the bag. Use a permanent marker to record the following information on the outside of the bag:

- Site identification information (i.e., borehole number)
- Depth interval
- Time the sample was collected
- For example: "SS-12, 2-4 ft, @1425"

Headspace should be allowed to develop before organic vapors are measured with a PID/FID. The amount of time required for sufficient headspace development will be determined by the project-specific sampling plan and the ambient temperature. Equilibration time should be the same for all samples to allow an accurate comparison of organic vapor levels between samples. However, adjustments to equilibration times may be necessary when there are large variations in ambient temperature from day to day. When ambient temperatures are below 32°F, headspace development should be within a heated building or vehicle. When heating samples, be sure there is adequate ventilation to prevent the build-up or organic vapors above action levels.

Following headspace development, open a small opening in the seal of the plastic bag. Insert the probe of a PID/FID and seal the bag back up around the probe as tightly as possible. Alternatively, the probe can be inserted through the bag to avoid loss of volatiles. Since PIDs and FIDs are sensitive to moisture, avoid touching the probe to the soil or any condensation that has accumulated inside of the bag. Since the PID/FID consumes organic vapors, gently agitate the soil sample during the reading to release fresh organic vapors from the sample. Erratic meter response may occur at high organic vapor concentrations or conditions of elevated headspace moisture, in which case, headspace data should be discounted. Record the highest reading on the field form or in the field notebook as described in Section 7.

5.3 Jar and Aluminum Foil (Alternate Method)

Half-fill a clean glass jar with the soil sample to be screened. Quickly cover the jar's opening with one to two sheets of clean aluminum foil and apply the screw cap to tightly seal the jar. Allow headspace development for at least ten minutes. Vigorously shake the jar for 15 seconds, both at the beginning and at the end of the headspace development period. Where ambient temperatures are below 32°F (0°C), headspace development should be within a heated area. When heating samples be sure there is adequate ventilation to prevent the build-up of organic vapors above action levels.

Subsequent to headspace development, remove the jar lid and expose the foil seal. Quickly puncture the foil seal with the instrument sampling probe, to a point about one-half of the headspace depth. Exercise care to avoid uptake of water droplets or soil particulates. As an alternative, use a syringe to withdraw a headspace sample, and then inject the sample into the instrument probe or septum-fitted inlet. This method is acceptable contingent upon verification of methodology accuracy using a test gas standard. Following probe insertion through the foil seal or sample injection to probe, record the highest meter response on the field form or in the field notebook. Using foil seal/probe insertion method, maximum response should occur between two and five seconds. Erratic meter response may occur at high organic vapor concentrations or conditions of elevated headspace moisture, in which case, headspace data should be discounted.

6.0 Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) will include the collection of duplicate samples. In general, one duplicate will be collected per 20 samples. Organic vapor concentrations measured in the primary and duplicate samples should be similar within plus or minus 20 percent. The frequency of headspace duplicate collection will be determined by the project manager/task manager. The PID/FID instrument must be calibrated according to the manufacturer's instructions before beginning screening, and checked or recalibrated every 20 analyses or when readings are suspected to be inaccurate. Record ambient organic vapor levels in the field notebook and on the field form. Periodically check ambient organic vapor levels. If ambient levels have changed more than 20 percent, recalibrate the PID/FID. Make sure readings are not collected near a vehicle exhaust or downwind of the drill rig exhaust. If grossly contaminated soil is encountered, decontaminate sampling instruments between samples and/or change contaminated gloves to avoid cross contaminating less contaminated samples.

7.0 Documentation

All data generated (results and duplicate comparisons) will be recorded in the field notebook and/or on the field form. Any deviation from the outlined procedure will also be noted. Field conditions (ambient temperature, wind, etc.) should also be recorded in the field notebook.

Readings may be recorded in a field notebook, on a boring log, or on an appropriate form specific to the project. The form should include the following information:

- When the PID/FID was calibrated (date/time) and calibration standard used
- Background/ambient concentrations measured after PID/FID calibration
- Location of sample (i.e., bore-hole number)
- Depth interval of sample measured
- Lithology of material measured
- PID/FID reading and units of measure

Note that if PID/FID measurements are recorded on a boring log, it is not necessary to duplicate information in the column where the PID/FID readings are recorded (e.g., borehole number, depth interval, lithology type).

All documentation will be stored in the project files and retained following completion of the project.

Appendix B

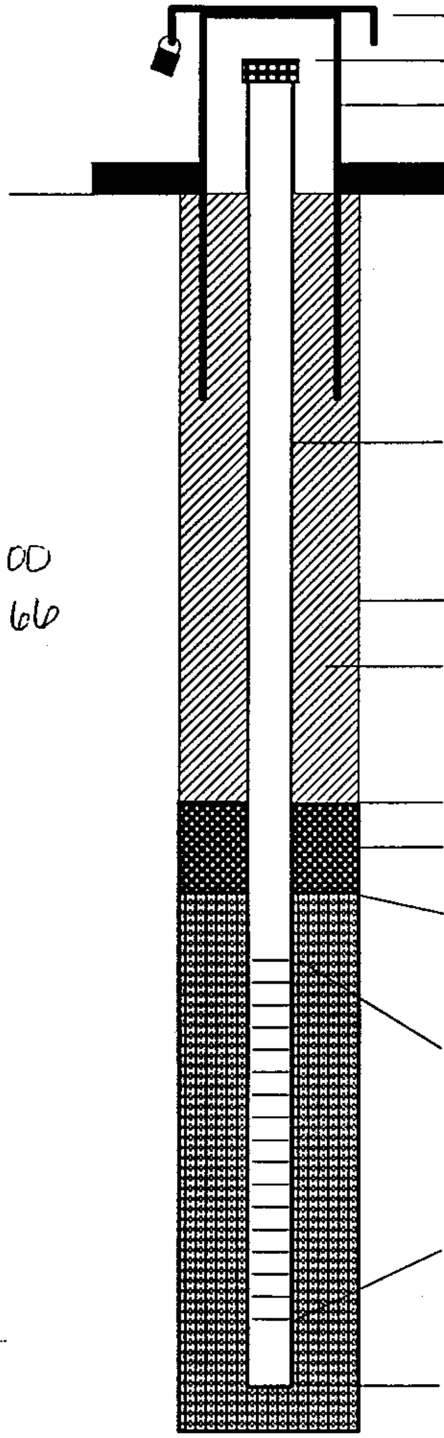
Boring and Well Logs

ThermoRetec Consulting Corporation
Well Completion Log

RECEIVED
NOV 16 1999

Date of Installation: 11/15/99
Drilling Company: O'Keefe
Field Engineer: Bjorn Selvig

Monitoring Well No.: S-3R



Northing: 1432042.00
Easting: 814546.66

Elevation of Top of Protective Casing: 2913.42 (T,D,H 11/99)
Elevation of Top of Riser Pipe: 2' abgs (2913.13 11/99)
I.D. of Protective Casing: 6"
Type of Protective Casing: Steel Casing w/ locking lid
Ground Surface Elevation: 2910.86 (T,D,H 11/99)

I.D. of Riser Pipe: 2"
Type of Riser Pipe: Galvanized Steel

Diameter of Borehole: 8"
Type of Backfill: Bentonite Holeplug 3/8" Chips
Grout Ratio:

Depth to Top of Seal: 1' bgs
Type of Seal: Bentonite Holeplug 3/8" Chips
Depth to Top of Sandpack: 6.7' bgs
Type of Sandpack: Oglebay Norton 10/20 Colorado Silica Sand

Depth to Top of Screen: 8.9' bgs
I.D. of Well Screen: 2"
Type of Well Screen: 2" 316 Stainless Steel wirewrap

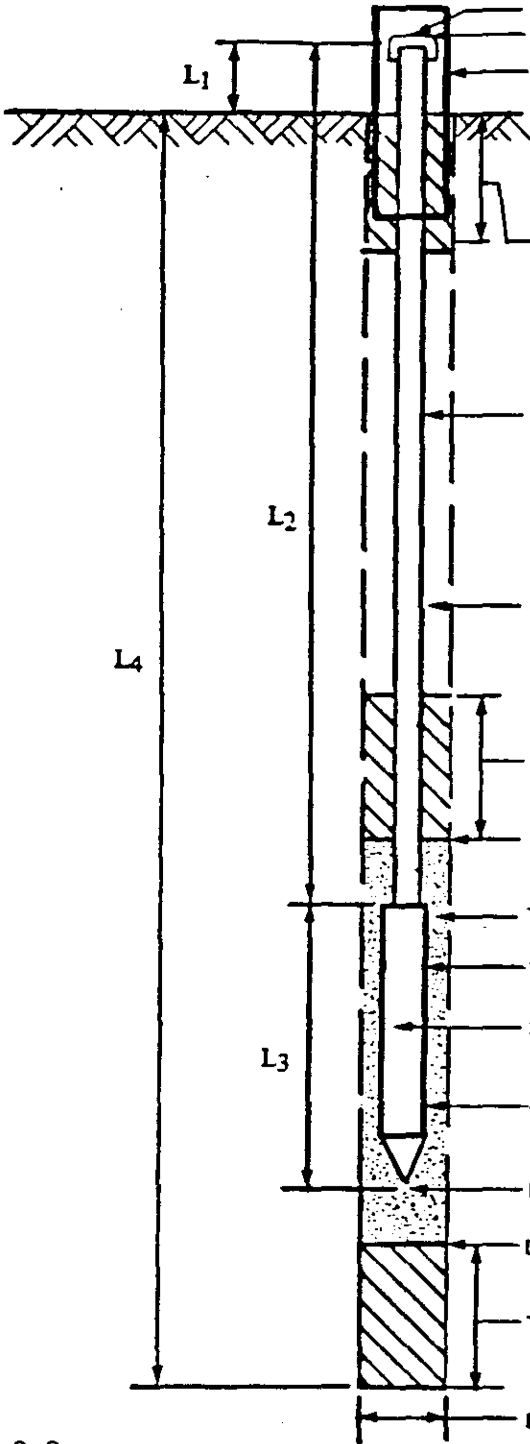
Depth to Bottom of Screen: 18.9' bgs

Depth to Bottom of Sediment Trap: 19.15'
Depth to Bottom of Borehole: 19.3'

Groundwater Levels
Initial During Drilling: ≈15' bgs
Upon Completion of Well: dry

JOB NO. 120-7859 PIEZOMETER NO. 6 (S-6)

GROUND ELEVATION AND DATUM ______



VENTED CAP	
ELEVATION OF TOP OF RISER PIPE	
PROTECTIVE CASING	
Diameter and Type	4" Steel
Total Length	3.0'
Length Above Ground	1.0'
THICKNESS AND TYPE OF SEAL	0-16.5'-Grout
DIAMETER AND TYPE OF RISER PIPE	2" Galvanized steel
TYPE OF BACKFILL AROUND RISER	Bentonite-cement grout
THICKNESS AND TYPE OF SEAL	16.5' to Surface grout
DEPTH TO TOP OF FILTER SAND	16.5'
TYPE OF FILTER AROUND SCREEN	#9 Gravel
TYPE OF PIEZOMETER	Stainless steel
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT NO.)	#10
DIAMETER AND LENGTH OF SCREEN	2"x10.2'
DEPTH TO BOTTOM OF PIEZOMETER	29.5'
DEPTH TO BOTTOM OF FILTER SAND	29.5'
THICKNESS AND TYPE OF SEAL	None
DIAMETER OF BOREHOLE	8"

L_1 = 0.8 FT

L_2 = 20.1 FT

L_3 = 10.2 FT

L_4 = 31.5 FT

INSTALLATION COMPLETED:
Date 10-22-81 Time 7:00

PIEZOMETER WATER LEVEL MEASUREMENTS			
DATE	TIME	BAILED DEPTHS	WATER LEVEL
10-23-81	-	not determined	22.7'

LOG OF TEST BORING

JOB NO 120-7859 VERTICAL SCALE 1" = 5' BORING NO 6 (S-6)

PROJECT SITE EVALUATION-BURLINGTON NORTHERN TIE TREATING PLANT-SOMERS, MONTANA

DEPTH IN FEET	DESCRIPTION OF MATERIAL (SURFACE ELEVATION)	GEOLOGIC ORIGIN	N	WL	SAMPLE NO	SAMPLE TYPE	W	D	LL/PL	Qu
2	CLAYEY SILT, dark brown, soft (ML-CL)	TOPSOIL OR FINE ALLUVIUM	4	*	1	2½L				
4½	SILT, brown, moist, loose (ML)	FINE ALLUVIUM	6		2	2½L				
12	SAND, fine grained, brown mottled, moist, medium dense to dense, some laminations of silt (SP-SM)	COARSE ALLUVIUM	11		3	2½L				
			12		4	2½L				
			19		5	2½L				
31½	SILTY SAND, fine grained, brown, moist to waterbearing, dense to loose (SM)		16		6	2½L				
			7		7	2½L				

End of Boring

Note: Piezometer installed in boring. See attached "Installation of Piezometer" sheet.

*Water level is estimated to be at depth in vicinity of 22½'

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
10-22	5:15	21½'	19½'		to	None
10-22	6:00	31½'	29½'		to	NMR
10-22	7:00		SEE NOTE		to	
					to	

START 10-22-81 COMPLETE 10-22-81

METHOD HSA(4¼" I.D.)0-29½' @ 6:00

CREW CHIEF Rechnagel

(C-2)

Project D930-320 Site BN Somers, MT **BORING** well S85-5b Sh 1 of 2

Date Started 10-3-85 Completed 10-4-85 Ground Elevation

Total Depth 40' Location Logged by AMC

Casing I.D. 2" Steel (6" I.D surface casing) Contractor Erickson - Ford

Remarks 12' from S-85-5A, S-85-5A has higher casing stickup, drilled with 6 1/4" hollow stem auger

Elev. Feet	Depth Feet	Sample: Type & Number	Sample: Blows per 6 In.	Sample: Depth Range	Sample: Rec.	Graphic Log	Sample Description	Equipment Installed
		split spoon					topsoil, dark black, moist, vegetation, PT	
	5		1,1,1	5-6'	100%		Sand, fine, brown, saturated, well sorted, SP	0-10' grout backfill
	10	#1	2,3,4	10-11'	100%			10-26' backfill with slough around bore-hole
	15		11,11,14	15-16'	100%		Sand, fine-med. grnd, gray-brn, moist, SP	
	20						(switch to rock bit, smaller diameter pipe, to gather split spoon samples, squeezing sands make it difficult to gather samples with auger)	
			4,7,7	23-24'	80%			
	25	#2, #3	4,8,6	27'-28'	100%			26-38' 10-20 Silica Sand
	30							28'-38' Sch 40 Screen
			2,3,3	33'-34'	100%		silt, gray, moist, MH	
	35							

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Project 093C-320 Site BN Somers, MT **BORING** well S-85-56 Sh 2 of 2

Elev. Feet	Depth Feet	Sample Type & Number	Sample Blows per 6 In.	Sample Depth Range	Sample Rec.	Graphic Log	Sample Description	Equipment Installed
	35							35
		#4	6,15,16	37-38'	100%		sand, fine, gray-brn, 30% MH, wet, SP	screen 28-38'
								38'-40' Sump
	40							T.D. 40
							drilled to 45; sands squeezed up to 38'	
	45							45

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(D-2)

Project D930-320 **Site** BN Somers, Mt **BORING** Well S-85-6b **Sh 1 of** 3
Date Started 10-9-85 **Completed** 10-10-85 **Ground Elevation**
Total Depth 52' **Location** **Logged by** AMC
Casing I.D. 2" Steel (6" I.D. surface casing) **Contractor** Erickson Ford
Remarks ~10' from well-S-85-6A drilled with 6 1/4" I.D hollow stem auger

Elev. Feet	Depth Feet	Sample: Type & Number	Sample: Blows per 6 In.	Sample: Depth Range	Sample: Rec.	Graphic Log	Sample Description	Equipment Installed
		split spoon					1'-3' topsoil, PT	5' steel surface casing
	5		1,2,1	5-6'	30%		silt, brn-gray, moist, orange staining, MH	5
	10	#1	1,1,1	10-11'	100			10 0'-33' grout backfill
	15		0,1,1	15-16'	100	▽	sand, silty, fine, gray, moist, well sorted, SP	15
	20		1,0,2	20-21'	100		sand, silty, fine, gray, wet, SP-MH	20
	25		1,0,2	25-26'	100		" "	25
	30		1,1,2	30-31'	100		" "	30
	35						grading finer	33'-35' bentonite plug 35

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Project D930-320 Site BN Somers mt. BORING WRY S-55-6b Sh 2 of 3

Elev. Feet	Depth Feet	Sample Type & Number	Blows per 6 In.	Depth Range	Rec.	Graphic Log	Sample Description	Equipment Installed
	35		3,2,5	35-36'	100%		Silt, sandy, fine, gray, MH-SP	35-57' 35 10-20 Silica Sand
	40		1,2,3	40-41'	100%			40-50' 40 Sch #40 Steel Screen
	45	*2	2,1,3	45-46'	100%		borehole making water while augering	45
	50		3,2,4	50-51'	100%		49' few gravels Silt, clayey, gray, slightly moist, MH	50-52' 50 Sump
	55		2,2,4	55-56'	100%			10-20 Silica Sand 55
	60		2,3,4	60-61'	100%		Silt, clayey, gray, slightly moist, tr. sand, platey structure	57'-62' bentonite pellet plug 60
	65		2,2,4	65-66'	100%			62'-120' 65 backfilled with cuttings
	70							70
	75	*3	2,2,3	75-76'	100%			75
	80							80

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Project 0930-320 Site GN Somers mt **BORING** well S-85-6b Sh 3 of 3

Elev. Feet	Depth Feet	Sample: Type & Number	Sample: Blows per 6 In.	Sample: Depth Range	Sample: Rec.	Graphic Log	Sample Description	Equipment Installed
80								80
85			3,4,5	85-86'	100%			85
90								90 backfilled with cuttings
95			3,3,6	95'-96'	100%			95
100								100
105		#4	4,6,7	105'-106'	100%			105
110							grading finer	110
115								115
120		#5	8,9,10	120'-121'			Clay, silty, trace sand, fine, gray, slightly moist, platey structure, CH	120

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(F-2)

Project D930-320 **Site** BN Somers Mt **BORING** Well S-85-8a **Sh 1 of** 1

Date Started 10-7-85 **Completed** 10-7-85 **Ground Elevation**

Total Depth 31' **Location** **Logged by** AMC

Casing I.D. 8" steel (6" I.D. surface casing) **Contractor** Erickson - Ford

Remarks ~12' from S-85-8B close to old ditch line, drilled with 6¼" I.D. hollow stem auger

Elev. Feet	Depth Feet	Sample: Type & Number	Sample: Blows per 6 in.	Sample: Depth Range	Sample: Rec.	Graphic Log	Sample Description	Equipment Installed
							see lithologic description for S-85-8B	5' steel surface casing
	5							5
								0-16' grout backfill
	10							10
	15							15 16-17' bent. plug 17-35' 10-20 silica sand
	20							19-29' Sch#40 screen 20
	25							25
	30							29-31' sump 30
	35							17-35' 10-20 silica sand

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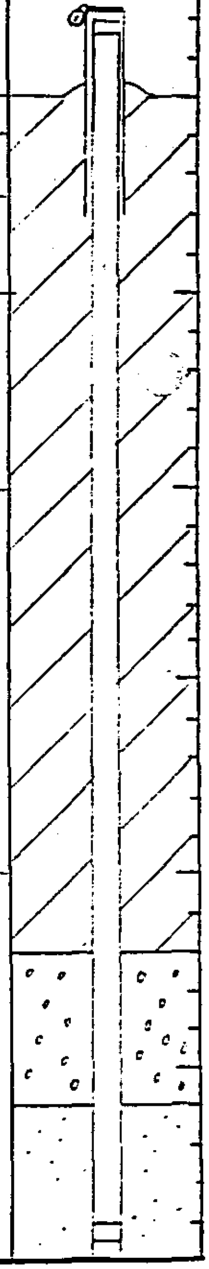
REMEDIATION TECHNOLOGIES INC

Project BN-SOMERS **Site** SOMERS TIE PLANT **BORING** S-86-1 **Sh 1 of** 2
Date Started 9-20-86 **Completed** 9-21-86 **Ground Elevation** ~2916'
Total Depth 40 FT. **Location** 190'N & 190'E S-84-11 **Logged by** BWSTONE
Casing I.D. 6 1/4 HST **Contractor** MOUNTAIN STATES DRILLING, BOISE ID
Remarks 2"x18" SPLIT SPOONS TAKEN AT 5' INTERVALS FOR LOGGING.
SAMPLE COLLECTED AT SCREENED INTERVAL FOR SIEVE ANALYSIS;
RIG: CME-55. WELL DEVELOPED w/ FILTERED COMPRESSED AIR (RATED 80CFM, 100psi)

Elev. Feet	Depth Feet	Sample: Type & Number	Sample: Blows per 6 In.	Sample: Depth Range	Sample: Rec.	USCS	Sample Description (WENTWORTH)	Equipment Installed
		SPLIT SPOON						2 FT STICKUP
	0					GW	0-0.5' LT. BROWN SILTY GRAVEL	
						ML	0.5-2' DARK BROWN TO BLACK SILT w/ A LITTLE GRAVEL	
						CL	2-5' LT. BROWN SILTY CLAY	
	5	S-1-5	5,4,4	5-6 1/2	60	SP	5-10 LT. BROWN TO RED SILTY VERY FINE SAND, SLIGHTLY MOTTLED, STRONG HCl REACTION	
	10	S-1-10	5,3,5	10-11 1/2	80	SP	10-20 LT BROWN SILTY FINE TO MED. SAND; MOTTLED; SLIGHT REACTION	
	15	S-1-15	4,5,6	15-16 1/2	60			
	20	S-1-20	2,3,4	20-21 1/2	60	SP	20-35 LT. BROWN MED. SAND; SUB ∠ - SUB ROUNDED; STRONG REACTION; MOIST	
	25	S-1-25	5,5,8	25-26 1/2	100		WET @ 25'	
	30	GRAB						



Project BN-SOMERS Site SOMERS TIE PLANT **BORING** S-86-1 Sh 2 of 2

Elev. Feet	Depth Feet	Sample Type & Number	Blows per 6 In.	Depth Range	Rec.	USCS	Sample Description WENTWORTH	Equipment Installed
	30					SP	LT. BROWN MED SAND	
	35	GRAB				SP	35-40 LT BROWN FINE-MED SAND; SUBROUNDED; CLEAN; SATURATED	
	40	GRAB						SCREEN: 0.010 SLOT STAINLESS; 29-40 FT SAND: 10-20 SILICA 26-40 FT. SEAL: VOLCLAY 1/4" BENTONITE PELLETS; 22-26 FT. GROUT: PORTLAND CEMENT TYPE I-II & SUPER-GEL-X 0-22 FT. RISER: 2 IN. GALV. W/ THREADED COUPLINGS 2 FT STICKUP

RETEC

Appendix C

Data Quality Objectives

C1.0 Data Quality Objectives

The Data Quality Objective (DQO) process is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. These DQOs also shall be the determinative factor for assessing the success or failure of the sampling. USEPA has issued guidelines to help data users develop site-specific DQOs (USEPA 2000). The DQO process is intended to:

- Clarify the study objective;
- Define the most appropriate type of data to collect;
- Determine the most appropriate conditions from which to collect the data; and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the design

C1.1 Data Quality Objective Process

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate data are justified. The DQO process consists of seven steps; the output from each step influences the choices that will be made later in the process. These steps are as follows:

Step 1: State the problem

Step 2: Identify the decision

Step 3: Identify the inputs to the decision

Step 4: Define the study boundaries

Step 5: Develop a decision rule

Step 6: Specify tolerable limits on decision errors

Step 7: Optimize the design

During the first six steps of the process, the Site team[1] develops decision performance criteria that will be used to develop the data collection design. The final step of the process involves developing the data collection design based on the DQOs. A brief discussion of these steps and their application to this Work Plan is provided below.

C1.1.1 State the Problem

The problem at the BNSF Railway Co. (BNSF) Former Tie Treating Plant in Somers, Montana (Site) is threefold.

1. A dissolved creosote constituent groundwater plume had been contained by a groundwater recovery system (GWTS) located in the former CERCLA lagoon and treated at an onsite water treatment plant. However, BNSF requested termination of the GWTS in 2007 based on modeling results that indicated creosote-impacted groundwater from the Site is not likely to migrate to either

[1] Includes USEPA, MDEQ, and BNSF Railway representatives.

the town well or Flathead Lake due to geologic conditions of the aquifer and the low mobility of the dissolved creosote constituents of concern (COCs) present onsite, whether or not the GWTS is operating. Approval to shutdown GWTS operations for an interim period was granted in October 2007. Since that time, BNSF has collected quarterly monitoring data to evaluate the stability of the dissolved creosote constituent plume and to verify that natural processes are present to aid in breaking down creosote constituents.

Recent investigations on neighboring property (Applied Water Consulting, 2010 – Figure 1) have indicated that creosote and/or dissolved phase constituents above the Record of Decision (ROD) cleanup levels are present in the subsurface beyond the proposed TI boundary.

2. Several monitoring wells have concentrations of zinc above ROD cleanup levels. The wells with concentrations of zinc above ROD cleanup levels were constructed of galvanized steel casings and it is hypothesized that the exceedances are caused through the dissolution or loss of the zinc coating used for galvanization.
3. Two monitoring wells installed at the site for the purpose of monitoring Site conditions have contained an insufficient amount of water to collect samples.

Based on the above observations, additional site investigations and monitoring are proposed. The ability to determine whether the proposed technical impracticability boundaries and the existing controlled groundwater area need revision depends on the results of these field activities and future monitoring.

C1.1.2 Identify the Decision

The purpose of this step is to define the decision statements this study will attempt to resolve. Decision statements are developed by combining principal study questions (PSQs) and alternative actions (AAs). PSQs are derived from the problem statements presented in Section C1.1.1 above. For each PSQ, AAs are developed (including no action alternative if appropriate) that indicate what action will be taken after each PSQ is answered. Data collected from this study will be incorporated into the larger Site dataset for decision making purposes. The PSQs are as follows: **Principal Study Questions**: Evaluate the vertical and horizontal extent of creosote and dissolved phase constituents of concern (COCs) in groundwater in the area between the former CERCLA lagoon and well S-91-2 that may exceed target cleanup levels set forth in the ROD. Better assess the source of zinc in groundwater that exceeds the target cleanup level in the ROD by replacing galvanized steel constructed wells with wells constructed of poly vinyl chloride (PVC). Replace monitoring wells S-3R and S-6, which have been dry during recent years, with wells completed with a deeper screen interval. Based on these principal study questions, the following alternative actions have been developed:

Alternative Action (1): Recommend that no additional borings and monitoring wells be completed and that the existing groundwater monitoring network be used to gauge potential migration of dissolved creosote COCs and zinc; or

Alternative Action (2): Recommend additional data collection efforts to better define the horizontal and vertical extent of the dissolved creosote COCs and zinc in groundwater and determine if the existing boundaries of the CGA and proposed TI area need to be revised.

The principal study questions and the alternative actions were combined to form the following decision statements:

Decision Statement: Determine whether or not existing data and data collected during implementation of the Work Plan for Additional Data Collection (2010 Work Plan) are sufficient to better define the horizontal and vertical extent of the dissolved constituents of concern and to determine if the existing boundaries of the proposed TI or CGA need to be revised. Determine if observed zinc exceedances are associated with galvanized steel casings. Determine if deeper wells can be installed to provide additional monitoring locations for the Site.

C1.1.3 Identify the Inputs to the Decision

The purpose of this step is to identify the information inputs needed to support the decision statement and to specify which inputs will require environmental measurements. Table 1.1 presents the data inputs needed and shows the relationship between the data inputs and evaluation criteria and performance goals.

C1.1.4 Define the Study Boundaries

The purpose of this step is to clarify the site characteristics that the environmental measurements are intended to represent. This step includes the following activities: 1) defining the scale of decision making, 2) specifying the characteristics that define the media of interest, 3) defining the spatial boundary of the decision statement defining the spatial boundary of the decision statement, 4) defining the spatial boundary of the decision statement, and 5) identifying any practical constraints on data collection. These activities are briefly discussed below.

Scale of Decision Making: The study area is divided into investigative subsets that represent different study areas. Independent decisions may be made for each of these areas. These areas are described as primary, secondary and tertiary objectives:

Primary Objective: Evaluate the extent of dissolved creosote constituents of concern in groundwater that may exceed target cleanup levels set forth in the ROD. The results of this investigation and additional quarterly monitoring will be used to determine if the boundaries of the existing Controlled Groundwater Area and the proposed technical impracticability area need to be revised.

Secondary Objective: Better assess the source of zinc in groundwater that exceeds the target cleanup level in the ROD by replacing galvanized steel casing constructed wells S-85-5B, S-85-6B, S-85-5A, and S-86-1 with poly vinyl chloride constructed wells. The results of this investigation and additional quarterly monitoring will be used to determine if the proposed technical impracticability area around nested wells S-85-5A and S-85-5B is necessary. It also can determine if the existing controlled groundwater area that covers the former LTU Area can be lifted and still remain protective of human health and the environment.

Tertiary Objective: Replace monitoring wells S-3R and S-6 with deeper screened wells to allow for better potentiometric maps to be developed and to provide analytical data representative of background conditions. Due to drought conditions in the region, the groundwater table has dropped 3 to 4 feet since the wells were constructed and wells have had insufficient volume to collect a sample during the interim monitoring period.

Characteristics That Define the Media of Interest: The media of interest associated with the primary objective is creosote impacted soil and non-aqueous phase creosote that acts as a continuous source of the dissolved creosote constituent groundwater plume. This impacted media, which is likely present beyond the CERCLA lagoon, is the primary target of possible future response actions (e.g. revision to the CGA or proposed TI boundaries).

The media of interest associated with the secondary objective is zinc that may be associated with the galvanized steel casings installed in wells S-85-5B, S-85-6B, S-85-8A, and S-86-1 that may be acting as a continuous source of the dissolved zinc that continues to be detected above ROD target cleanup levels in samples collected from these wells.

The media of interest associated with the tertiary objective is groundwater that has decreased in elevation over time.

Spatial Boundary of the Decision: The spatial boundary includes the former land treatment unit (LTU) and upgradient monitoring well S-3R to the west, ponded and marshy areas beyond monitoring well cluster S-85-5 to the north, monitoring wells S-84-15 and S-91-2 to the east and Flathead Lake to the south. These boundaries are further divided into investigative subsets about which independent decisions can be made. The spatial boundaries are dynamic and can be modified if field observations indicate a need to modify the boundaries of the study.

Temporal Boundaries of the Decision: The field investigations are anticipated to be completed by October 31, 2010. Groundwater sample results will continue to be collected and reported quarterly during the remainder of the interim monitoring period.

Practical Constraints of Data Collection: Practical constraints of data that will be collected include the physical and administrative access to the properties not owned by BNSF as well as existing structures and buried utilities associated with all the properties where borings and monitoring wells are planned to be completed. In addition, a sufficient volume of water may not be available for the collection of groundwater at each desired depth due to the geologic conditions at the site.

C1.1.5 Develop a Decision Rule

The decision rule states what regulatory response action would be appropriate depending on whether a chosen parameter is greater or less than the action level. For this study, groundwater and soil analytical results will be compared with ROD based target cleanup levels. Groundwater and soil analytical results and field chemistry measurements from this event as well as future groundwater analytical results also will be used to support future site decisions.

Decision Rule Primary Objective: If data collected during this upcoming field investigation and future quarterly monitoring events indicate that the dissolved phase constituents above target cleanup goals extends, or has the potential to extend, beyond the existing Controlled Groundwater Area (CGA), the need to revise the original boundaries of the CGA pursuant to Section 85-2-506 and 508, MCA as amended will be evaluated.

If data collected during this upcoming investigation indicate that the dissolved phase constituents do not extend, or have the potential to extend, beyond the existing CGA, then site wide quarterly monitoring will continue to demonstrate plume stability and to verify that in-situ degradation of dissolved creosote constituents in groundwater is occurring during the remainder of the interim monitoring period.

Decision Rule Secondary Objective: Groundwater sample results will continue to be collected during the regularly scheduled sampling events for the remainder of the interim monitoring period at S-85-5BR, S-85-6BR, S-85-8AR, and S-86-1R.

If the replacement well S-85-5BR is determined to be in compliance with the target cleanup goals for zinc after four quarters, the Agencies will determine in consultation with BNSF if the proposed technical impracticability area around nested wells S-85-5A and S-85-5B is necessary.

If the replacement well S-85-5BR is not in compliance or if compliance cannot be established following four quarters of monitoring, the interim monitoring plan will be revised and the need to establish the proposed TI area around nested wells S-85-5A and S-85-5B will be evaluated in coordination with the Agencies.

Decision Rule Tertiary Objective: Groundwater sample results will continue to be collected during the regularly scheduled sampling events for the remainder of the interim monitoring period.

C1.1.6 Specify the Tolerable Limits on the Decision Errors

The purpose of this step is to specify the tolerable limits on decision errors, which are used to establish performance goals for the data collection design, and discuss how decision errors will be addressed. For the 2010 Work Plan, the boring and monitoring locations as well as the number of samples (which can impact the statistical power associated with the sample approach) were established based on previous investigations, discussions between the Agencies, BNSF and its representatives, and Agency direction. These are specified in Chapter 2.0 of the 2010 Work Plan.

In order to mitigate the potential for false positive and/or false negative errors associated with field sampling, sample collection processes will be consistent with established and relevant Project Operating Procedures (POPs) included as attachment A to the 2010 Work Plan. This includes collection of duplicate samples (and subsequent comparison to primary samples using relative percent difference (RPD) statistics), implementing a decontamination procedure (which may include the use of disposable sampling equipment), and the collection of field blanks.

For laboratory analysis of samples, quality assurance/quality control (QA/QC) steps (such as the use of laboratory controls, matrix spikes, matrix spike duplicates, blanks, etc.) will be consistent with previous QA/QC procedures used at this Site and will be consistent with established and relevant procedures outlined in the Quality Assurance project Plan included as Appendix E to the 2010 Work Plan. In addition, split samples may be taken to evaluate laboratory analytical performance. This will be at the discretion of the Agencies and property owners provided a sufficient volume of soil and/or groundwater can be collected from the boring.

C1.1.7 Optimize the Design

The purpose of this step is to identify the most resource-effective data collection design for generating data expected to satisfy the DQOs specified in the preceding six steps. For this sampling event, the sample locations and the investigative approach were selected based on the results of previous sampling efforts at this site; discussions between the Agencies, BNSF and its representatives, and existing data needs.

Table C1-1
Summary of Data Input Needs

Evaluation Criteria	Performance Goals of In Situ Remedy	Proposed Performance Level	Data Needed to Estimate Performance	Source of Data
Long-Term Effectiveness and Permanence	Achieve conditions that are compatible with planned future use of the site.	For the media treated, achieve RAOs specified in the ROD and/or finalize the proposed technical impracticability waiver if these RAOs cannot be achieved.	Contaminant concentrations over time following monitoring well installation.	Environmental sampling
Reduction of Toxicity, Mobility, or Volume	Reduce effort needed to maintain long-term remedial operations at the site.	If GWTS is permanently discontinued, ensure impacted groundwater that does exceed the ROD cleanup levels does not migrate outside of existing CGA and proposed TI boundary.	Contaminant concentrations over time. Additional lithologic information.	Environmental sampling Soil borings
Short-Term Effectiveness	Maintain subsurface conditions that are compatible with the operation of the existing groundwater collection and treatment system.	At the boundaries of the proposed technical impracticability boundary, maintain the RAOs specified in the ROD.	Contaminant concentrations in groundwater at sentinel and Point of Compliance wells to be determined.	Environmental sampling
Cost	Reduce long-term costs	Performance level to be determined by stakeholders.	Estimated cost of interim response actions and long-term monitoring	Cost estimate, rough (-30%, +50%).
Compliance with ARARs	Comply with ARARs identified in the ROD.	ARARs compliance	Contaminant concentrations over time.	Environmental sampling

Appendix D

Correspondence Pertaining to Work Plan

Contents

E-mail from AECOM (Shelly Young) to USEPA and MDEQ. May 10, 2010. BNSF Somers Revised 2010 Work Plan. Attachment of Somers 2010 Work Plan_Revised Final w Figure included.

E-mail from USEPA (Roger Hoogerheide) to AECOM. May 21, 2010. Workplan (request for inclusion of QAPP/FSP).

E-mail from USEPA (Roger Hoogerheide) to AECOM and BNSF. June 7, 2010. Request for an electronic copy of the work plan (May 2010) for revision to insert DQOs.

E-mail from AECOM (Shelly Young) to USEPA and MDEQ. June 8, 2010. Submittal of electronic copy of May 2010 Work Plan.

E-mail from USEPA (Roger Hoogerheide) to AECOM and BNSF. June 9, 2010. Response to AECOM e-mail summarizing telephone conversation on same date.

E-mail from USEPA (Roger Hoogerheide) to AECOM and BNSF. July 2, 2010. Work Plan Revisions BNSF Somers. Attachment of Work Plan for Additional Data Collection7_2 and figure included attached is the redline version of revisions to the Work Plan that were proposed by the Agency).

Letter from USEPA to BNSF. July 20, 2010. BNSF – Somers Clarification of two changes to the revised work plan for additional work submitted to BNSF Railway on July 2, 2010.

E-mail from USEPA (Roger Hoogerheide) to BNSF and AECOM. July 20, 2010. Response to Agency responses from July 19 conference call.

E-mail from AECOM (Shelly Young) to USEPA to MDEQ. July 30, 2010. 2010 Work Plan – Final Draft 2010 Work Plan. Attachments include revised 2010 Work Plan and Appendix C documents, both Word versions and a PDF showing redlines. The redlined version is included in the Correspondence PDF.

E-mail from USEPA (Roger Hoogerheide) to AECOM. July 30, 2010. Comment on the figure included in the Final Draft submittal.

E-mail from USEPA (Roger Hoogerheide) to AECOM and BNSF. August 17, 2010. Comments on the Final Draft Work Plan for Additional Data Collection. Attachment of 2010 Work Plan- Appx C and 2010 Work Plan_Final Draft included.

E-mail from USEPA (Roger Hoogerheide) to AECOM and BNSF. August 20, 2010. Response to AECOM regarding Comments on the Final Draft Work Plan for Additional Data Collection.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Montana Department of ENVIRONMENTAL QUALITY

July 15, 2009

Mr. Dave Smith
Manager Environmental Remediation
Burlington Northern Santa Fe (BNSF) Railway Company
825 Great Northern Boulevard, Suite 105
Helena, MT 59601-3340

Re: *First Annual Interim Monitoring Report January through November 2008*

Dear Dave:

The *First Annual Interim Monitoring Report January through November 2008* (Report) for the BNSF Former Tie Treating Plant in Somers, Montana, prepared by AECOM, Inc. has been received and reviewed by DEQ and EPA. The following pages present specific agency comments on the Report. In addition, DEQ and EPA have provided comments regarding Interim Monitoring Plan and future monitoring report revisions, as well as additional work provisions that will be required. These can be discussed during our conference call on July 16. We appreciate your efforts in preparing the *First Annual Interim Monitoring Report January through November 2008.*

Sincerely,

Lisa DeWitt
DEQ Project Officer

Roger Hoogerheide
EPA Remedial Project Manager

cc: Shelly Young, AECOM (electronic copy)
Ann Colpitts, AECOM (electronic copy)
Andrew Schmidt, EPA (electronic copy)
Larry Scusa, DEQ (electronic copy)
Joe Vranka, EPA (electronic copy)
File

SPECIFIC COMMENTS:

Section 1.3 (Site wide monitoring) Page 1-2 states that the extraction and injection wells are presented on Figure 1. However, these features are not included on Figure 1. Please include these wells on Figure 1.

Section 2.1 (Groundwater flow direction). Page 2-1. The text states:

> *"The groundwater contours show dissipation of the drawdown cone of depression observed during the groundwater pumping system operation. At the center of the pumping system cone of depression, the groundwater elevations ranged from approximately 2,888 to 2,894 feet over the period of operation. The elevation in the same area post GWTS shutdown indicate the groundwater is still depressed but the effects of pumping are dampening with time."*

Water level maps from February, June, and September 2007 (during pumping and a long-term regional drought that affected groundwater elevations at the Site) illustrate substantially lower water levels (typically in the range of 2,882 to 2,885 feet msl) than the 2,888 to 2,894 ft msl noted in the above statement. As a result, the subsequent part of the statement that post pumping levels are still depressed does not follow. BNSF compares 2008 values (2,887 to 2,892 ft msl) to 2,888/2,994 values which are assumed to be average elevations during period of operations rather than the observed values of 2,882 to 2,885 ft msl which were observed in months proceeding shutdown. When the observed values are used, it is apparent that water levels have risen substantially since pumping has terminated. Please correct the discussion to reflect the observed values.

Section 2.2 (Vertical Gradient): Page 2-2. Text states
"In addition, with the seasonal gradient reversal, the transport of chemicals would also be reversed. Since no PAHs are present in the bedrock well near the lake, the recharge/discharge relationship between the lake and bedrock aquifer will not impact PAH migration."

This should be re-written to read

"In addition, with the seasonal gradient reversal, the transport of chemicals would also be reversed. However, since no polycyclic aromatic hydrocarbons (PAHs) are present in the bedrock well near the lake, the recharge/discharge relationship between the lake and bedrock aquifer should not impact the migration of PAHs at the Site."

Section 2.2 (Vertical Gradient): Page 2-2. The determination of vertical gradients in this Section uses two well clusters that are relatively distant from the highest areas of contamination. The S-85-6 cluster, while within the proposed TI boundary, is located relatively close to the lake, and during high levels in Flathead Lake, the groundwater flow direction at this cluster is from the lake toward the area of contamination. The S-91-4/S-84-10 cluster is near the swamp pond where the maximum TPAH concentration from sampling since 1984 is 2.1 ug/L. If the evaluation of vertical gradients is to determine the potential for downward contaminant migration, then it seems more appropriate to use clusters located within the most impacted areas, such as S-93-2S and S-93-2D. The Agencies note that the vertical gradient at this cluster for all four quarters of 2008 was upward. The water level measurements from the S-85-8a/S-85-8b/S-88-8c cluster would also be helpful, but the water levels do not appear to be reliable. The water levels at S-85-8a and S-88-8c, which are in the overburden, appear to be extremely low (approximately 4 feet low) compared to all other water levels measured at the site both toward and away from the lake. The deeper well (S-85-8b), which is in bedrock, has a water level that is more comparable to those measured on site and is substantially higher than these two other wells in the cluster. The reasoning for the abnormally low water levels at S-85-8a and S-88-8c is unclear. An explanation should be provided in the text of the report.

Section 3.1.4 (Water Level Measurement and GW Sampling Protocols): page 3-4 states *"Purge water will be purged into a bucket or other container to measure the volume; the bucket will then be emptied onto the ground surface at the well."*

Observation of Nancy Gillliland during a sampling event in 2008 suggests that she does not empty water onto the ground surface at the well and that water that may contain dissolved phase constituents that the Agencies are trying to remediate is normally not disposed of on the ground. Is this procedure detailed in the Sampling and Analysis Plan or in a Standard Operating Procedure and has this practice been historical done with approval from the previous EPA Project Manager?

Section 3.3.2.2 (Results): This Section states that the January 2008 TPAH concentration in monitoring well S-88-2 was elevated due to dilution during analysis (10,380 μg/L). It seems unlikely that the detected TPAH concentrations were elevated due to dilution during analysis. The sample was most likely diluted as a result of the high concentrations of analytes in the sample. Please correct the discussion appropriately.

Tables 7 and Appendix A: A reference to data flag "D" is missing. Include the reference.

Figure 2a – 2d: When there is a nested set of wells or a cluster of wells (S-85-8a/b/c series) and groundwater elevations differ, how are wells chosen when potentiometric surface maps are developed?

Figure 3: The presentation of the 2008 data in the hydrograph presented in Figure 3 is confusing. The x-axis is arranged by category and a uniform space on the x-axis is presented between each data point, despite the 2008 data being collected at a more frequent interval than in previous years. Furthermore, the data for 2008 appear to be inconsistent with expectations and the historical pattern. For example, during the period noted as Summer 2008, the lake is at a low point, where as generally the lake is maintained at full pool in the summer. It is suggested in future reports that this plot be constructed using a scatter plot so that the x-axis scales depending on the amount of time between data points. The water level data for Flathead Lake should also be included in tabular form somewhere in the reports. Related to this discussion, AECOM states, "Review of the hydrographs suggests that during the spring both the bedrock and surficial systems discharge to the lake. Conversely, it is apparent that the lake discharges to the surficial

aquifer during the fall monitoring events." This statement appears to be reversed. Please correct the discussion appropriately.

Figure 9: The January 2008 TPAH concentration for monitoring well S-88-2 should be included on the concentration vs. time plot.

REVISIONS TO THE INTERIM MONITORING PLAN RESULTING FROM COMMENTS ON THE ANNUAL REPORT

1. **Monthly water level measurements will be measured at least until the Third Five Year Review is finalized in 2011 to confirm that the quarterly measurements accurately capture the transient nature of the water levels at the site and influences from Flathead Lake.**

Section 2.1 (Groundwater flow direction): Page 2-1. The text states in multiple sections that the groundwater flow pattern is similar to that observed during pumping conditions in February 2007. The potentiometric surface map during pumping conditions routinely indicate a very substantial cone of depression and what appeared to be a very wide capture zone. A good indicator is variation in the head difference between S-88-2 vs. S-88-3 during pumping and non-pumping conditions. During pumping conditions (2007), the head difference indicates flow toward S-88-2 (i.e., toward the area of pumping), but three of the four water levels from post pumping conditions (2008) show flow in the reverse direction (i.e., away from the area of pumping). This represents a substantial change in the flow field that could demonstrate plume migration in the absence of pumping.

Section 2.1 (Groundwater flow direction): Page 2-1. This Section reports approximate gradients and reports that groundwater flow is easterly to northeasterly during each quarter. A review of the data indicates the flow field is quite variable horizontally and vertically during any particular quarter and from quarter to quarter. In some cases, there are gradient reversals, and the complicated nature of the potentiometric surface maps and the relative lack of resolution (i.e., 1 foot contours) often misses these subtle changes. Developing an average potentiometric surface map based on the four quarters of data collected during 2008 would likely show converging flow along a line oriented northeast from S-88-3. That is, from the northwest of S-88-3 water flows from the northwest (i.e., toward the lake) and from the southeast of S-88-3 water flows from the southeast (i.e., directly away from the lake). Despite the multiple references to S-88-3 in the preceding sentences, S-88-3 may not necessarily be located along the centerline of groundwater flow. S-88-3 is only used as a point of reference given the absence of other features and wells in this area. This groundwater flow pattern is likely due to the relatively high average water level of Flathead Lake. Part of the problem may be associated with the vertical variation in water levels. The data indicate substantial differences in water levels with depth within the same cluster, indicating that the depth of a well has a large affect on the measured water level. For example, S-85-6a and S-85-6b are screened only 10 feet apart, but have water levels that are often 0.5 feet different, which translates to a vertical hydraulic gradient that is substantially larger than the horizontal hydraulic gradient between S-88-3 and S-85-6a. Many of the wells at the site are installed at different depths (e.g., S-88-3 is at a different depth than S-88-2 or S-88-1), and some measurements appear to be so uncharacteristic that they are unreliable (e.g., S-85-8a and S-88-8c compared to S-85-8b), making it difficult to develop reliable potentiometric surface maps. These findings also have an interesting influence on the interpreted fate and transport of the contamination such as:

- On average, contamination appears to be prevented from flowing to the lake due to the control of the lake water level and therefore groundwater may flow parallel to the lake for some unknown distance during periods of the year. It is unclear if this is the case or if flow directions at this site cannot accurately be ascertained given that the horizontal gradients are sufficiently flat that they are masked by the large change in water levels with depth.

- The actual fate of groundwater migrating from the site is unclear, as it does not appear to be the lake at all times (at least not in the immediate vicinity of the site). It also does not appear to be generally downward given that the deeper wells in a pair or cluster typically have the higher water levels.

- The S-85-6A cluster appears to be either cross gradient and in some periods potentially up gradient of the area of contamination

2. Additional quarterly monitoring is required beyond the two year interim monitoring period at least until the Third Five Year Review is finalized in September 2011.

As per the Agencies request, groundwater containing emulsified creosote in the plume stability network from monitoring well S-88-2 was sampled and analyzed for PAHs, phenols, and zinc in the second quarter of 2009. Dissolved phase concentrations in monitoring well S-88-2 were as follows: TPAHs at a concentration of 20,730 μg/L, CPAHs at a concentration of 346 μg/L, and a total phenols concentration of 8,944 μg/L. The presence of emulsified creosote most likely influences concentrations in monitoring well S-88-2, however, these dissolved phase concentrations in combination with the presence of emulsified creosote suggest that the rebound of groundwater levels post-groundwater pumping may be flushing creosote downgradient of the former lagoon source area.

Simple calculations of drawdown over time would not support a discernible cone of depression this long after pumping, especially given the natural variation of water levels at this site. Ideally, monitoring plume stability should not occur until all influences of pumping have subsided so that plume stability can be evaluated under the conditions that will exist over the long term in the absence of pumping. If 2007 groundwater elevations prior to shutdown of the groundwater treatment system, the Agencies believe that this condition occurred soon after pumping was discontinued

As part of the Five Year Review process the agencies will evaluate monitoring data and provide recommendations on the number and frequency of wells that will be monitored going forward.

3. **The next statistical evaluation will be conducted by the Agencies as part of the Third Five Year Review once 12 quarters of data with the GWTS shutdown have been collected**

Section 3.3.2 (Statistical analytical evaluation): This Section describes the use of three years worth of data when statistically evaluating trends for plume stability in order to meet a minimum of three quarters worth of data. The use of data from the period of remedy operation is inappropriate when evaluating the plume stability in the absence of pumping. Statistical analysis of the data for the evaluation of plume stability in the absence of pumping should be avoided until sufficient, representative non-pumping data is available. The Agencies require twelve quarters of data to meet the data requirements of the statistical tests and the Agencies will conduct the statistical evaluation as part of the 3rd Five Year Review.

Section 3.3.2.2 (Results): page 3-6. This Section suggests downward trends in S-91-2, S-85-5a, and S-85-5b. First, the change in pumping conditions that occurred during the statistical sample period makes the statistical analysis meaningless when evaluating concentration trends in the absence of pumping. Had there been no change in pumping, the analysis still appears faulty. The data used indicate a change in the detection limits, which appears to be the cause of the BNSF's conclusion of a decreasing trend in at least one well. For example, well S-91-2 is reported to have a decreasing trend, but this appears to be entirely due to using half the detection limit for non-detected values coupled with much higher detection limits in the first part of the sample period. A decrease from " <23.6 ug/L" to a value of 0.57 ug/L should not be interpreted as a decreasing trend.

Section 3.3.2.2 (Results): page 3-6. Monitoring well S-88-2 was not sampled for the three monitoring events following the elevated detection of TPAH due to the presence of emulsified creosote. The presence of emulsified creosote suggests that the TPAH concentration of 10,380 μg/L in January 2008 was probably not anomalous. The statement that "There was no significant trend in TPAH concentrations in this well with either the January 2008 sample included or removed." does not appear to take into account the presence of emulsified creosote in monitoring well S-88-2 during the last three quarters of 2008. It is unreasonable to conclude that the substantial increase to 10,380 ug/L of TPAH followed by three sampling events with product present does not represent a significant increasing trend in this well. This statement also underscores the issue with applying statistics over a period when pumping conditions changed if the point of the statistics is to evaluate the trends during non-pumping conditions. It is clear from these findings and the historic findings that the change in pumping rate had a significant affect on the direction of contaminant migration and the impacts at this well.

4. **Natural attenuation well network will be monitored for total phenols, total PAH, total carcinogenic PAH, TSS and zinc for the remainder of the interim monitoring period. Well S-88-1 will also be moved from the natural attenuation well network and placed in the plume stability well network as a source area well.**

Section 3.4 (Natural attenuation well network): Pages 3-7 to 3-9. This Section discusses trends of natural attenuation parameters to assess in-situ degradation of dissolved creosote constituents in groundwater yet three of the wells in the source area have never been sampled due to the presence of emulsified product. Dissolved phase constituents of creosote (PAHs, phenols) and zinc will be collected from the monitored natural attenuation well network as part of any revision to the interim monitoring plan to assess the actual degradation that may or may not be occurring in conjunction with the natural attenuation parameter trends. Wells S-93-2S and S-93-5S shall also be sampled even if emulsified product is present.

Section 3.4 (Natural attenuation well network): Pages 3-7 to 3-9. The Agencies recognize that interpreting groundwater flow directions at the site is complicated. Identifying wells that are along a single flow path is difficult given the current monitoring well network. As such, The Agencies agree with the approach of identifying natural attenuation parameters and demonstrating that natural degradation of contaminants is likely occurring. However, given these complexities, the current well network, and the current gaps in understanding groundwater flow and contaminant transport, the Agencies feel that the demonstrate plume stability should be accomplished by evaluating concentration trends of the contaminants of concern with the recognition that there is a mechanism for degradation. The data presented appear to indicate that mechanism is present, but additional monitoring of the contaminants of concern in the natural attenuation well network is needed to demonstrate plume stability.
In the Interim Monitoring Plan, it was agreed to define S-88-2 as a source area well. However, a review of the RI questions the reasoning for that definition as it appears to be located downgradient from the original source. During the installation of S-88-2, soil contamination was identified at 11-13 ft below ground surface, which generally coincides with the water table at this location. The concentrations PAHs at this interval were described as less than 10 mg/kg. Figure 4-4 from the RI depicts S-88-1, S-88-2, and S-88-3 as being located in areas of "subsurface soil contamination (at groundwater table and below)", which contrasts to the description for upgradient locations with "surface soil contamination". Based on these findings, one would conclude that S-88-2 is historically downgradient of the source area and that its impacts have resulted from contaminant migration in groundwater.

5. All future quarterly monitoring reports are required to have contaminant concentration contours drawn beyond the proposed TI boundary as appropriate based on data collected.

Figure 7a: Inferred CPAH contours do not include data collected at monitoring well S-84-15, which according to Figure 1, is directly downgradient of monitoring well S-88-2.

Figures 2 and 4 (March through May 2009 Progress Report): Inferred TPAH contours (Figure 2), and inferred phenol contours (Figure 4) do not include data collected at monitoring well S-91-2. Contours on Figures 2 and 4 must be redrawn to incorporate monitoring well S-91-2.

6. **All wells identified as downgradient wells are required to be resampled in the event that PAH or phenol concentrations observed in a well are above 50% of the target cleanup levels except for S-88-2.**

Section 3.3.1.3 (CPAH), the text reads,

"Well S-88-3 is near the source area and is not required to be resampled as some plume expansion is expected until equilibrium of the plume is reached."

It is noted that given the general absence of wells in the likely average flow path of groundwater, this well provides valuable information regarding plume expansion.

7. **Any revision to the Interim Monitoring Plan shall include an Appendix that contains well log reports for all wells that are being monitored. Future quarterly and annual reports shall also include a table of well construction reports - contents of the table can be discussed in a future conference call.**

8. **Future annual monitoring reports shall include a comprehensive Microsoft Access database or excel file containing all data collected by constituents of concern for the monitoring wells monitored during that year.**

9. **Would an absorbent sock effectively absorb some of the emulsified creosote in S-88-2, S-93-2S, S-88-1, and S-93-5S where "emulsified creosote" is found so that a representative sample of dissolved constituents of concern could be taken?**

Section 3.3.2.2 (Results): The Final Interim Groundwater Treatment System Monitoring Plan states that creosote that accumulates in any of the monitoring wells will be removed, and that if the rate of accumulation is slow, absorbent socks will be used to recover creosote as it enters the well.

ADDITIONAL WORK REQUIREMENTS

EPA will provide written notification that additional work is required per Section XXII A. and C. of the 1991 Consent Decree:

> Section XXII. ADDITIONAL WORK
>
> A. In the event that EPA or Defendants determine that Additional Work, as defined in Section III of this Decree, is necessary, written notification of such Additional Work shall be provided to the Project Coordinator for the other Party.
>
> C. Within thirty (30) days of receipt of notice from EPA that EPA has determined Additional Work is necessary under this Decree, Defendants shall submit to EPA for approval modifications and amendments to the Work Plan adequate to provide for implementation of the Additional Work. EPA's determination of the need for Additional Work shall not be subject to Dispute Resolution under this Decree. Defendants' submittal of the required modifications and amendments to the Work Plan shall conform to the requirements and procedures set forth in Section V of this Decree. Upon approval of the modified and amended Work Plan by EPA under Section V of this Decree (Performance of Work), Defendants shall perform the Additional Work and implement the modified and amended Work Plan in accordance with the approved specifications and schedules contained therein.

The following work is required, based on the specific Annual Review comment(s) provided subsequent to each work item:

1. Background wells will be replaced with a deeper well to provide regularly scheduled monitoring of background conditions per the Interim Monitoring Plan.

<u>Section 3.3.2.1 (Statistical Analysis of Groundwater Data):</u> Page 3-5 Well S-3R was dry all of the sampling events. Well S-4 was only sampled in January 2008 but was not sampled in the other three quarters because it was dry.

2. Cross gradient well S-6 will be replaced with a deeper well to provide regularly scheduled monitoring of cross gradient conditions per the Interim Monitoring Plan.

<u>Section 3.3.2.1 (Statistical Analysis of Groundwater Data):</u> Page 3-5 Well S-6 was not sampled because it was dry. This well was sampled in June 2005 and 2006, but TPAH was not detected during those periods; therefore, no statistical analysis was conducted on this well.

3. Additional investigations are necessary to:

a) Verify that the groundwater flow pattern continues to be the same as observed during pumping conditions;

b) **Ensure that concentrations above the target cleanup levels established in the ROD and subsequent ESDs have not migrated beyond the proposed TI boundary and the Controlled Groundwater Area: and**

c) **Determine whether the boundaries of the existing Controlled Groundwater Area need to be temporarily expanded per provisions of SB-120.**

The Contingency Plan has been implemented twice because observed concentrations were above 50% of the target cleanup level in wells that are located outside of the Controlled Groundwater Area

Given the points raised in this review, the classification of S-84-15, S-84-16, S-85-6a, S-85-6b, and S-91-2 as "downgradient of source area monitoring wells" should be reconsidered. It does not appear that these wells are consistently within the groundwater flow path from the source area. Additional investigations will help determine if these wells are downgradient of source area.

Section 2.1 (Groundwater flow direction). The text states in multiple sections that the groundwater flow pattern is similar to that observed during pumping conditions in February 2007. However, the potentiometric surface map during pumping conditions routinely indicate a very substantial cone of depression and what appeared to be a very wide capture zone. A good indicator is variation in the head difference between S-88-2 vs. S-88-3 during pumping and non-pumping conditions. During pumping conditions (e.g., 2007), the head difference indicates flow toward S-88-2 (i.e., towards the area of pumping), but three of the four water levels from post pumping conditions (e.g., 2008) show flow in the reverse direction (i.e., away from the area of pumping). This represents a substantial change in the flow field that could relate to allowing plume migration beyond the proposed TI boundary in the absence of pumping.

Section 3.3.2.2 (Results): Observation of groundwater elevation contours since the shutdown of the groundwater treatment system suggests that the groundwater levels are continuing to rebound. Analysis of the groundwater flow direction in April 2009 indicates that the flow direction is to the northeast. Although the northeast direction of flow may change seasonally, the presence of emulsified creosote and/or high dissolved phase concentrations of PAHs and phenols in S-88-2 suggest that additional monitoring points are needed downgradient of S-88-2 and the former lagoon area to the northeast to ensure that dissolved phase constituents aren't migrating beyond the current TI boundary.

Per the Agencies request, groundwater containing emulsified creosote in the plume stability network from monitoring well S-88-2 was sampled and analyzed for PAHs, phenols, and zinc in the second quarter of 2009. Dissolved phase concentrations in monitoring well S-88-2 were as follows: TPAHs at a concentration of 20,730 µg/L, CPAHs at a concentration of 346 µg/L, and a total phenols concentration of 8,944 µg/L. The presence of emulsified creosote most likely influences concentrations in monitoring well S-88-2, however, these dissolved phase concentrations in combination with the presence of emulsified creosote suggests that the rebound of groundwater levels post-groundwater pumping may be flushing creosote downgradient of the former lagoon source area.

SB-120 was recently passed in the 2009 legislative session. This bill allows DNRC to establish a temporary Controlled Groundwater Area if the department finds that sufficient facts are not available to designate a permanent controlled ground water area. The additional investigation will provide the necessary facts to determine if additional monitoring is required before the boundaries of the existing controlled groundwater area are permanently expanded.

- SB120 allows DNRC to designate by rule a temporary controlled ground water area to allow studies to obtain the facts needed to determine whether or not it is appropriate to designate a permanent controlled ground water area. The department shall set the length of time that the temporary controlled ground water area will be in effect. Subject to subsection (6) (c), the term of a temporary controlled ground water area may be extended by rule.
    - A temporary controlled ground water area designation is for the purpose of study and cannot include the control provisions provided in subsection (7), other than measurement, water quality testing, and reporting requirements.
    - A temporary controlled ground water area designation may not exceed a total of 6 years including any extensions.

Following completion of the additional well network, all wells shall be re-surveyed

Page 15 of *"Methods for Monitoring Pump-and-Treat Performance"* (EPA/600/R-94/123, June 1994):

"Well reference point elevations should be surveyed to +/- 0.01 ft and checked periodically due to the potential for settlement of surface materials, compaction of pumped strata, or physical damage to the well. This is particularly important when measuring small head differences because the flow direction may be misinterpreted due to slight elevation errors."

Pages 8-9 of *"A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems"* (EPA 600/R-08/003 | January 2008):

"When water levels are collected, it is good practice to provide the field technician with historical depth to water data at each location, so that reasonableness of measurements can be evaluated in the field. When anomalous data are observed, a plan to resolve discrepancies with historical data can be developed while the technician is still in the field. It is also good practice to periodically survey measuring point elevations. For instance, changes in measuring point elevations can occur over time due to frost heaving. In other cases, wells installed by different contractors at different times may be surveyed inconsistently."

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August 11, 2009

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Subject: Response to July 15, 2009 Agency Comments on the First Annual Interim Monitoring Report January through November 2008, BNSF Former Tie Treatment Plant, Somers, Montana

Dear Mr. Hoogerheide and Ms. Dewitt,

On behalf of BNSF Railway Company (BNSF), AECOM Environment (AECOM) is pleased to respond to the above mentioned comments. Revised pages, tables, and figures are included and are intended to replace the original pages in the report submitted April 30, 2009. A complete electronic copy of the revised report is also being provided on CD to the Agencies.

Specific comments regarding the Annual Interim Monitoring Report from the July 15, 2009 Agency letter (shown in italics) and responses are listed below. Agency comments pertaining to revisions to the Interim Monitoring Plan and additional work requirements will be addressed in separate correspondence.

Comment:
<u>Section 1.3 (Site wide monitoring)</u> Page 1-2 states that the extraction and injection wells are presented on Figure 1. However, these features are not included on Figure 1. Please include these wells on Figure 1.

Response:
The correct reference is Section 1.2 (Overview of the phase I groundwater remedy). Figure 1 was revised to include the extraction and injection wells.

Comment:
<u>Section 2.1 (Groundwater flow direction).</u> Page 2-1. The text states:

> *"The groundwater contours show dissipation of the drawdown cone of depression observed during the groundwater pumping system operation. At the center of the pumping system cone of depression, the groundwater elevations ranged from approximately 2,888 to 2,894 feet over the period of operation. The elevation in the*

> *same area post GWTS shutdown indicate the groundwater is still depressed but the effects of pumping are dampening with time. "*

Water level maps from February, June, and September 2007 (during pumping and a long-term regional drought that affected groundwater elevations at the Site) illustrate substantially lower water levels (typically in the range of 2,882 to 2,885 feet msl) than the 2,888 to 2,894 ft msl noted in the above statement. As a result, the subsequent part of the statement that post pumping levels are still depressed does not follow. BNSF compares 2008 values (2,887 to 2,892 ft msl) to 2,888/2,994 values which are assumed to be average elevations during period of operations rather than the observed values of 2,882 to 2,885 ft msl which were observed in months proceeding shutdown. When the observed values are used, it is apparent that water levels have risen substantially since pumping has terminated. Please correct the discussion to reflect the observed values.

Response:
The text referenced in the Agencies comment has been revised as discussed during the July 16, 2009 call. It now reads:

> "The groundwater contours show dissipation of the drawdown cone of depression observed during the groundwater pumping system operation. At the center of the pumping system cone of depression, the groundwater elevations ranged from approximately 2,888 to 2,894 feet over the period of operation."

The third paragraph in the executive summary was also modified in response to this comment. The paragraph now reads:

> "Sitewide groundwater elevations were monitored quarterly as part of the interim monitoring period sampling events. The groundwater contours show dissipation of the drawdown cone of depression observed during the groundwater pumping system operation. At the center of the pumping system cone of depression, the groundwater elevations ranged from approximately 2,888 to 2,894 feet over the period of operation. In September 2008, the elevations in the same area post GWTS shutdown are approximately 2,887 to 2,891 feet. No measureable creosote was detected in any well measured during the first year of interim monitoring."

Comment:
Section 2.2 (Vertical Gradient): Page 2-2. Text states

"In addition, with the seasonal gradient reversal, the transport of chemicals would also be reversed. Since no PAHs are present in the bedrock well near the lake, the recharge/discharge relationship between the lake and bedrock aquifer will not impact PAH migration."

This should be re-written to read

"In addition, with the seasonal gradient reversal, the transport of chemicals would also be reversed. However, since no polycyclic aromatic hydrocarbons (PAHs) are present in the bedrock well near the lake, the recharge/discharge relationship between the lake and bedrock aquifer should not impact the migration of PAHs at the Site. "

Response:
The text has been revised.

Comment:
<u>Section 2.2 (Vertical Gradient)</u>: Page 2-2. The determination of vertical gradients in this Section uses two well clusters that are relatively distant from the highest areas of contamination. The S-85-6 cluster, while within the proposed TI boundary, is located relatively close to the lake, and during high levels in Flathead Lake, the groundwater flow direction at this cluster is from the lake toward the area of contamination. The S-91-4/S-84-10 cluster is near the swamp pond where the maximum TPAH concentration from sampling since 1984 is 2.1 µg/L. If the evaluation of vertical gradients is to determine the potential for downward contaminant migration, then it seems more appropriate to use clusters located within the most impacted areas, such as S-93-2S and S-93-2D. The Agencies note that the vertical gradient at this cluster for all four quarters of 2008 was upward. The water level measurements from the S-85-8a/S-85-8b/S-88-8c cluster would also be helpful, but the water levels do not appear to be reliable. The water levels at S-85-8a and S-88-8c, which are in the overburden, appear to be extremely low (approximately 4 feet low) compared to all other water levels measured at the site both toward and away from the lake. The deeper well (S-85-8b), which is in bedrock, has a water level that is more comparable to those measured on site and is substantially higher than these two other wells in the cluster. The reasoning for the abnormally low water levels at S-85-8a and S-88-8c is unclear. An explanation should be provided in the text of the report.

Response:
During the July 16, 2009 call, the Agencies indicated a table similar to Table 5 from the 2007 Annual Report, which shows the vertical gradient analysis, would sufficiently address this comment. Table 4 of the Annual Interim Monitoring Report submitted April 30, 2009 is similar to Table 5 from the 2007 Annual report; therefore, no changes have been made.

Comment:
<u>Section 3.1.4 (Water Level Measurement and GW Sampling Protocols)</u>: page 3-4 states "Purge water will be purged into a bucket or other container to measure the volume; the bucket will then be emptied onto the ground surface at the well."

Observation of Nancy Gilliland during a sampling event in 2008 suggests that she does not empty water onto the ground surface at the well and that water that may contain dissolved phase constituents that the Agencies are trying to remediate is normally not disposed of on the ground. Is this procedure detailed in the Sampling and Analysis Plan or in a Standard Operating Procedure and has this practice been historical done with approval from the previous EPA Project Manager?

Response:
The Interim Monitoring Plan indicated the following in Section 3.1.4, Water Level Measurement and Groundwater Sampling Protocols:

> "Purge water will be purged into a bucket or other container to measure the volume; the bucket will then be emptied onto the ground surface at the well. If emulsified creosote is observed in the purge water, the water will be contained and transferred to a 55-gallon drum for storage on-site until the drum is full and sent off-site for disposal as a hazardous waste."

The statement in the annual report is accurate and is consistent with the aforementioned approved sampling protocols and historical practices at the Somers Site.

Comment:
<u>Section 3.3.2.2 (Results)</u>: This Section states that the January 2008 TPAH concentration in monitoring well S-88-2 was elevated due to dilution during analysis (10,380 µg/L). It seems unlikely that the

detected TPAH concentrations were elevated due to dilution during analysis. The sample was most likely diluted as a result of the high concentrations of analytes in the sample. Please correct the discussion appropriately.

Response:
The text was revised to the following:

> "Source well S-88-2 was sampled during January 2008 but not in the other three quarters of 2008 due to emulsified creosote. The TPAH concentration of 10,380 µg/L measured in the January 2008 sample was unusually high for this well. There was no statistically significant trend in TPAH concentrations in this well with either the January 2008 sample included or removed (Table 8 and Figure 9). The complete data set did not exhibit seasonality, but the reduced data set (i.e., without the January 2008 data) was seasonal."

Comment:
Tables 7 and Appendix A: A reference to data flag "D" is missing. Include the reference.

Response:
The tables have been revised and a reference to data flag "D" has been added. A reference to data flag "J" was also added to Table 7.

Comment:
Figure 2a - 2d: When there is a nested set of wells or a cluster of wells (S-85-8a/b/c series) and groundwater elevations differ, how are wells chosen when potentiometric surface maps are developed?

Response:
Our goal is to use the completion interval of the well screen to determine if a well is used for contouring. However, if the groundwater elevation in a well appears to be inconsistent with surrounding wells, a case-by-case determination is made to determine if the well will be used to contour. Table 3 of the Annual Interim Monitoring Report submitted April 30, 2009 is similar to Table 4 from the 2007 Annual report and includes a note stating that certain wells are not used to contour. The text in Section 2.1 has been modified to include similar language.

Comment:
Figure 3: The presentation of the 2008 data in the hydrograph presented in Figure 3 is confusing. The x-axis is arranged by category and a uniform space on the x-axis is presented between each data point, despite the 2008 data being collected at a more frequent interval than in previous years. Furthermore, the data for 2008 appear to be inconsistent with expectations and the historical pattern. For example, during the period noted as Summer 2008, the lake is at a low point, where as generally the lake is maintained at full pool in the summer. It is suggested in future reports that this plot be constructed using a scatter plot so that the x-axis scales depending on the amount of time between data points. The water level data for Flathead Lake should also be included in tabular form somewhere in the reports. Related to this discussion, AECOM states, "Review of the hydrographs suggests that during the spring both the bedrock and surficial systems discharge to the lake. Conversely, it is apparent that the lake discharges to the surficial aquifer during the fall monitoring events." This statement appears to be reversed. Please correct the discussion appropriately.

Response:
Figure 3 has been revised to a scatter graph as requested. Table 3 has been revised to include the elevation of Flathead Lake. The statement "Review of the hydrographs suggests that during the spring both the bedrock and surficial systems discharge to the lake. Conversely, it is apparent that the lake

discharges to the surficial aquifer during the fall monitoring events." has been removed from the report as the following paragraph from the text more accurately describes the relationship between the lake and surficial aquifer.

> "The lake level is artificially controlled by Kerr Dam at the south end of the lake. Under agreement with the Flathead Lakefront property owners, the lake level should be at full pool by June 15 of every year. The lake level is maintained at full pool until after Labor Day, although this is dependent on weather and the demand for power. Flathead Lake may stay at full pool throughout the fall. In the fall, the lake level is artificially dropped to 10 feet below full pool to 2,883 feet above mean sea level to create storage for snow melt and spring runoff. The artificial elevation of the lake level creates a seasonal condition. During the late spring, summer and early fall months, the surficial aquifer is recharged by the lake. During the late fall, winter and early spring, if the lake level is lowered, the surficial aquifer discharges to the lake. In addition, with the seasonal gradient reversal, the transport of chemicals would also be reversed. However, since no polycyclic aromatic hydrocarbons (PAHs) are present in the bedrock well near the lake, the recharge/discharge relationship between the lake and bedrock aquifer should not impact the migration of PAHs at the Site."

Comment:
Figure 9: The January 2008 TPAH concentration for monitoring well S-88-2 should be included on the concentration vs. time plot.

Response:
Figure 9 was revised to include the S-88-2 January 2008 TPAH concentration of 10,380 µg/L.

If you have questions or comments, please contact Shelly at (406) 652-7481.

Yours sincerely,

Ann M. Colpitts

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Enclosure

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August 18, 2009

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Subject: Response to July 15, 2009 Agency Comments on the Revisions to the Interim Monitoring Plan Resulting from Comments on the Annual Report, BNSF Former Tie Treatment Plant, Somers, Montana

Dear Mr. Hoogerheide and Ms. Dewitt,

On behalf of BNSF Railway Company (BNSF), AECOM Environment (AECOM) is pleased to respond to the July 15, 2009 Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (MDEQ), hereto referred to as the Agency or Agencies, comments on the revisions to the interim monitoring plan that resulted from comments on the annual report. Conference calls were held among the Agencies, BNSF, and AECOM on July 16 and July 29, 2009 to discuss the Agency's requests and to clarify technical issues in the July 15, 2009 letter. The revised 2008 Annual Interim Monitoring Report (IMP) and responses to specific report comments were submitted to the Agencies on August 11, 2009. This letter addresses the July 15, 2009 Agencies comments regarding changes to the IMP as a result of modifications to the annual report.

As discussed during the calls, EPA indicated that the July 15, 2009 letter was not a written notification triggering additional action. The Agencies indicated BNSF could negotiate additional action required by the Agencies under the Consent Decree during subsequent conference calls and correspondence. As mentioned above, two conference calls have already taken place. A third conference call is tentatively scheduled for August 24, 2009 to discuss in detail the changes to the 2008 Interim Monitoring Plan (IMP) and the additional work requirements requested in the July 15, 2009 letter. Anticipating agreements can be reached during the August 24th call or soon after, modifications to the IMP will be submitted by September 14, 2009 as approved in the August 18, 2009 e-mail correspondence from EPA to AECOM.

A summary of the interim monitoring program objectives and progress is provided in the first section below. The Agency comments and BNSF responses are in the following section. Agency comments pertaining to the additional work requirements included in the July 15, 2009 letter will be addressed in separate correspondence.

Interim monitoring period summary

The interim monitoring program was designed to evaluate the stability and containment of the dissolved creosote constituent plume following termination of groundwater treatment system (GWTS) operation in

October 2007. Data quality objectives during the interim monitoring period (as agreed upon during the September 21, 2007 conference call with EPA, MDEQ and BNSF) include the following:

1. Demonstrate plume stability following GWTS shut down; confirm constituent of concern (COC) containment.
2. Monitor natural attenuation (NA) parameters to confirm that NA is occurring.
3. Measure creosote accumulation in the former CERCLA lagoon area; demonstrate an effective means by which accumulated creosote may be removed from wells.
4. Ensure safety of the public drinking water through continued sampling of the municipal well.
5. Continue LTU post-closure monitoring activities as scheduled.
6. Conduct ongoing operating and maintenance activities.

Two monitoring well networks were established in the 2008 Interim Monitoring Plan. The first well network was selected to demonstrate plume stability and to confirm COC containment following shut down of the GWTS. It took approximately six quarters for the aquifer affected by the recovery wells to return to pre-pumping conditions. Therefore, the Agencies have requested an extension to the interim monitoring period. BNSF agrees to this extension. As the goal of the plume stability network is to ensure plume stability in the former CERCLA lagoon area, BNSF requests wells S-85-5a and S-85-5b be removed from the monitoring well network for the extended interim monitoring period since they are located in the smaller TI area and the purpose of these wells is not to monitor the plume stability in the CERCLA lagoon area. Well S-85-5a is currently part of the LTU monitoring network.

The second well network was established to monitor natural attenuation and to confirm that NA is occurring. Results from monitoring wells located upgradient, within, and downgradient of the known area of residual creosote provide evidence that natural attenuation via intrinsic organic contaminant biodegradation is occurring at the Somers Site. Given the strong evidence that NA is occurring at the Somers Site, as reported in the annual report, BNSF requests a reduction in the natural attenuation monitoring frequency to annual during the remainder of the interim monitoring period.

Monitoring, recovery, and injection wells located in the former CERCLA lagoon area have been gauged for creosote accumulation. No distinct measureable layer of creosote has been observed in any wells. As a result, no recovery methods have been implemented.

The municipal well has been monitored on a semi-annual basis during the interim monitoring period and sampling results indicate continued safety of the public drinking water supply. The well will continue to be monitored throughout the extended period.

LTU post-closure monitoring activities will continue as scheduled. The next monitoring event will occur in 2010.

The site and GWTS system were inspected quarterly during the period of record. The inspection included checking the integrity of the fence and gate to ensure unauthorized access to the site was prevented and checking the building and well vaults to ensure they were closed and that all locks were intact and locked. The motors in pumps P-1 and P-6 and the bearing in the air compressor were rotated every two months as recommended by the manufacturers. Site activities also included snow removal, mowing, and noxious weed control.

Response to comments

Comment:

1. *Monthly water level measurements will be measured at least until the Third Five Year Review is finalized in 2011 to confirm that the quarterly measurements accurately capture the transient nature of the water levels at the site and influences from Flathead Lake.*

Response:
BNSF and the Agencies agreed on the July 16, 2009 call that BNSF will collect monthly water level measurements through the September 2009 event to look for consistency in flow direction. If consistency in flow direction is not observed during this period, additional groundwater level measurements may be collected at monthly intervals after the September 2009 event. Elevations were collected in June as part of the third quarter interim monitoring event. Elevations were collected on July 20, 2009 and will be collected in August to satisfy this request. Potentiometric surface figures from June, July, and August will be submitted with the third quarter progress report due October 10, 2009.

Additional Agency text associated with comment #1:
Section 2.1 (Groundwater flow direction): *Page 2-1. The text states in multiple sections that the groundwater flow pattern is similar to that observed during pumping conditions in February 2007. The potentiometric surface map during pumping conditions routinely indicate a very substantial cone of depression and what appeared to be a very wide capture zone. A good indicator is variation in the head difference between S-88-2 vs. S-88-3 during pumping and nonpumping conditions. During pumping conditions (2007), the head difference indicates flow toward S-88-2 (i.e., toward the area of pumping), but three of the four water levels from post pumping conditions (2008) show flow in the reverse direction (i.e., away from the area of pumping). This represents a substantial change in the flow field that could demonstrate plume migration in the absence of pumping.*

Response:
The text of the document refers to the fact that *sitewide* (including the upgradient, the LTU, the lake, and downgradient of the former CERCLA lagoon areas) groundwater flow direction has not changed perceptibly from the February 2007 flow direction measured when the pumping system was operating. While the sitewide groundwater flow direction has not changed perceptibly following the shutdown of the pumping wells, in the pumping well area, the flow direction has changed from going toward the pumping wells to moving in a downgradient or northeasterly direction. This post pumping localized flow pattern is consistent with the flow pattern observed prior to start up of the pumping wells.

Additional Agency text associated with comment #1:
Section 2.1 (Groundwater flow direction): Page 2-1. This Section reports approximate gradients and reports that groundwater flow is easterly to northeasterly during each quarter. A review of the data indicates the flow field is quite variable horizontally and vertically during any particular quarter and from quarter to quarter. In some cases, there are gradient reversals, and the complicated nature of the potentiometric surface maps and the relative lack of resolution (i.e., 1 foot contours) often misses these subtle changes. Developing an average potentiometric surface map based on the four quarters of data collected during 2008 would likely show converging flow along a line oriented northeast from S-88-3. That is, from the northwest of S-88-3 water flows from the northwest (i.e., toward the lake) and from the southeast of S-88-3 water flows from the southeast (i.e., directly away from the lake). Despite the multiple references to S-88-3 in the preceding sentences, S-88-3 may not necessarily be located along the centerline of groundwater flow. S-88-3 is only used as a point of reference given the absence of other features and wells in this area. This groundwater flow pattern is likely due to the relatively high average water level of Flathead Lake. Part of the problem may be associated with the vertical variation in water levels. The data indicate substantial differences in water levels with depth within the same

cluster, indicating that the depth of a well has a large affect on the measured water level. For example, S-85-6a and S-85-6b are screened only 10 feet apart, but have water levels that are often 0.5 feet different, which translates to a vertical hydraulic gradient that is substantially larger than the horizontal hydraulic gradient between S-88-3 and S-85-6a. Many of the wells at the site are installed at different depths (e.g., S-88-3 is at a different depth than S-88-2 or S-88-1), and some measurements appear to be so uncharacteristic that they are unreliable (e.g., S-85-8a and S-88-8c compared to S-85-8b), making it difficult to develop reliable potentiometric surface maps. These findings also have an interesting influence on the interpreted fate and transport of the contamination such as:

- *On average, contamination appears to be prevented from flowing to the lake due to the control of the lake water level and therefore groundwater may flow parallel to the lake for some unknown distance during periods of the year. It is unclear if this is the case or if flow directions at this site cannot accurately be ascertained given that the horizontal gradients are sufficiently flat that they are masked by the large change in water levels with depth.*

- *The actual fate of groundwater migrating from the site is unclear, as it does not appear to be the lake at all times (at least not in the immediate vicinity of the site). It also does not appear to be generally downward given that the deeper wells in a pair or cluster typically have the higher water levels.*

- *The S-85-6A cluster appears to be either cross gradient and in some periods potentially up gradient of the area of contamination.*

Response:
We agree with these overall observations but it is also important to note the following:

- A very good understanding of groundwater flow direction before operation of the GWTS was obtained prior to placement of S-88-3 and the well was positioned downgradient of the former CERLCA lagoon.

- There are perturbations in groundwater flow due to the startup, operation, and shutdown of the pumping wells and the groundwater elevations had to return to prepumping levels to accurately observe groundwater flow. The prepumping condition has now been achieved, and with the addition of 0.5 foot contour lines, amore detailed flow direction can be determined.

- It is important the water levels be measured in well screens with similar completions (elevations and screen lengths). Future potentiometric surface maps will be created using these guidelines to lessen the influence of vertical changes in flow.

- The fate of groundwater migrating from the former CERLCA lagoon is generally in the direction of the lake. The flow direction in the vicinity of the lake is dependent on the lake level and this has not been affected by pumping conditions.

Comment:
2. *Additional quarterly monitoring is required beyond the two year interim monitoring period at least until the Third Five Year Review is finalized in September 2011.*

Response:
BNSF agrees to extend the interim monitoring period through September 2011. A quarterly monitoring frequency may be excessive given Helen Dawson's assumptions that result in a groundwater travel

distance of 1.26 feet in 90 days for groundwater in the former CERCLA lagoon area; however, BNSF understands the Agencies require twelve monitoring events to satisfy the data requirements of the statistical tests that will be conducted as part of the 3rd Five Year Review.

Additional Agency text associated with comment #2:
As per the Agencies request, groundwater containing emulsified creosote in the plume stability network from monitoring well S-88-2 was sampled and analyzed for PAHs, phenols, and zinc in the second quarter of 2009. Dissolved phase concentrations in monitoring well S-88-2 were as follows: TPAHs at a concentration of 20,730 ug/L, CPAHs at a concentration of 346 ug/L, and a total phenols concentration of 8,944 ug/L. The presence of emulsified creosote most likely influences concentrations in monitoring well S-88-2, however, these dissolved phase concentrations in combination with the presence of emulsified creosote suggest that the rebound of groundwater levels post-groundwater pumping may be flushing creosote downgradient of the former lagoon source area.

Simple calculations of drawdown over time would not support a discernible cone of depression this long after pumping, especially given the natural variation of water levels at this site. Ideally, monitoring plume stability should not occur until all influences of pumping have subsided so that plume stability can be evaluated under the conditions that will exist over the long term in the absence of pumping.

As part of the Five Year Review process the agencies will evaluate monitoring data and provide recommendations on the number and frequency of wells that will be monitored going forward.

Response:
There is no evidence of “flushing of creosote” downgradient of the former CERCLA lagoon area. It is not clear how rising water levels could flush groundwater COCs in a downgradient direction. It is possible that rising water levels create a condition where water is coming in contact with residual creosote in the soil and therefore causing elevated levels of COCs. In addition, the presence of emulsified creosote creates higher levels of TPAHs, CPAHs, and phenols. To observe flushing of creosote in the downgradient direction, groundwater velocities would have to be much greater than 1.26 foot in 90 days (i.e., more than 5 feet/year).

Comment:
3. *The next statistical evaluation will be conducted by the Agencies as part of the Third Five Year Review once 12 quarters of data with the GWTS shutdown have been collected.*

Response:
BNSF is in agreement to have the Agencies conduct the statistical analysis. The annual reports submitted by BNSF will not include statistical analysis as discussed and agreed upon during the July 16, 2009 call.

Additional Agency text associated with comment #3:
<u>Section 3.3.2 (Statistical analytical evaluation)</u>: This Section describes the use of three years worth of data when statistically evaluating trends for plume stability in order to meet a minimum of three quarters worth of data. The use of data from the period of remedy operation is inappropriate when evaluating the plume stability in the absence of pumping. Statistical analysis of the data for the evaluation of plume stability in the absence of pumping should be avoided until sufficient, representative non-pumping data is available. The Agencies require twelve quarters of data to meet the data requirements of the statistical tests and the Agencies will conduct the statistical evaluation as part of the 3rd Five Year Review.

<u>Section 3.3.2.2 (Results)</u>: page 3-6. This Section suggests downward trends in S-91-2, S-85-5a, and S-85-5b. First, the change in pumping conditions that occurred during the statistical sample period makes the statistical analysis meaningless when evaluating concentration trends in the absence of pumping. Had there been no change in pumping, the analysis still appears faulty. The data used indicate a change in the detection limits, which appears to be the cause of the BNSF's conclusion of a decreasing trend in at least one well. For example, well S-91-2 is reported to have a decreasing trend, but this appears to be entirely due to using half the detection limit for non-detected values coupled with much higher detection limits in the first part of the sample period. A decrease from" <23.6 µg/L" to a value of 0.57 ug/L should not be interpreted as a decreasing trend.

<u>Section 3.3.2.2 (Results)</u>: page 3-6. Monitoring well S-88-2 was not sampled for the three monitoring events following the elevated detection of TPAH due to the presence of emulsified creosote. The presence of emulsified creosote suggests that the TPAH concentration of 10,380 µg/L in January 2008 was probably not anomalous. The statement that "There was no significant trend in TPAH concentrations in this well with either the January 2008 sample included or removed." does not appear to take into account the presence of emulsified creosote in monitoring well S-88-2 during the last three quarters of 2008. It is unreasonable to conclude that the substantial increase to 10,380 µg/L of TPAH followed by three sampling events with product present does not represent a significant increasing trend in this well. This statement also underscores the issue with applying statistics over a period when pumping conditions changed if the point of the statistics is to evaluate the trends during non-pumping conditions. It is clear from these findings and the historic findings that the change in pumping rate had a significant affect on the direction of contaminant migration and the impacts at this well.

Response:
BNSF is in agreement with having the Agencies conduct a statistical analysis as part of the Five Year Review in 2011 as stated in the previous response. In regards to the discussion above involving monitoring well S-88-2, BNSF revised the First Annual Interim Monitoring Report to indicate there is no statistically significant trend. Studies have shown that groundwater monitoring data collected from wells with non-dissolved product is unreliable for characterizing dissolved concentrations of constituents in the groundwater, including the evaluation by Dawn Zemo that was published in *Ground Water Monitoring & Remediation* in the Summer 2006 edition[1]. Due to the uncertainty of the results obtained from wells with emulsified or measureable product, it is doubtful that data collected from these wells would be beneficial. In addition, a statistical evaluation should not be performed on results obtained from samples collected from wells with observed emulsified or measureable creosote during sample collection.

Comment:
4. *Natural attenuation well network will be monitored for total phenols, total PAH, total carcinogenic PAH, TSS and zinc for the remainder of the interim monitoring period. Well S-88-1 will also be moved from the natural attenuation well network and placed in the plume stability well network as a source area well.*

Response:
BNSF is in agreement to monitor wells currently in the natural attenuation network for the plume stability parameters. As the natural attenuation parameters collected during the initial seven quarters of the

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[1] Zemo, D.A.. 2006. Sampling in the Smear Zone: Evaluation of Nondissolved Bias and Associated BTEX. MTBE, and TPH Concentrations in Ground Water Samples. *Ground Water Monitoring & Remediation* 26, no. 3: 125-133.

interim monitoring period provide solid evidence that natural attenuation via intrinsic organic contaminant biodegradation is occurring at the Somers Site, BNSF requests natural attenuation monitoring be reduced to an annual frequency during the remainder of the interim monitoring period.

The Agencies asked BNSF to review the location of the natural attenuation wells for duplication. Between the plume stability and natural attenuation networks, there are five monitoring wells located in or near the source area. Due to the presence of five wells monitoring this area, BNSF requests wells S-88-2 and S-93-5S be excluded from sample collection because emulsified creosote continues to be observed in the well. Plume stability parameters will be collected from wells S-88-1, S-93-2S, and S-93-2D throughout the remainder of the extended interim monitoring period. Sample results collected from the remaining three wells will provide more reliable data for characterizing the dissolved constituents in the groundwater. If emulsified creosote is no longer observed in S-88-2 or S-93-5S or returns to wells S-88-1 and S-93-2S, BNSF requests the right to reevaluate the wells for inclusion in the sampling network.

Additional Agency text associated with comment #4:

<u>Section 3.4 (Natural attenuation well network)</u>: Pages 3-7 to 3-9. This Section discusses trends of natural attenuation parameters to assess in-situ degradation of dissolved creosote constituents in groundwater yet three of the wells in the source area have never been sampled due to the presence of emulsified product. Dissolved phase constituents of creosote (PAHs, phenols) and zinc will be collected from the monitored natural attenuation well network as part of any revision to the interim monitoring plan to assess the actual degradation that may or may not be occurring in conjunction with the natural attenuation parameter trends. Wells S-93-2S and S-93-5S shall also be sampled even if emulsified product is present.

Response:
The Agency comment above indicates three wells have not been sampled for natural attenuation parameters due to emulsified creosote in the well. Wells S-93-2S and S-88-1 were not sampled during the first three quarters of the interim monitoring period; however, starting with the September 2008 event, emulsified creosote was no longer present in the wells and they have been sampled quarterly since. Well S-93-5S is the only well in the natural attenuation network that has not been sampled during the interim monitoring period due to the initial and continued presence of emulsified creosote. As referenced in a previous response, studies have shown that groundwater monitoring data collected from wells with non-dissolved product is unreliable for characterizing dissolved concentrations of constituents in the groundwater. There are methods, including centrifuging or filtering, that can remove product from groundwater samples; however, each method has a level of uncertainty associated with it. For example, centrifuging separates the phases (i.e. water and creosote) present in a sample but may not be effective if the densities are very close and the water is also decanted prior to analysis which may allow the separated emulsified creosote back into the groundwater sample. Filtering the sample or using a sorbent to separate the product may either not remove all of the emulsified product or may remove dissolved constituents in addition to the product leading to an unreliable result. The accuracy of data may also be compromised because of the additional steps prior to analysis and the multiple sample handlers involved in the process. For this reason, collecting samples from wells if the presence of emulsified creosote is observed at the time of sampling may not provide reliable information.

Additional Agency text associated with comment #4:
<u>Section 3.4 (Natural attenuation well network)</u>: Pages 3-7 to 3-9. The Agencies recognize that interpreting groundwater flow directions at the site is complicated. Identifying wells that are along a single flow path is difficult given the current monitoring well network. As such, The Agencies agree with the approach of identifying natural attenuation parameters and demonstrating that natural degradation

of contaminants is likely occurring. However, given these complexities, the current well network, and the current gaps in understanding groundwater flow and contaminant transport, the Agencies feel that the demonstrate plume stability should be accomplished by evaluating concentration trends of the contaminants of concern with the recognition that there is a mechanism for degradation. The data presented appear to indicate that mechanism is present, but additional monitoring of the contaminants of concern in the natural attenuation well network is needed to demonstrate plume stability. In the Interim Monitoring Plan, it was agreed to define S-88-2 as a source area well. However, a review of the RI questions the reasoning for that definition as it appears to be located downgradient from the original source. During the installation of S-88-2, soil contamination was identified at 11-13 ft below ground surface, which generally coincides with the water table at this location. The concentrations PAHs at this interval were described as less than 10 mg/kg. Figure 4-4 from the RI depicts S-88-1, S-88-2, and S-88-3 as being located in areas of "subsurface soil contamination (at groundwater table and below)", which contrasts to the description for upgradient locations with "surface soil contamination". Based on these findings, one would conclude that S-88-2 is historically downgradient of the source area and that its impacts have resulted from contaminant migration in groundwater.

Response:
There are three parts to the Agency comment above: 1) understanding the groundwater flow direction, 2) analyzing for constituents of concern from wells in the natural attenuation network, and 3) defining the source area.

The Somers Site has undergone approximately 25 years of data collection efforts, including Phase I, Phase II, and Phase III investigations. Monitoring wells have been located based on the results of these investigations, approval of the Agencies, and groundwater flow and transport at the Site. However, as indicated in the response to Agency comment #1, water levels will be measured in well screens with similar completions (elevations and screen lengths) going forward. Future potentiometric surface maps will be created using these guidelines to lessen the influence of vertical changes in flow.

As mentioned in the response to Agency comment #4 above, BNSF agrees to collect plume stability network parameters from the wells in the natural attenuation network for the remainder of the extended interim monitoring period. However, BNSF requests samples not be collected from wells S-88-2 and S-93-5S if emulsified creosote is observed for two reasons. First, there are a total of five wells monitoring this area and sample collection from three of the wells will allow for an adequate analysis of the COCs. Second, studies have shown that data collected from wells with non-dissolved product is unreliable for characterizing the dissolved concentrations of constituents in groundwater.

The 1989 Record of Decision (ROD) states that contaminants emulsified from the CERCLA lagoon migrated between 400 and 600 feet downgradient. The Agencies acknowledge in the above comment that soil contamination was identified during the installation of S-88-2 from 11 to 13 feet below ground surface. BNSF is in agreement that impacts in S-88-2 likely resulted from contaminant migration in the groundwater but contends the historic presence of emulsified contaminants and/or contaminated soil in the subsurface is a source of dissolved constituents to groundwater and wells located in these areas can be considered source area wells. Thus decreases of COCs in source area wells is not expected to occur within a reasonable timeframe, which the ROD considers to be a period of 50 years.

Comment:
5. *All future quarterly monitoring reports are required to have contaminant concentration contours drawn beyond the proposed TI boundary as appropriate based on data collected.*

Response:
BNSF is in agreement to evaluate the concentration contours during future events and to extend them beyond the proposed TI boundary if appropriate. BNSF currently shows the result values next to the monitoring wells in the figures and will continue to do so. BNSF will also include wells that have observations of emulsified creosote in the plume contours.

Additional text associated with comment #5:
Figure 7a: Inferred CPAH contours do not include data collected at monitoring well S-84-15, which according to Figure 1, is directly downgradient of monitoring well S-88-2.

Figures 2 and 4 (March through May 2009 Progress Report): Inferred TPAH contours (Figure 2), and inferred phenol contours (Figure 4) do not include data collected at monitoring well S-91-2. Contours on Figures 2 and 4 must be redrawn to incorporate monitoring well S-91-2.

Response:
Comment #5 refers to future quarterly reports. BNSF will create future figures to include these wells as the data indicate.

Comment:
6. *All wells identified as downgradient wells are required to be resampled in the event that PAH or phenol concentrations observed in a well are above 50% of the target cleanup levels except for 8-88-2.*

Response:
BNSF requests the Agency review the contingency plan outlined in the interim monitoring plan as discussed during the July 29, 2009 call.

Additional text associated with comment #6:
Section 3.3.1.3 (CPAH), the text reads,

"Well S-88-3 is near the source area and is not required to be resampled as some plume expansion is expected until equilibrium of the plume is reached."

It is noted that given the general absence of wells in the likely average flow path of groundwater, this well provides valuable information regarding plume expansion.

Response:
The Interim Monitoring Plan was drafted with the agreement by all parties that some plume expansion would occur following shut down of the GWTS. One objective of the interim monitoring period is to confirm COC containment. BNSF agrees that results from monitoring well S-88-3 will provide valuable information regarding plume expansion. However, as this well has historically had concentrations exceeding the contingency and target cleanup levels, resampling the well following exceedances does not provide additional information.

Comment:
7. *Any revision to the Interim Monitoring Plan shall include an Appendix that contains well log reports for all wells that are being monitored. Future quarterly and annual reports shall also include a table of well construction reports – contents of the table can be discussed in a future conference call.*

Response:
BNSF agrees to include well logs in any revision to the Interim Monitoring Plan. BNSF will also include a table of well construction reports in future quarterly and annual reports with the format to be discussed during a future conference call with the Agencies.

Comment:
8. *Future annual monitoring reports shall include a comprehensive Microsoft Access database or excel file containing all data collected by constituents of concern for the monitoring wells monitored during that year.*

Response:
BNSF agrees to submit a Microsoft Access database or Excel file in future annual monitoring reports that includes data collected during that year.

Comment:
9. *Would an absorbent sock effectively absorb some of the emulsified creosote in S-88-2, S-93-2S, S-88-1, and S-93-5S where "emulsified creosote" is found so that a representative sample of dissolved constituents of concern could be taken?*

Section 3.3.2.2 (Results): The Final Interim Groundwater Treatment System Monitoring Plan states that creosote that accumulates in any of the monitoring wells will be removed, and that if the rate of accumulation is slow, absorbent socks will be used to recover creosote as it enters the well.

Response:
Emulsified creosote observed in monitoring wells does not accumulate into a distinct measurable layer. A sorbent sock is not selective enough to account for all of the emulsified creosote in the well and will not prevent emulsified creosote from entering the well from the surrounding aquifer.

Once BNSF and the agencies have agreed on the final changes to the IMP, the plan will be revised and sent to the agencies for Agencies' approval. If you have questions or comments, please contact Shelly Young with AECOM at (406) 652-7481.

Yours sincerely,

Ann M. Colpitts

Shelly Young
Project Manager/Environmental Engineer
shelly.young@aecom.com

Ann Colpitts
Senior Program Manager/Senior Hydrogeologist
ann.colpitts@aecom.com

Enclosure

cc: D. Smith, BNSF
C. Trueblood, PG&E
A. Colpitts, AECOM
AECOM Somers Field Office
File No. 01140-176-230

Young, Shelly

From: Young, Shelly
Sent: Monday, August 24, 2009 1:27 PM
To: Hoogerheide.Roger@epamail.epa.gov
Cc: Schmidt.Andrew@epamail.epa.gov; Colpitts, Ann; Trueblood, Craig; Smith, David M; DeWitt, Lisa
Subject: RE: BNSF Somers - response to Agency comments on IMP
Attachments: S-85-5a_S-85-5b_Historical_Zinc.pdf

Hi Roger,

Here is the zinc figure you requested. I hope you get it in time to print.

Shelly Young

Project Manager/Environmental Engineer

AECOM Environment

P 406.652.7481 ext. 31

shelly.young@aecom.com

Please consider the environment before printing this email.

-----Original Message-----
From: Hoogerheide.Roger@epamail.epa.gov
[mailto:Hoogerheide.Roger@epamail.epa.gov]
Sent: Monday, August 24, 2009 8:50 AM
To: Young, Shelly
Cc: Schmidt.Andrew@epamail.epa.gov; Colpitts, Ann; Trueblood, Craig; Smith, David M; DeWitt, Lisa
Subject: Re: BNSF Somers - response to Agency comments on IMP

How easy would it be to provide a figure containing zinc concentration over time for S-85-5a & S-85-5b for our call this afternoon?

"Young, Shelly" <Shelly.Young@aecom.com>

08/18/2009 04:16 PM

To
Roger Hoogerheide/MO/R8/USEPA/US@EPA, "DeWitt, Lisa" <lidewitt@mt.gov>, Andrew Schmidt/R8/USEPA/US@EPA

cc

"Smith, David M"
<David.Smith4@bnsf.com>,
"Colpitts, Ann"
<Ann.Colpitts@aecom.com>,
"Trueblood, Craig"
<craig.trueblood@klgates.com>
Subject
BNSF Somers - response to Agency comments on IMP

Good afternoon Roger, Lisa, and Andrew.

BNSF's response to Agency comments on the IMP are attached. Hard copies will also be sent to the Agencies.

A call is proposed for Monday August 24, 2009 at 1:30 to discuss these comments and additional actions the Agency has requested at the Somers site. Roger and Andrew, please let me know if the revised call time will work for you (it was initially proposed for this Thursday).

Thanks!

Shelly Young
Project Manager/Environmental Engineer
AECOM Environment
P 406.652.7481 ext. 31
shelly.young@aecom.com

AECOM
2048 Overland Avenue, Suite 101
Billings, Montana 59102

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Please note: my e-mail has changed to shelly.young@aecom.com Please update your address books accordingly.

it is addressed and may contain information that is privileged, confidential or subject to copyright. Any unauthorized use, disclosure or copy the sender immediately. Any communication received in error should be deleted and all copies destroyed.

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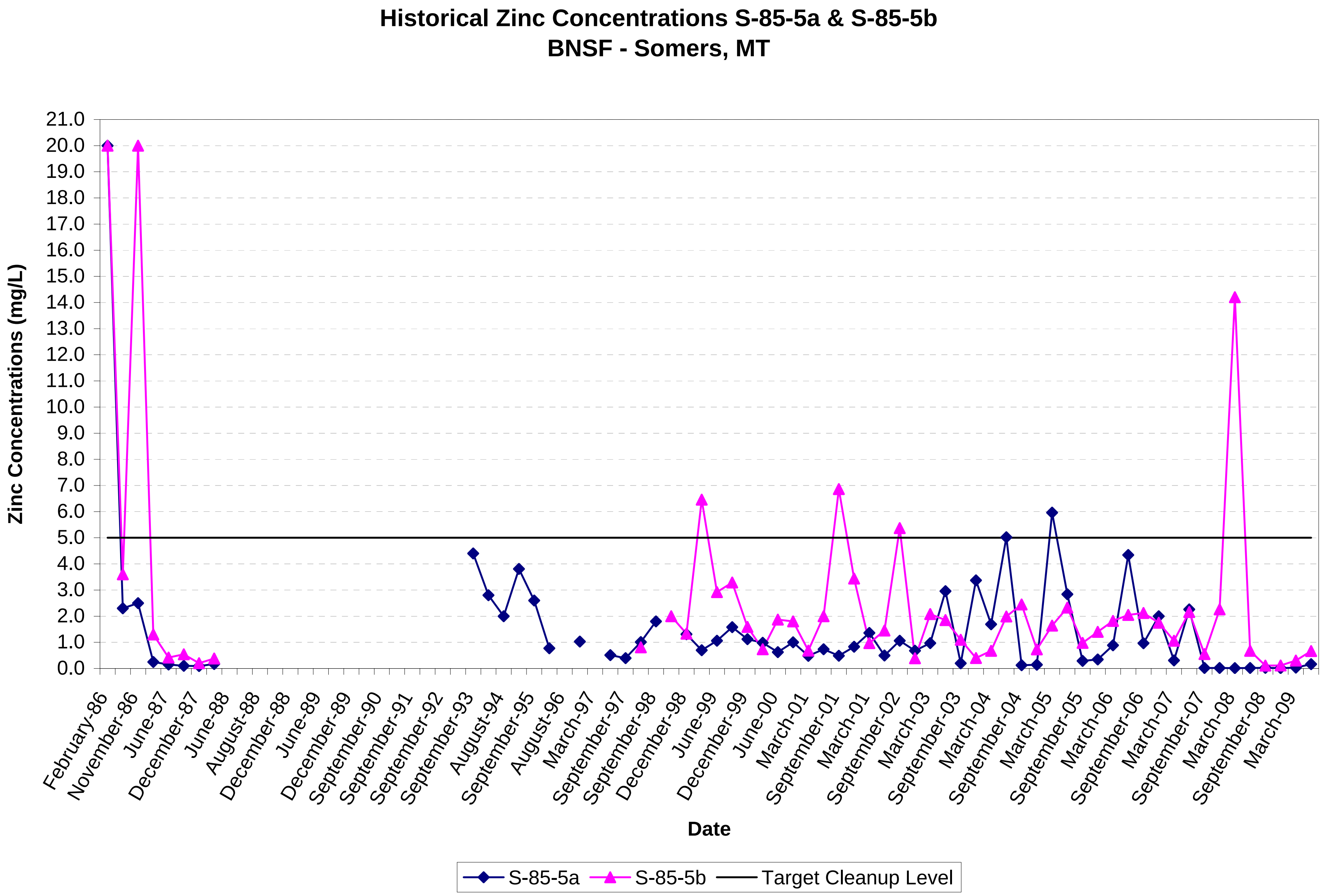
[attachment "Response to IMP Comments.pdf" deleted by Roger Hoogerheide/MO/R8/USEPA/US]



Historical Zinc Concentrations S-85-5a & S-85-5b
BNSF - Somers, MT
Zinc Concentrations (mg/L)
21.0
20.0
19.0
18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
February-86
November-86
June-87
December-87
June-88
August-88
December-88
June-89
December-89
September-90
September-91
September-92
September-93
August-94
September-95
August-96
March-97
September-97
September-98
December-98
June-99
December-99
June-00
March-01
September-01
March-01
September-02
March-03
September-03
March-04
September-04
March-05
September-05
March-06
September-06
March-07
September-07
March-08
September-08
March-09
Date
S-85-5a
S-85-5b
Target Cleanup Level

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Tuesday, August 25, 2009 1:35 PM
To: Young, Shelly
Cc: Schmidt.Andrew@epamail.epa.gov; Colpitts, Ann; Trueblood, Craig; Smith, David M; DeWitt, Lisa
Subject: 17.50.706 LOCATION AND NUMBER OF MONITORING WELLS

17.50.706 LOCATION AND NUMBER OF MONITORING WELLS
(1) The background ground water quality monitoring well(s) must be located so as to monitor the quality of ground water representative of the ground water passing the relevant point of compliance that has not been affected by leakage from the unit. At least 1 background water quality monitoring well is required at all facilities. At least 2 background wells must be installed at facilities where statistics will be utilized for ground water quality data evaluation unless it can be demonstrated to the department's satisfaction that a single well will suffice for the statistical test method chosen for ARM 17.50.708.
(a) A determination of background quality may include sampling of wells that are not hydraulically upgradient of the waste management area where:
(i) Hydrogeologic conditions do not allow the owner or operator to determine what wells are hydraulically upgradient; or
(ii) Sampling at other wells will provide an indication of background ground water quality that is as representative or more representative than that provided by the upgradient wells and will represent the quality of ground water passing the relevant point of compliance.
(2) Downgradient ground water quality monitoring wells must be capable of detecting a migration of hazardous constituents from active and closed waste disposal areas. The number and location of downgradient monitoring wells must be approved in writing by the department. At least 2 downgradient monitoring wells are required, although the department may require more.
(a) The downgradient monitoring system must be installed at the relevant point of compliance specified by the department that ensures detection of ground water contamination in the uppermost aquifer. When physical obstacles preclude installation of ground water monitoring wells at the relevant point of compliance at existing units, the down-gradient monitoring system may be installed at the closest practicable distance hydraulically down-gradient from the relevant point of compliance specified by the department.
(3) All wells shall be designed, installed, developed, sampled and documented in accordance with procedures outlined herein. (History: 75-10-204 , MCA; IMP , 75-10-204 , 75-10-207 , MCA; NEW , 1991 MAR p. 1937, Eff. 10/18/91; AMD , 1993 MAR p. 1645, Eff. 10/9/93; TRANS , from DHES, 1995 MAR p. 2253.)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Montana Department of
ENVIRONMENTAL QUALITY

Ref: 8MO

October 2, 2009

Mr. Dave Smith
Manager Environmental Remediation
Burlington Northern Santa Fe (BNSF) Railway Company
825 Great Northern Boulevard, Suite 105
Helena, MT 59601-3340

Re: *BNSF – Somers Progress Report for March through May 2009 (EPA ID No. MTD053038386)*

Dear Dave:

The *BNSF – Somers Progress Report for March through May 2009* (Report) for the BN Somers Site in Somers, Montana, prepared by AECOM, Inc. has been received and reviewed by DEQ and EPA, as well as revisions to Figures 2 and 4. Although the Agencies still have concerns about these figures, the Report is hereby determined to be complete as required by the Record of Decision, Consent Decree, and the Groundwater Treatment System Interim Monitoring Plan.

As previously agreed, all future reports shall include appropriately drawn plume concentrations maps showing the inferred extent of the contaminant plume based on information collected each quarter. Wells with emulsified product will be assumed to have concentrations that shall be included in the "highest" contour, unless sampling and analysis is conducted to show otherwise. On figures, if no sample is collected from a well due to the presence of emulsified, this must be clearly indicated. Any well having emulsified product, regardless of the sampling network, shall be included in the establishment of the inferred contaminant plume boundary. The "highest" contour shall not be less than the concentrations determined through sampling and analysis from the September 2009 sampling event, unless subsequent data are collected. Plume contaminant inferred boundaries shall be drawn using the associated potentiometric information collected at the time the samples are collected.

We appreciate your efforts in preparing the *BNSF – Somers Progress Report for March through May 2009*. If you have any questions or concerns about our approval process, please call either of us at the following numbers: Lisa DeWitt at (406) 841-5037 or Roger Hoogerheide at (406) 457-5031.

Sincerely,

Lisa M. DeWitt

Lisa DeWitt
DEQ Project Officer

Roger Hoogerheide

Roger Hoogerheide
USEPA Project Manager

cc: Shelly Young, AECOM Environment (electronic copy)
Ann Colpitts, AECOM Environment (electronic copy)
Larry Scusa, MDEQ (electronic copy)
Joe Vranka, EPA (electronic copy)
Andrew Schmidt
File

Young, Shelly

From: Schmidt.Andrew@epamail.epa.gov
Sent: Friday, October 09, 2009 3:32 PM
To: Colpitts, Ann; David.Smith4@bnsf.com; Young, Shelly
Cc: Hoogerheide.Roger@epamail.epa.gov; lidewitt@mt.gov; Schmidt.Andrew@epamail.epa.gov
Subject: BN Somers Site - Proposed Boring Locations

Attachments: Fig for BNSF 2.pdf; Fig for BNSF 1.pdf

Fig for BNSF 2.pdf (323 KB) Fig for BNSF 1.pdf (361 KB)

David, Ann, and Shelly,

Please find attached two maps that show the Agency's proposed boring locations. I have included two figures as they both show different features at the site. An explanation of the sampling and analyses that should occur is below:

Investigation downgradient of source area and between monitoring wells S-84-15 and S-91-2.

A total of 9 borings are proposed. The boring locations were selected based on historical source areas, current analytical results, and groundwater flow paths.

Borings should be completed to a depth of 65-70 feet bgs, an elevation of 2831 to 2826 feet mean sea level (The depth of the borings were based on the TOC elevation of monitoring well S-88-3 - If wells are at a higher elevation, the depth of the boring should be increased accordingly), or until impacts are no longer observed, whichever is deepest.

The rationale for the depths of the borings is based on the deepest impacts observed during the installation of the boring for monitoring well S-88-3 (51.5-51.9 feet bgs).

Soil samples should be screened at 3-5 foot intervals. Field screening should consist of sheen tests, PID readings, and odor. If impacted soil is observed above the water table, then a soil sample of the impacted interval should be collected and analyzed.

Groundwater samples should be collected at the first incidence of groundwater and every 10-15 feet thereafter until the 65-70 depth is reached, or until field screening suggests that groundwater is no longer impacted, whichever is deepest. Field screening below the groundwater table should consist of sheen tests, PID readings, and odor.

Well CP-2 should be sampled in a depth discreet fashion as part of the investigation. Well CP-2 has a 50 foot screen, and thus from the water table to the bottom of the screen, groundwater samples should be collected every 10-15 feet. Ideally, depth discreet groundwater samples would be collected by packing off the desired sample interval and collecting samples using a low-flow technique.

The investigation should be adjusted based on field results. If initial results suggest that the extent of impacts are greater or less than initially anticipated, then the number of borings should be modified. This also applies to the frequency at which depth discreet groundwater samples are collected. Field based decisions should be made collectively between EPA, MDEQ, and BNSF.

Ideally, groundwater samples would be submitted on a 24 hour turnaround so that the results could be used to make field-based decisions.

Soil and Groundwater samples should be analyzed for PAHs, phenols,

zinc, TSS, and TPH diesel and heavy oil range.
The rationale for analyzing groundwater samples for TPH diesel and heavy oil range is that the tie treating process typically used heavy fuel oil as a dilutant for the creosote (typically a 50/50 solution), as per the RI.

Replacement of monitoring well S-6.
Monitoring well S-6 will be replaced as per the July 15, 2009 letter.
The boring for the S-6 replacement monitoring well will be completed in the same fashion as the 9 borings described above.
If impacts are observed in the boring for S-6, the well will be screened across the most impacted interval. If no impacts are observed, the well will be constructed to intercept the water table (as previously designed) with a screen length sufficient to handle decreases in the groundwater elevation.
If impacts are observed in the boring for S-6, and additional boring will also be installed downgradient of S-6, in between the new monitoring well and the road northeast of the site boundary.

Investigation of zinc exceedances.
Wells that are currently exceeding the zinc target cleanup level and that are constructed of steel, should be replaced with a well constructed of PVC or other material that will not potentially contribute zinc to the groundwater system.
The rationale for installing new wells vs. completing several borings around the wells with zinc exceedances is that a drill rig capable of installing monitoring wells will already be necessary due to the depths of the investigative borings. By replacing the wells, we retain monitoring points that are critical for long term monitoring at the site.

Thank you, and I look forward to talking to you on Tuesday.

Andrew

(See attached file: Fig for BNSF 2.pdf)(See attached file: Fig for BNSF 1.pdf)

Andrew P. Schmidt, R.G.
Regional Superfund Hydrogeologist
US EPA Region 8, 8EPR-PS
1595 Wynkoop Street
Denver, CO 80202-1129
303.312.6283 (office)
303.312.7151 (fax)

Please consider the environment before printing this email.

NOTES:

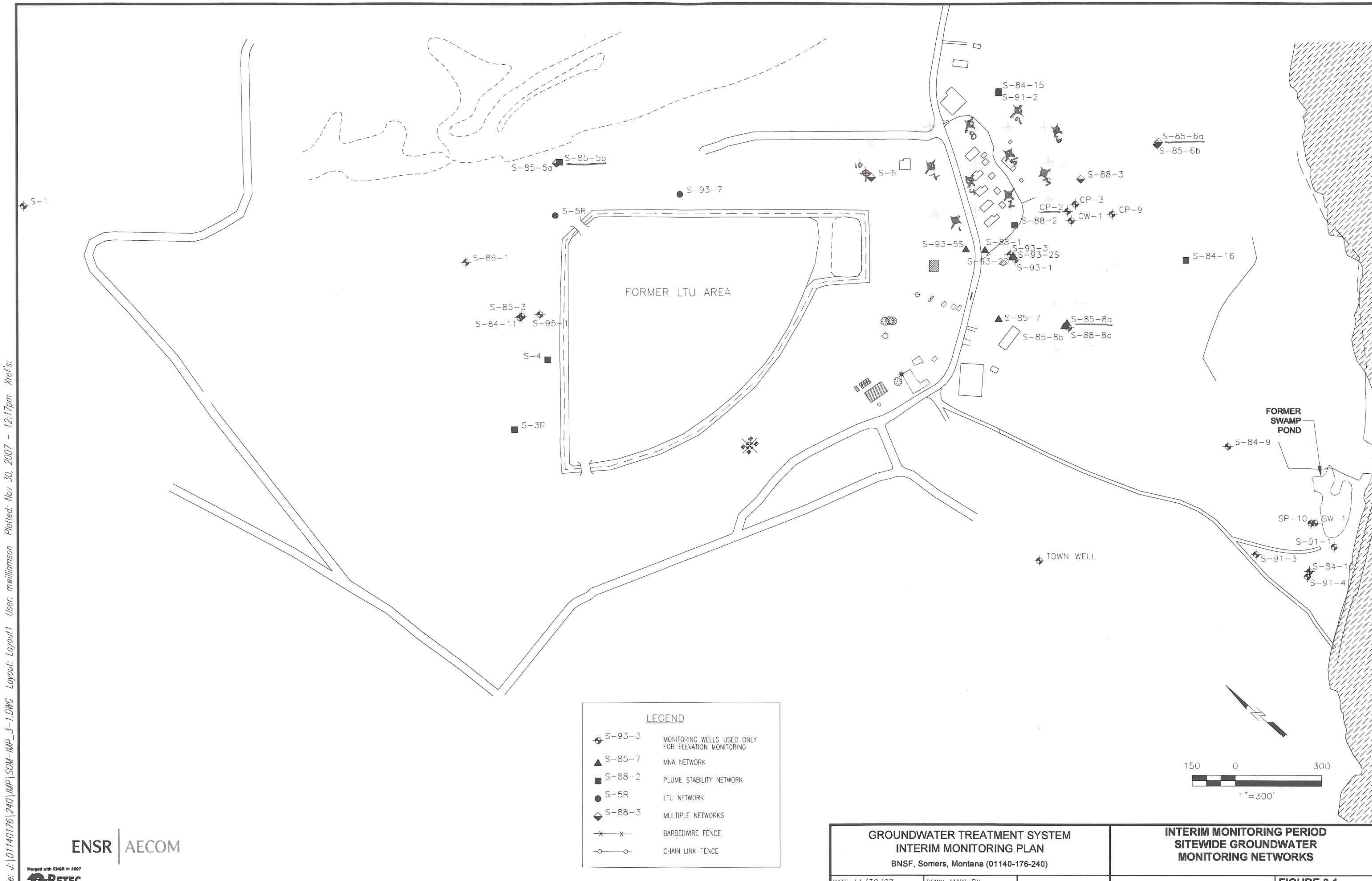
1. PHENOLS CONCENTRATIONS ARE μg/L
2. VALUES EXCEEDING THE TARGET CLEANUP LEVEL HAVE BEEN BOLDED
3. LTU CLOSED IN NOVEMBER 2002
4. EMULSIFIED CREOSOTE OBSERVED IN S-88-2; SAMPLE COLLECTED AT REQUEST OF EPA AND MDEQ

ROD TARGET CLEANUP LEVELS:
PHENOLS = 6,000 μg/L

AECOM

QUARTERLY PROGRESS REPORT		SITEWIDE PHENOLS CONCENTRATIONS APRIL 2009 BNSF - SOMERS, MT
01140-176-210		
DATE: 09/15/09	DRWN: LP/FTC	FIGURE 4

File: J:\ACADP\BNSF Somers\01140176\Quarterly Report\April 2009\Figure 4- Phenols.dwg Layout: Layout1 User: paull Plotted: Sep 15, 2009 - 3:33pm Xref's:



ENSR | AECOM

Merged with ENSR in 2007 RETEC

GROUNDWATER TREATMENT SYSTEM
INTERIM MONITORING PLAN
BNSF, Somers, Montana (01140-176-240)

DATE: 11/30/07 | DRWN: MAW/BIL

INTERIM MONITORING PERIOD
SITEWIDE GROUNDWATER
MONITORING NETWORKS

FIGURE 3-1

File: J:\01140176\240\IMP\SOM-IMP_3-1.DWG Layout: Layout1 User: mwilliamson Plotted: Nov 30, 2007 - 12:17pm Xref's:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Montana Department of
ENVIRONMENTAL QUALITY

Ref: 8MO

October 27, 2009

Mr. Dave Smith
Manager Environmental Remediation
Burlington Northern Santa Fe (BNSF) Railway Company
825 Great Northern Boulevard, Suite 105
Helena, MT 59601-3340

Re: *BNSF – Somers Progress Report for June through August 2009 (EPA ID No. MTD053038386)*

Dear Dave:

The *BNSF – Somers Progress Report for June through August 2009* (Report) for the BNSF Somers Site in Somers, Montana, prepared by AECOM Environment has been received and reviewed by DEQ and EPA. The Agencies have the following comments regarding this Progress Report:

1. Page 4. First paragraph following bullets. Modify the sentence to read as follows: "On the basis of this analysis, it is concluded that the data collected during the June 2009 sampling event provides evidence of intrinsic contaminant biodegradation occurring through iron reduction and methanogenic metabolic pathways."

2. Page 5. Delete the second paragraph in the Long term GWTS operation section.

3. The Agencies continue to have concerns on where the "green" zone on Figures 2-4 have been drawn since the Agencies feel that the green areas should be more similar in size, i.e., the contaminant areas depicted in Figures 3 and 4 should look more like the contaminant area as depicted in Figure 2, since there is no justification for why the contaminant would be discontinuous in this area. In addition, it is noted that in Figure 4,

phenol concentration contours were only drawn for 1ug/L and >6,000 ug/L contours. In the March to May 2009 Report, the Agencies received phenol concentration contours that had a 1, 10, 100, 1000 ug/L from BNSF.

As previously agreed and noted in the Agencies approval of the March through May 2009 Progress Report, all future reports shall include appropriately drawn plume concentrations maps showing the inferred extent of the contaminant plume based on information collected each quarter. Plume contaminant inferred boundaries shall be drawn using the associated potentiometric information collected at the time the samples are collected. Additionally, figures shall appropriately extend concentration contours around wells where constituents of concern have been identified. If emulsified product is present, these wells shall be coded as EP (Emulsified Product) and included in the development and representation of inferred plume diagrams, regardless of which monitoring network the wells are included in.

We appreciate your efforts in preparing the *BNSF – Somers Progress Report for June through August 2009*. Please incorporate responses to the above comments in the Progress Report, and submit the appropriate revised pages to the Agencies. If you have any questions or concerns about our approval process, please call either of us at the following numbers: Lisa DeWitt at (406) 841-5037 or Roger Hoogerheide at (406) 457-5031.

Sincerely,

Lisa M. DeWitt

Lisa DeWitt
DEQ Project Officer

Roger Hoogerheide

Roger Hoogerheide
USEPA Project Manager

cc: Shelly Young, AECOM Environment (electronic copy)
Ann Colpitts, AECOM Environment (electronic copy)
Larry Scusa, MDEQ (electronic copy)
Joe Vranka, EPA (electronic copy)
Andrew Schmidt, EPA (electronic copy)
File

Young, Shelly

From: Young, Shelly
Sent: Monday, November 16, 2009 12:28 PM
To: 'Hoogerheide.Roger@epamail.epa.gov'; 'DeWitt, Lisa'
Cc: 'Schmidt.Andrew@epamail.epa.gov'; 'Smith, David M'; Colpitts, Ann
Subject: FW: approach for Somers field effort
Attachments: Addl Investigation Locations.pdf

This e-mail presents our recommendation for the additional work planned at Somers in 2010 and is in response to Andrew's e-mail sent October 9, 2009.

We understand the objectives of the investigation to be the following:

1. Confirm extent of dissolved plume that exceeds target cleanup levels for the COCs
2. Determine if the current TI boundary proposed by the Agencies is sufficient or if more extensive boundary originally proposed by BNSF is appropriate
3. Replace galvanized steel constructed wells S-85-5B, S-85-6B, and S-85-8a with PVC constructed wells to better assess routine exceedance of the zinc cleanup level
4. Replace well S-6 with a deeper well to allow groundwater collection

The following actions are recommended to meet the above objectives.

<u>Confirm the extent of dissolved plume that exceeds target cleanup levels for the COCs and if the current proposed TI boundary is sufficient</u>

1. Install IB-1 and IB-2 to 70 ft bgs. IB-1 located approximately midway between S-93-5S and S-91-2 and near Somers Road. IB-2 located midway between S-88-2 and S-91-2 (see attached figure).
    a. Borings installed to 65-70 feet bgs per Agency request. Soil will be logged at 5-ft intervals.
    b. Results collected from these borings will determine the location of additional borings; thus samples will be sent to the lab with a 24-hr TA requested. All samples will be analyzed for PAH, phenols, zinc, and TSS (GW only). The agency requested TPH diesel and heavy oil range compounds; however, this was not identified in the ROD as a constituent of concern at the site and there are no clean up levels for TPH established for the site. Therefore, TPH diesel and heavy oil range compounds will not be included in the requested analysis.
    c. Soil sample will be collected and sent to lab if evidence of contamination is encountered above the GW table.
    d. Depth discrete GW samples will be collected at the start of the GW table and at 15-ft intervals to the end of boring as requested by the Agency = approx. 5 samples each
    <u>Alternative</u>: Collect samples from top of aquifer (approx. 15 ft bgs), middle of boring (approx. 40-45 ft bgs), and end of boring (approx. 65-70 ft bgs) = 3 samples each
2. Install wells based on results obtained from IB-1 and IB-2.
    a. If IB-1 and IB-2 groundwater results exceed target cleanup goals, wells S-09-1 and S-09-2 will be installed downgradient from IB-1 and IB-2, approximately midway between the borings and well S-91-2.
    b. If IB-1 and IB-2 groundwater results did not exceed target cleanup goals, wells S-09-1 and S-09-2 will be installed between IB-1 and S-93-5S and between IB-2 and S-88-2, respectively.
    c. Screen placement will be based on field observations and PID readings (assuming readings in IB-1 and IB-2 correlated to analytical results).
    d. Soil sample will be collected and sent to lab if evidence of contamination is encountered above the GW table.
    e. Groundwater samples will be collected from impacted intervals based on field observations and PID readings (assuming readings in IB-1 and IB-2 correlated to analytical results).
    f. Normal TA will be requested on samples because additional boring locations are not dependent on the results obtained from these wells.

3. Do not collect sample from CP-2 as it will be sampled as part of Agency's approach to 5-year review, well is located within the TI and CGA, we have S-88-3 and S-85-6a/6b located downgradient of CP-2.

Replace wells with S-85-5B, S-85-6B, and S-85-8a

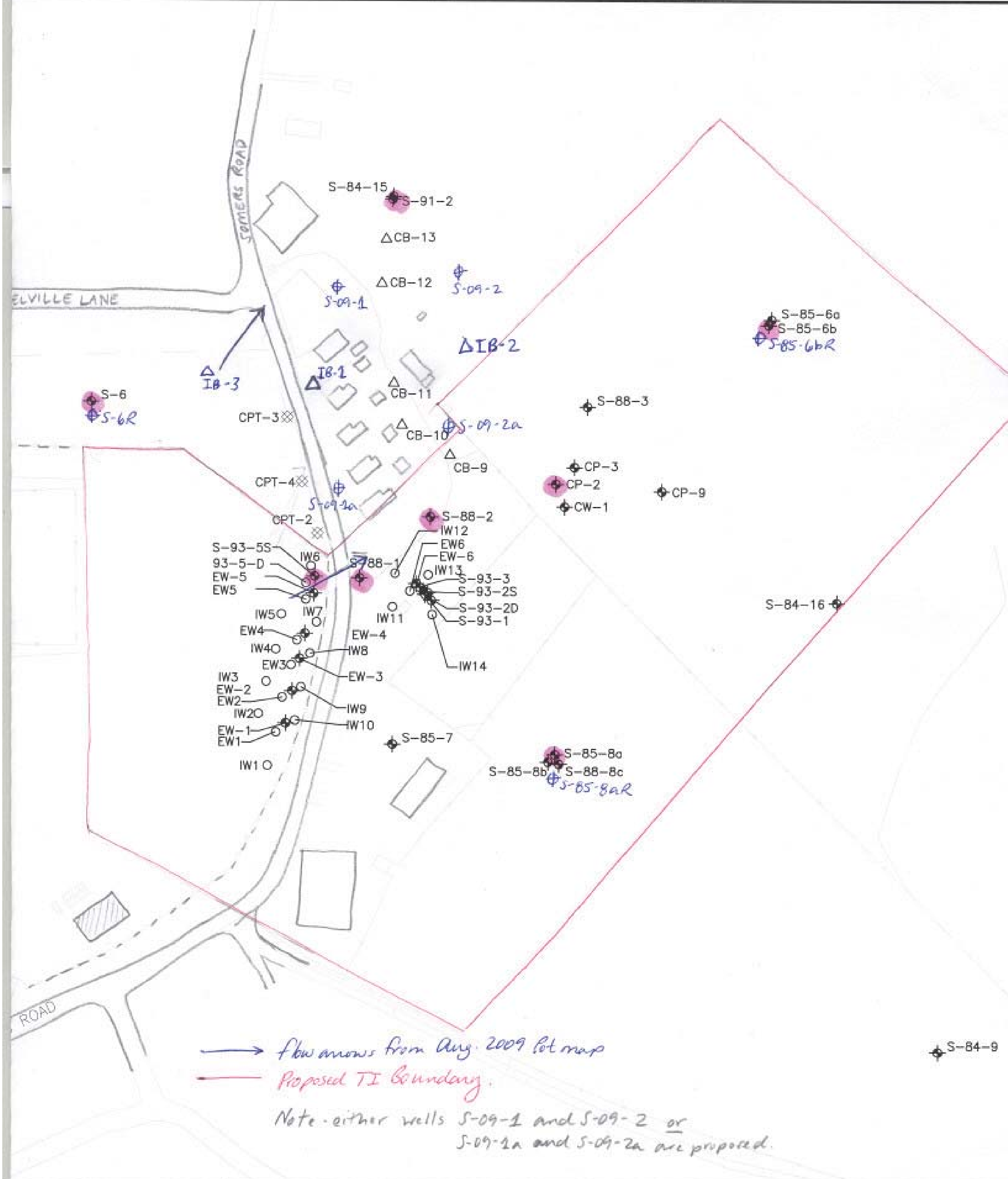
1. Install replacement wells S-85-5bR, S-85-6bR, S-85-8aR.
    a. Wells will be installed approximately 25 feet upgradient from existing wells to ensure they are installed outside of the radius of influence of zinc suspected to originate from galvanized casing.
    b. No samples are expected to be collected for laboratory analysis.
2. Abandon wells S-85-5b, S-85-6b, and S-85-8a

Replace well S-6 with a deeper well

1. Install replacement well S-6R similar to borings above.
    a. Collect soil sample if impacted soil is observed above the GW table.
    b. Groundwater samples will be collected from impacted intervals (based on field observations and PID readings (assuming readings in IB-1 and IB-2 correlated to analytical results).
    c. Well will be installed and screened at the impacted interval or slightly deeper than the previous screen if no impacts are observed.
    d. Normal TA will be requested on samples because additional boring location will be dependent on PID readings and presence of sheen or creosote globules.
2. If impacts are observed in S-6R, an additional boring, will be installed between S-6R and IB-1. Impacts are defined as PID readings greater than a determine value based on comparison of GW results to PID readings from IB-1 and IB-2, observed sheen, or presence of creosote globules. Samples will be collected and analyzed as described above.
3. Abandon well S-6.

We look forward to discussing this revised approach during the December 23rd call.

Shelly Young
Project Manager/Environmental Engineer
AECOM Environment
P 406.652.7481 ext. 31
shelly.young@aecom.com



BNSF RAILWAY COMPANY

SOMERS, MONTANA (01140-176-210)

DATE: 10/23/09 | DRWN: LP/FTC

ADDITIONAL INVESTIGATION SITE MAP

FIGURE 1

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Wednesday, December 02, 2009 12:37 PM
To: Young, Shelly; Colpitts, Ann; Smith, David M
Cc: Vranka.Joe@epamail.epa.gov; lscusa@mt.gov; Stearns.James@epamail.epa.gov; lidewitt@mt.gov; Schmidt.Andrew@epamail.epa.gov
Subject: Agency comments on approach for Somers field effort
Attachments: Addl Investigation Locations.pdf

Per our discussion last week, please find our comments on BNSF Railway's draft outline for the additional investigation that the Agencies have requested at the Somers Site. As discussed, this should be incorporated into a formal workplan that contains all the appropriate figures, tables and appendices needed for Agency approval. We look forward to working with you on this effort.

We understand the objectives of the investigation to be the following:

1. Confirm extent of dissolved plume that exceeds target cleanup levels for the COCs
2. Determine if the current TI boundary proposed by the Agencies is sufficient or if more extensive boundary originally proposed by BNSF is appropriate
3. Replace galvanized steel constructed wells S-85-5B, S-85-6B, and S-85-8a with PVC constructed wells to better assess routine exceedance of the zinc cleanup level
4. Replace well S-6 with a deeper well to allow groundwater collection

The following actions are recommended to meet the above objectives.

Confirm the extent of dissolved plume that exceeds target cleanup levels for the COCs and if the current proposed TI boundary is sufficient

1. Install IB-1 and IB-2 to 70 ft bgs. IB-1 located approximately midway between S-93-5S and S-91-2 and near Somers Road. IB-2 located midway between S-88-2 and S-91-2 (see attached figure).

   The Agencies require an additional boring (IB-3) between CB-10 and CB-11 that will follow the same protocol identified below

   a. Borings installed to 65-70 feet bgs per Agency request. Soil will be logged at 5-ft intervals.
   b. Results collected from these borings will determine the location of additional borings monitoring wells; thus samples will be sent to the lab with a 24-hr TA requested. All samples will be analyzed for PAH, phenols, zinc, and TSS (GW only). The agency requested TPH diesel and heavy oil range compounds; however, this was not identified in the ROD as a constituent of concern at the site and there are no clean up levels for TPH established for the site. Therefore, TPH diesel and heavy oil range compounds will not be included in the requested analysis.

Agencies are OK with this. However the work plan implies but should explicitly state that PID readings will be taken during logging of the three borings and will be correlated with analytical results since the later parts of the work plan rely on these correlated PID/analytical results.

c. The Agencies will require split samples of all gw samples collected for analysis in these borings
d. Soil sample will be collected and sent to lab if evidence of contamination is encountered above the GW table.

Elaborate on how this will be done.

e. Depth discrete GW samples will be collected at the start of the GW table and at 15-ft intervals to the end of boring as requested by the Agency = approx. 5 samples each Alternative: Collect samples from top of aquifer (approx. 15 ft bgs), middle of boring (approx. 40-45 ft bgs), and end of boring (approx. 65-70 ft bgs) = 3 samples each

Given the known heterogeneity of the site, the Agencies require the primary approach (approximately 5 samples at 15 foot intervals) over the alternative proposed by AECOM

2. Install wells based on results obtained from IB-1, IB-3 and IB-2.
   a. If IB-1, IB-3 and IB-2 groundwater results exceed target cleanup goals, wells S-09-1 and S-09-2 will be installed downgradient from IB-1, IB-3 and IB-2, approximately midway between the borings and well S-91-2.
   b. If IB-1 IB-3 and IB-2 groundwater results did not exceed target cleanup goals, wells S-09-1 and S-09-2 will be installed between IB-1 and S-93-5S and between IB-2 and S-88-2, respectively.

   Rather than agree on exact location for well placement prior to field investigations, use the data collected in the field to make the call for placement of wells

   c. Screen placement will be based on field observations and PID readings (assuming readings in IB-1 IB-3 and IB-2 correlated to analytical results).

The work plan should state that a cross-section between existing wells and the new borings will be sketched (including geological and PID/analytical information) to assist in determining appropriate intervals for screening the wells. The PID readings at the well locations (as stated in the work plan) and the information from the sketched cross-sections will be used to select the most appropriate intervals where contamination would be migrating.

   d. Soil sample will be collected and sent to lab if evidence of contamination is encountered above the GW table.
   e. Groundwater samples will be collected from impacted intervals based on field observations and PID readings (assuming readings in IB-1 IB-3 and IB-2 correlated to

analytical results).

The sketched cross-sections, along with the PID readings, should be used to select the locations for collecting groundwater samples. The work plan should also specifically state that groundwater samples will be collected from the newly installed wells and the list of parameters.

f. Normal TA will be requested on samples because additional boring locations are not dependent on the results obtained from these wells.

3. Do not collect sample from CP-2 as it will be sampled as part of Agency's approach to 5-year review, well is located within the TI and CGA, we have S-88-3 and S-85-6a/6b located downgradient of CP-2.

That's OK. However, as part of the 5 Year Review data collection, the Agencies will require data to be collected twice from the entire well network to correspond with High & Low Elevation levels of Flathead Lake. The low flow data will have to be collected in 2010 to be able to use in a 5 Year Review that is Statutorily required to be completed by Sept 2011

Replace wells with S-85-5B, S-85-6B, and S-85-8a

1. Install replacement wells S-85-5bR, S-85-6bR, S-85-8aR.
    a. Wells will be installed approximately 25 feet upgradient from existing wells to ensure they are installed outside of the radius of influence of zinc suspected to originate from galvanized casing.
    b. No samples are expected to be collected for laboratory analysis.
2. Abandon wells S-85-5b, S-85-6b, and S-85-8a

The work plan should state that these wells will be sampled during the next regularly scheduled event. The replacement wells will be sampled quarterly for four consecutive events, at which point the wells will be assessed for compliance with target cleanup goals. If the replacement wells are determined to be in compliance, then monitoring will continue as detailed in the Long-Term Monitoring Plan. If the replacement wells are not in compliance, or if compliance cannot be established, then quarterly monitoring will continue until compliance is achieved.

Replace well S-6 with a deeper well

1. Install replacement well S-6R similar to borings above.
    a. Collect soil sample if impacted soil is observed above the GW table.
    b. Groundwater samples will be collected from impacted intervals (based on field observations and PID readings (assuming readings in IB-1 IB-3 and IB-2 correlated to analytical results).
    c. Well will be installed and screened at the impacted interval or slightly deeper than the previous screen if no impacts are observed.

d. Normal TA will be requested on samples because additional boring location will be dependent on PID readings and presence of sheen or creosote globules.

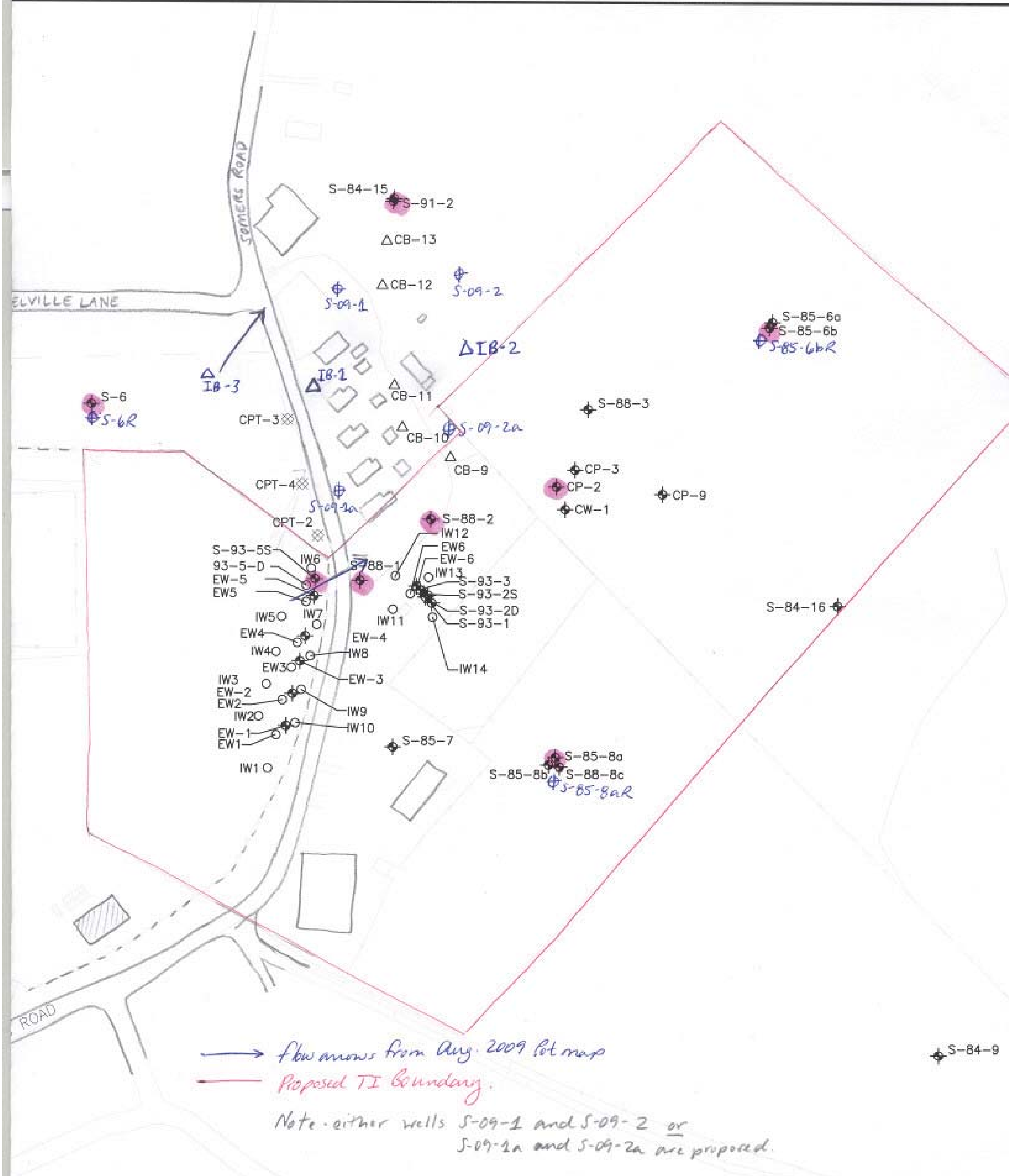
2. If impacts are observed in S-6R, an additional boring, will be installed between S-6R and IB-1. Impacts are defined as PID readings greater than a determine value based on comparison of GW results to PID readings from IB-1 IB-3 and IB-2, observed sheen, or presence of creosote globules. Samples will be collected and analyzed as described above.

If impacts are observed in S-6R, 4 quarters of gw elevation data needs to be collected to understand gw flow direction with GWTS shutdown before an additional boring is required.

3. Abandon well S-6.

The work plan should state that all wells will be surveyed by a licensed surveyor as part of the upcoming 5 Year Review and these elevations will be incorporated in all future routine sampling and well gauging events.

(See attached file: Addl Investigation Locations.pdf)



BNSF RAILWAY COMPANY

SOMERS, MONTANA (01140-176-210)

DATE: 10/23/09 | DRWN: LP/FTC

ADDITIONAL INVESTIGATION SITE MAP

FIGURE 1

Young, Shelly

From: Young, Shelly
Sent: Friday, January 15, 2010 2:44 PM
To: Hoogerheide.Roger@epa.gov; DeWitt, Lisa
Cc: Colpitts, Ann; Smith, David M
Subject: Somrs 2010 Work Plan
Attachments: 2010 Work Plan_DRAFT.docx; Additional Site Investigation Map.pdf

Hi Roger and Lisa,

Please find attached a draft copy of the 2010 Work Plan for the additional data collection activities proposed at Somers. As this is a draft, the figure is included for your review but the attachments are not. Please instruct if you would like the attachments sent and if you would like a hard copy or CD of this 2010 Work Plan sent to you.

Thanks and have a good weekend.

Shelly Young
Project Manager/Environmental Engineer
AECOM Environment
P 406.652.7481 ext. 31
shelly.young@aecom.com

AECOM Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, MT
60136257
January 2010

Work Plan for Additional Data Collection

BNSF Former Tie Treatment Plant
Somers, Montana
Draft

AECOM Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, MT
60136257
January 2010

Work Plan for Additional Data Collection

BNSF Former Tie Treatment Plant
Somers, Montana
Draft

Prepared By
Shelly Young, Project Manager

Reviewed By
Ann Colpitts, Senior Program Manager

Contents

List of Appendices

List of Figures

1.0 Introduction

This work plan for additional data collection (2010 Work Plan) has been prepared by AECOM Environment on behalf of BNSF Railway Company (BNSF) at the direction of the Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (MDEQ), hereafter referred to as Agency or Agencies. This 2010 Work Plan reflects correspondence BNSF received from the Agencies in July and October 2009 as well as verbal comments made during a series of conference calls in occurring in late 2009 and early 2010 between BNSF, the Agencies, and AECOM covering the approach for additional data collection. The 2010 Work Plan reflects BNSF's understanding of the scope and nature of the additional data collection the Agencies are requesting at the BNSF Former Tie Treatment Plant in Somers, Montana (Site). The objectives of the work discussed in this 2010 Work Plan are the following.

1. Confirm extent of dissolved constituents of concern (COCs) in groundwater that exceeds cleanup levels set forth in the EPA Record of Decision (ROD) or subsequent Explanation of Significant Differences (ESDs) by installing additional wells and borings and collecting samples and by replacing existing well S-6 with a deeper well and collecting samples.
2. Determine if the current technical impracticability (TI) boundary proposed by the Agencies is sufficient.
3. Better assess the source of zinc in groundwater that exceeds the cleanup level in the ROD by replacing galvanized steel constructed wells S-85-5B, S-85-6B, and S-85-5A with poly vinyl chloride (PVC) constructed wells.

The objectives of the data collection activities are provided in this introduction section. The scope of work is presented in Section 2. Section 3 addresses sample handling and reporting. Health and safety requirements are discussed in Section 4.

2.0 Scope of Work

This chapter presents the scope of work to meet the objectives of additional data collection, including discussion of the borings that will be installed, types of data that will be collected, field methods for collection, laboratory analytical methods, and data collection locations. **Figure 1** presents the site layout, existing wells and borings discussed in this plan, and locations and proposed borings and wells.

2.1 Extent of Dissolved Plume and TI Boundary Location

Additional activities are proposed to confirm the extent of the dissolved plume downgradient of the source area originating from the former CERCLA lagoon toward monitoring well S-91-2. The data will also help determine if the current TI boundary proposed by the Agencies is sufficient in that direction (**Figure 1**).

2.1.1 Boring Locations

Soil borings will be installed between existing wells S-93-5S and S-88-2 within the source area and well S-91-2 downgradient from the source area and current TI boundary to meet the objectives. Borings will be located as follows.

- Soil boring IB-1 will be installed approximately midway between S-93-5S and S-91-2 and will be located near Somers Road.
- Soil boring IB-2 will be installed approximately midway between S-88-2 and S-91-2.
- Soil boring IB-3 will be installed between the CERCLA lagoon borings CB-10 and CB-11 installed in 1991 as requested by the Agencies in their comments to the approach for the Somers field effort dated December 2, 2009.

Actual boring locations will be determined in the field and will take into account existing structures, utility locations, and access agreements. If the location varies more than 50 feet from the proposed location, placement will be determined in consultation with the Agencies.

Monitoring wells S-10-1 and S-10-2 will be installed based on the groundwater results obtained from IB-1, IB-2, and IB-3. If results exceed the groundwater target cleanup goals for the COCs at the Site, the wells will be installed downgradient of the borings. If results do not exceed the groundwater target cleanup goals, the wells will be installed upgradient from the borings. Well placement will be determined through consultation with the Agencies based on the data collected from borings IB-1, IB-2, and IB-3.

2.1.2 Installation and Sampling Methods

Borings will be installed and sampled per the following protocol.

- Boring will be installed using Sonic or hollow stem auger drilling to approximately 65 to 70 feet below ground surface (bgs) or until evidence of contamination is no longer observed, whichever is greater.
  - Soil will be logged at five-foot intervals.
  - PID readings will be collected by sealing soil from each five-foot interval in a plastic baggie and collecting a PID reading after letting the soil rest approximately 10 minutes.
  - A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized.
- Soil samples will be collected if evidence of contamination (i.e. dark staining, hydrocarbon odors, or PID readings greater than 10 ppm) is encountered above the groundwater table.

  - Samples will be collected from the continuous Sonic core or from split spoon augers depending on the drilling method used.
  - Samples will be sent to Pace Analytical Services, Inc. (Pace) in Minneapolis, Minnesota and will be analyzed for TPAH, CPAH, phenols, and zinc.
  - A 24-hour turnaround will be requested on samples collected from IB-1, IB-2, and IB-3 as results collected from these borings will determine the location of addition borings or monitoring wells.

- Depth discrete groundwater samples will be collected at 15-foot intervals from the start of the groundwater table to the end of the boring.
  - Samples will be collected by either
    1. pulling back the sonic casing and installing a packer assembly into the exposed borehole and collecting groundwater at the desired depth from a stainless screen attached to a two inch diameter black pipe; the packer is inflated to isolate the desired depth interval and a bailer or peristaltic pump is used to collect the sample – or –
    2. advancing a power punch sampling tool past the drilling auger at the desired depth and collecting groundwater from a three-quarter inch screen exposed at the desired depth by using a small diameter bailer or a peristaltic pump.
  - Samples will be sent to Pace and will be analyzed for TPAH, CPAH, phenols, and zinc.
  - A 24-hour turnaround will be requested on samples collected from IB-1, IB-2, and IB-3 as results collected from these borings will determine the location of addition borings or monitoring wells.
  - Split samples will be made available to the Agencies upon request provided a sufficient volume of water can be collected from the boring.
- Borings well be abandoned following sample collection. The boring will be filled with sealing material (bentonite) to within three feet of the surface. Any remaining hole will be filled with naturally occurring soils.

As indicated in Section 3.1.1, additional borings or monitoring wells will be installed based on the results obtained from samples collected from borings IB-1, IB-2, and IB-3. Wells will be installed and sampled per the following protocol.

- Wells will be installed using Sonic or hollow stem auger drilling to approximately 65 to 70 feet below ground surface (bgs) or until evidence of contamination is no longer observed, whichever is greater. Soil will be logged at five-foot intervals and PID readings will be collected.
- Soil samples will be collected if evidence of contamination is encountered above the water table. Analysis will follow the procedure outlined for the borings; however, as other locations are not dependent on the results, a normal turnaround time will be requested.
- As requested by the Agencies in the December 2, 2009 correspondence, a cross-section between existing wells and the new borings will be sketched. Geological, PID, and analytical data will be used to determine the appropriate groundwater sampling and screen placement intervals. The PID readings at the well locations and the information from the sketched cross sections will be used to select the most likely intervals where creosote impacts may be encountered.
- The wells will be completed as follows:
  - Two inch diameter schedule 40 PVC casing and 0.020 inch slotted screen.
  - The wells will be screened over a 10 foot interval below the water table where evidence of creosote impacts were noted or from 25 to 35 feet bgs if no impacts are observed in the boring.
  - The wells will be completed with a one-foot sump.

  - Surface completion will consist of a two to three foot stickup casing with a locking lid. Ballards will be placed around the competed wells to prevent vehicular damage to the well. However, if the well is located in or very near a roadway, the well will be completed as a flush-mounted well.
- Groundwater samples will be collected from impacted intervals based on the cross-sections described above, field observations, and PID readings. If no impacts are observed, the well will be completed and groundwater samples will be collected from the screened interval following completion.
  - Samples will be sent to Pace and will be analyzed for TPAH, CPAH, phenols, and zinc.
  - A normal turnaround time will be requested.
  - Split samples will be made available to the Agencies upon request provided a sufficient volume of water can be collected from the boring

2.2 Galvanized Steel Constructed Well Replacement

Wells S-85-5B, S-85-6B, and S-85-8A will be replaced with wells constructed with PVC casing and screen material. The replacement wells will be installed approximately 25 feet upgradient from the existing wells. The distance is to ensure they are installed outside of the radius of zinc suspected to originate from the galvanized steel casing used to construct the original wells. The replacement wells will be installed at a similar depth as the original wells using two-inch schedule 40 PVC. A 0.010 or 0.020 inch slotted screen will be used depending on the screen in the existing well that is being replaced. The well completion logs from S-85-5B, S-85-6B, and S-85-8A are included in **Appendix A**.

The replacement wells will be monitored during the regularly scheduled sampling event following installation, which will likely be in June 2010. Sample results collected during four consecutive events will be evaluated to determine compliance with the target cleanup goals. If the replacement wells are determined to be in compliance after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011). If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, quarterly monitoring well continue until compliance is achieved.

Wells S-85-5B, S-85-6B, and S-85-8A will be abandoned according to Montana well abandonment requirements. Where possible, the casing will be removed from the ground. In the event that the casing cannot be removed, it will be cut off or driven downward so that the top of the casing is at least three feet below the ground surface. The well will then be filled with sealing material (bentonite) to within three feet of the surface. Any remaining hole will be filled with naturally occurring soils.

2.3 Well S-6 Replacement

Monitoring well S-6 is included in the interim monitoring period plume stability network and also sampled as part of the land treatment unit post-closure monitoring program. This well regularly has an insufficient volume of water in the well to collect samples; therefore, a deeper well will be installed to replace S-6. Well S-6R will be installed similar to but will be screened slightly deeper than S-6 (see **Appendix A** for the well completion log from S-6) and will be constructed with two-inch schedule 40 PVC casing and 0.010 slotted screen. If impacted intervals are encountered, the screen may be placed at the impacted interval. Well S-6 will be abandoned as described in Section 2.2 above.

Samples will be collected from the replacement well if impacts are observed in the boring. A soil sample will be collected and analyzed as described in Section 2.1.2 if impacted soil is observed above the groundwater table. Groundwater samples will be collected as described in Section 2.1.2 if impacted intervals are observed below the water table. A normal turnaround time will be requested on all samples as no additional boring locations will be dependent on results obtained from boring S-6R.

The replacement well will be monitored during the regularly scheduled sampling events following installation. Sample results collected during four consecutive quarters will be evaluated to determine compliance with the target cleanup goals.

2.4 Well Survey

All wells and boring locations will be surveyed by a licensed surveyor as part of the upcoming Agency Five-Year Review. Surveying will be provided by Montana licensed professional land surveyor. Surveying will be based on the horizontal datum of NAD 83 Montana State Plane Feet and the vertical datum of NAVD 88. Positional accuracy of the survey will meet the Accuracy Standards for ALTA/ACSM Land Title Surveys, as adopted by the American Land Title Association and the National Society of Professional Surveyors. The well elevations obtained will be incorporated in all future routine sampling and well gauging events.

3.0 Sample Handling and Reporting

All samples will be shipped overnight to the project laboratory. Sample collection, storage, and shipment will follow chain of custody protocol. All sampling equipment will be subject to appropriate decontamination protocol.

A summary data table and copies of laboratory reports will be included in the progress report for the quarter within which the work is conducted. The groundwater summary tables will include a comparison to the cleanup levels in the ROD and will indicate which results, if any, exceeded the levels. The progress report will also include a description of all activities conducted under this 2010 Work Plan, deviations to the planned work, an evaluation of data quality, and copies of all field log books and field forms.

4.0 Health and Safety

A site-specific health and safety plan (HASP) has been developed for the Somers site and is reviewed and updated annually. The HASP contains emergency contact information and directions to the hospital, as well as information on hazards generally present on AECOM field sites. A copy of the HASP will remain on-site in the treatment building office throughout the data collection activities; all personnel working on site must read and sign the HASP. Task Hazard Analyses (THAs) have been prepared for tasks expected during the additional activities and are included in **Appendix B** to this report and in the HASP.

Safety equipment is available on site and personnel involved in the work activities need to be familiar with its proper use and location. Equipment includes the safety shower eyewash station and fire extinguishers. Minimum personal protective equipment (PPE) requirements include safety glasses with side shields, hard hats, and steel-toed boots. Gloves shall be worn when handling equipment and materials. Nitrile or other chemically impervious gloves shall be worn when working with contaminated liquids or sludges. Orange vests will also be worn when working around moving vehicles or near public roads.

Below is a list of general safety guidelines which will be followed during the additional data collection activities.

- All contractors will have completed the BNSF Contractor Orientation Training prior to conducting work on site. Annual certification is required.
- All manufacturers' recommended safety precautions for all chemicals will be followed. Refer to the Material Safety Data Sheets (MSDS) located in the HASP.
- A task or job hazard analysis will be conducted prior to performing interim monitoring tasks. If a THA already exists for the activity, it will be reviewed by all personnel involved in the task. New THAs will be filed in the HASP.
- All required PPE shall be worn while conducting work on site.
- Special precautions will be taken with moving liquids. This requires the use of protective clothing and maintaining a safe distance.
- Utility locates will be conducted prior to installing borings and wells.

All personnel are empowered to stop work activities if a deviation from planned activities occurs or if an unsafe condition is present.

4.1 Access Agreements

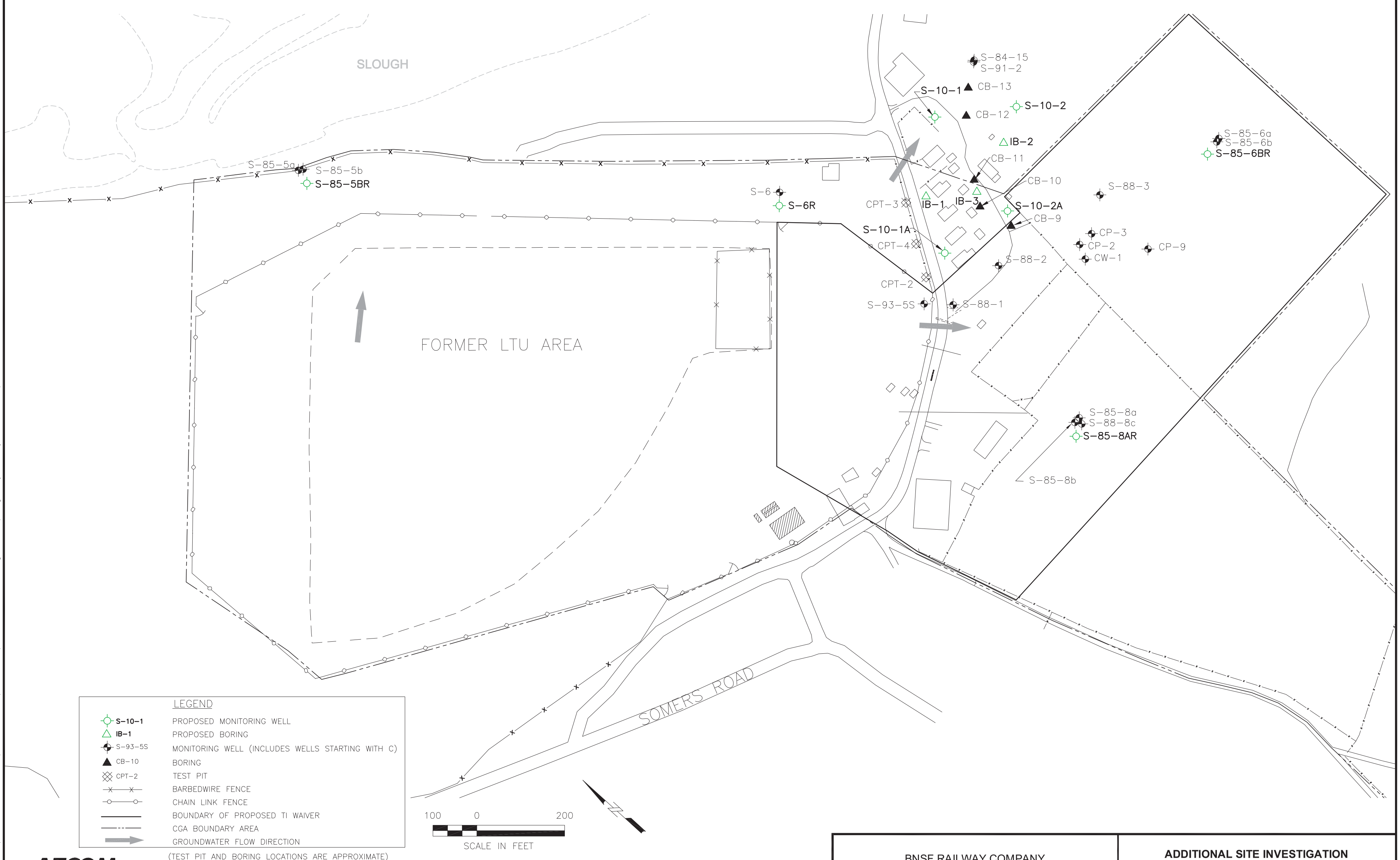
The borings and monitoring wells proposed to determine the extent of the dissolved plume are located off of BNSF owned property. Owners of the property where borings and wells may be located will be contacted prior to commencing work to gain access to their property. An effort will be made to locate borings and wells away from structures and utilities. If a property owner will not grant access, county authorities will be contacted for permission to install borings within the county right-of-way. If a monitoring well is installed an access agreement will be drafted with which the property owner will grant BNSF access to the well for future monitoring purposes.

No personnel shall be allowed within the work area without prior approval. Property owners will be notified of the work activities and health and safety concerns. Access to the work area will be controlled with barricades, temporary fencing, or other means to limit entry. The AECOM field manager will be responsible for ensuring unauthorized access to the work area is prevented.

4.2 Data Collection-Derived Waste Management

Soil generated during the field work will be containerized and stored within the fenced area of the Somers Site until appropriate disposal can be arranged. A sample will be collected from the containerized soil and will be analyzed for total polycyclic aromatic hydrocarbons (TPAH), carcinogenic PAH (CPAH), phenols, and zinc analysis. Soil cuttings that are non-hazardous will be spread on the ground surface within the fenced area of the site. If soil cuttings are determined to be hazardous waste (F034), they will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

Water produced during sampling and decontamination activities will be collected, drummed, and sent off site for disposal if in contact with soil that is impacted with Site COCs.



BNSF RAILWAY COMPANY SOMERS, MONTANA (60136257-210)	ADDITIONAL SITE INVESTIGATION SITE MAP
DATE: 1/13/10 DRWN: LP/FTC	FIGURE 1

File: S:\CADD\CADD FORT COLLINS\BNSF Somers\60136257\Additional Site Investigation Map.dwg Layout: Layout1 User: paull Plotted: Jan 13, 2010 - 11:12am Xref's:

Appendix A

Boring and Well Logs

Appendix B

Task Hazard Analyses

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Montana Department of
ENVIRONMENTAL QUALITY

Ref: 8MO

January 19, 2010

Mr. Dave Smith
Manager Environmental Remediation
Burlington Northern Santa Fe (BNSF) Railway Company
825 Great Northern Boulevard, Suite 105
Helena, MT 59601-3340

Re: Revised Groundwater Treatment System Interim Monitoring Plan, BNSF Former Tie Treating Plant, Somers, MT, October 2009

Dear Dave:

The United States Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (MDEQ) have received and reviewed the "Revised Groundwater Treatment System Interim Monitoring Plan, BNSF Former Tie Treating Plant, Somers, MT, October 2009". Please make the following revisions to the October 2009 Revised Groundwater Treatment System Interim Monitoring Plan.

Section 1.1 Page 1-2, third paragraph - While the cancer slope was revised for CPAHs, the target clean up goal was not revised in the 1998 Explanation of Significant Difference. The reasoning behind this was that MDEQ was revising state standards for these compounds and updated groundwater standards would be addressed as part of the Technical Impracticability (TI) waiver approval process. Based on this new information, the Agencies require changes to this document to reflect the current cleanup standard of 0.03 ug/l as established in the Record of Decision (ROD). All references to a cleanup goal of 0.047 ug/l (Page 3-6, Table 3 in Appendix C, etc.) need to be changed to the cleanup goal of 0.03 ug/l established in the ROD.

Section 1.1. Page 1-2. 4th Paragraph. "As per EPA Headquarters, previous site activities, investigations, and modeling have indicated that EPA's three objectives for site remediation will be satisfied without operating the groundwater treatment system." Modify to read "As per EPA

Headquarters, previous site activities, investigations, and modeling have indicated that EPA's three objectives for site remediation may be satisfied without operating the groundwater treatment system."

Section 1.1. Page 1-2, Last paragraph, Item 3 – The deed restriction prohibiting new wells was dated stamped by Flathead County on 12/8/2008.

Section 1.2.2. Page 1-4. Third bullet. Modify to read "Available groundwater treatment technologies are not able to meet the groundwater treatment goals in a reasonable time at the time the TI evaluation was completed."

Section 1.2.2. Page 1-4. 3rd Paragraph. Delete the last sentence of the third paragraph .

Section 1.2.2. Page 1-4. 5th Paragraph. Add the following sentence to the end of the 5th paragraph: "Additional work will be conducted in 2010 to determine whether the currently designated CGA is sufficient."

Section 1.2.3. Page 1-5. Paragraph 1. Sentence 1. Modify the sentence to read "Groundwater treatment operations were conducted from 1994 to 2007."

Section 3.1. Page 3-1, Last paragraph, last sentence – Add following language to replace sentence as the Agencies have specified monitoring requirements for this replacement well in the 12/02/2009 email to BNSF regarding upcoming field investigation at Somers:
"The 85-5b replacement well will be sampled quarterly for four consecutive events upon completion of the new well, at which point the well will be assessed for compliance with target cleanup goals. If the replacement well is determined to be in compliance, then additional monitoring will be evaluated in addition to evaluating removal of the small proposed TI boundary around S-85-5a and S-85-5b. If the replacement wells are not in compliance, or if compliance cannot be established, then quarterly monitoring will continue until compliance is achieved as specified in the Interim Monitoring Plan."

Section 3.1. Page 3-2, First paragraph, first sentence – Replace sentence as follows: Groundwater will be monitored for the four years after termination of GWTS operation at which time the Agencies in consultation with BNSF Railways will re-evaluate monitoring requirements.

Section 3.1. Page 3-1. Paragraph 1. Sentence 6. Modify the sentence to read "A potentiometric map will be generated for each measurement event to determine..."

Section 3.1. Page 3-2, First paragraph, last sentence – delete the sentence as the Agencies cannot agree to a decreased monitoring frequency until all data has been evaluated.

Section 3.1. Page 3-2, Second paragraph, fourth sentence. Clarify sentence to mean no further sampling will be required if emulsified creosote is observed during purging activities.

Section 3.1. Page 3-2. 2nd Paragraph. Add the following sentence to the end of the second paragraph: "In future sampling and reporting events, the value reported from the September 2009 sampling shall be used as a representative value for emulsified creosote in the development of any inferred concentration contour maps, unless subsequent sampling provides more recent data; maps shall be footnoted to indicate that the value used is only meant to represent the concentration likely to be present in emulsified product in the wells."

Section 3.1.1. Page 3-2. Fourth bullet. Wells S-88-1 and S-88-2 often contain emulsified product, and are therefore not sampled. How, then are we evaluating changes in the concentration of dissolved creosote constituents?

Section 3.1.1. Page 3-2. Last sentence of paragraph 2. Delete everything after the semi-colon in the last sentence, and change the semi-colon to a period.

Section 3.5. Page 3-2, last paragraph - Swamp pond area monitoring wells will be sampled as part of the upcoming 5 Year Review once in the fall 2010 and again in the Spring 2011 since this monitoring was agreed to by EPA when a resident asked about monitoring frequency of the Swamp pond area during our October 2009 public meeting. These sampling events can serve to confirm groundwater is not impacted in this area and no further sampling during the last anticipated interim monitoring period sampling round is required.

Section 3.5. Page 3-2, last paragraph, last sentence - Add following to end of sentence:

"Data will be collected during the high and low elevations of Flathead Lake no less than every five years as part of any upcoming five year review as long as waste is left in place on Site above levels that do not allow for unlimited use and unrestricted exposure."

Section 3.1.4. Page 3-4. Item 1. Last sentence. Modify to read "If emulsified product is detected in the well, samples will not...".

Section 4.1 Change *"TPAH"* to *"COC"*.

Section 5. Page 5-1. Paragraph 2. Last sentence. "Wells that have historically had detections of COC above target cleanup levels (including wells S-88-1 and S-88-3) will not be resampled if results are above the target cleanup levels." Modify to read "Wells that have had detections of COC above target cleanup levels (including wells S-881 and S-88-3) during the previous four sampling events will not be resampled if results are above the target cleanup levels."

Revise Tables 4-1 through 4-4 to include the Historical dataset (2007 – 2009)

Revise Tables 1 through 3 (Historic site-wide COC concentrations for zinc, TPAHs and CPAHs) of Appendix C to include all data collected during the previous 8 quarters of the Interim Monitoring Period.

We appreciate your efforts in developing this plan and working with EPA and MDEQ to approve them. Please make these changes and send a revised "Final Groundwater Treatment

System Interim Monitoring Plan".

If you have any questions or concerns about our approval process, please call either of us at the following numbers: Lisa DeWitt at (406) 841-5037 or Roger Hoogerheide at (406) 457-5031.

Sincerely,

Lisa DeWitt
MDEQ Project Manager

Roger Hoogerheide
USEPA Project Manager

cc: Shelly Young, ENSR (electronic)
Ann Colpitts, ENSR (electronic)
Andrew Schmidt, EPA (electronic)
Joe Vranka, EPA (electronic)
Larry Scusa, DEQ (electronic)
File

Young, Shelly

From: Young, Shelly
Sent: Monday, April 12, 2010 1:23 PM
To: 'Hoogerheide.Roger@epamail.epa.gov'
Cc: lidewitt@mt.gov; Schmidt.Andrew@epamail.epa.gov; 'Smith, David M'; Colpitts, Ann
Subject: Revised locations for 2010 Work Plan - Somers
Attachments: Additional Site Investigation Map rev 4-7-10.pdf

Hi All,

Attached is the revised figure for inclusion in the 2010 Work Plan for Somers. The Ortiz/Able boring locations have been added to the figure (based on coordinates provided in the report) and the proposed location for IB-2 has been slightly revised. From our understanding, the Agency will use this figure to complete their review of the 2010 Work Plan and will provide approval to BNSF or will request revisions prior to proceeding with the additional activities.

Thanks!

Shelly Young
Project Manager/Environmental Engineer
AECOM Environment
Office 406.652.7481
Direct 406.896.4582
shelly.young@aecom.com

AECOM
207 North Broadway, Suite 315
Billings, Montana 59101

www.aecom.com

LEGEND

O-GP-1	ORTIZ/ABLE BORING
S-10-1	PROPOSED MONITORING WELL
IB-1	PROPOSED BORING
S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
CB-10	BORING
CPT-2	TEST PIT
	BARBEDWIRE FENCE
	CHAIN LINK FENCE
	BOUNDARY OF PROPOSED TI WAIVER
	CGA BOUNDARY AREA
	GROUNDWATER FLOW DIRECTION

(TEST PIT AND BORING LOCATIONS ARE APPROXIMATE)

AECOM

BNSF RAILWAY COMPANY
SOMERS, MONTANA (60147072-510)

ADDITIONAL SITE INVESTIGATION
SITE MAP

DATE: 4/7/10 | DRWN: LP/FTC

FIGURE 1

File: S:\CADD\CADD FORT COLLINS\BNSF Somers\60136257\Additional Site Investigation Map.dwg Layout: Layout1 User: paull Plotted: Apr 07, 2010 - 1:30pm Xref's:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Montana Department of
ENVIRONMENTAL QUALITY

Ref: 8MO

April 19, 2010

Mr. Dave Smith
Manager Environmental Remediation
Burlington Northern Santa Fe Railway Company
139 North Last Chance Gulch
Helena, MT 59601

Re: Agency Comments on the Draft Work Plan for Additional Data Collection, BNSF Former Tie Treatment Plant

Dear Dave:

The Agencies have received and reviewed the "Draft Work Plan for Additional Data Collection," submitted by BNSF. Comments are as follows:

General Comments

In general, the Work Plan requires more detail. Typically, a Sampling and Analysis Plan (SAP) or Standard Operating Procedures (SOPs) will accompany a Work Plan and will provide detailed information on sampling and other field procedures, equipment used, analytical methods, detection limit goals, sample container sizes, etc. The draft final Work Plan should include a SAP or SOPs, or the detail of the Work Plan should be increased accordingly.

The Work Plan does not detail what will happen if multiple impacted intervals are discovered during the installation of the borings. If more than one impacted interval is observed during the installation of a boring then the Agencies will require a nested well set to be installed at that location to monitor all impacted intervals. The Work Plan must provide more detail regarding this possible scenario.

The Work Plan does not detail the order in which the proposed borings will be completed. The Agencies recommend that boring IB-1 be completed first, and IB-3 be completed second to allow for flexibility in the final position of boring IB-2. It is possible that based on the results from IB-1 and IB-3, a different location than what is shown on Figure 1 may be appropriate.

The recent December 2009 groundwater sampling event revealed the presence of CPAHs above ROD based cleanup levels and detected the presence of TPAHs in the newly designated background monitoring well S-86-1. In addition, well S-86-1 contained zinc concentrations of 20.5 mg/L during the March 2010 groundwater sampling event. As a result, S-86-1 will not be acceptable as a background monitoring well. Section 2.3 should be expanded to include the language to replace and deepen background monitoring well S-3R as originally requested by the Agencies.

The Work Plan does not describe how drill cuttings or sample purge water will be disposed.

Specific Comments

<u>Section 2.1.2</u>.

Borings Section

Soils
First bullet, first "dashed" item: It states that soil will be logged at five-foot intervals. Presumably this means that the soil will be logged for lithology continuously, but will be screened with a PID every 5 feet. If this is correct, please revise the Work Plan to avoid further confusion.

First bullet, second "dashed" item: It states that PID readings will be collected by sealing soil from each five-foot interval in a plastic baggie. Will the soil be composited over the entire 5 foot interval, or will the soil be collected from a more specific interval? The agencies would prefer that every 5 feet, a discreet soil sample be collected for a PID reading, and the discreet depth of the PID sample location and the PID result marked on the boring log. If an impacted area is observed in the 5 foot interval, then the soil sample collected for a PID reading should be collected from the impacted zone.

First bullet, second "dashed" item: After the end of the sentence, insert the following: "PID readings will be recorded in the field logbook."

Second bullet: After the first sentence, insert the following: "The interval from which samples are collected will be recorded in the field logbook, as well as photos of the soil boring as appropriate."

Second bullet, first "dashed" item: A brief description of the soil sample SOP is appropriate.

Second bullet, second "dashed" item: It does not specify what analytical methods will be used for TPAH, CPAH, phenols, and zinc. The Work Plan should provide the analytical methods and ensure that detection limits for PAHs are sufficient to adequately determine compliance with TPAH and CPAH cleanup goals.

Second bullet, third "dashed" item: It states that (soil?) samples will be analyzed on a 24-hour turnaround. Although the agencies do not have a problem with requesting a quick turnaround, it is unclear why a 24-hour turnaround time would be necessary for soil samples.

Second bullet: Another dashed line should be added " Split samples will be made available to the Agencies and the property owner upon request".

Groundwater

Third bullet, first "dashed" item: A brief description of the groundwater sample SOP is appropriate

Third bullet, first "dashed" item, Number 1: It describes the use of packers when collecting groundwater samples. It may not be necessary to use packers if using sonic drilling methodology.

Third bullet, second "dashed" item: It does not specify what analytical methods will be used for TPAH, CPAH, phenols, and zinc. The Work Plan should provide the analytical methods and ensure that detection limits for PAHs are sufficient to adequately determine compliance with TPAH and CPAH cleanup goals.

Third bullet, third "dashed" item: Include a provision for providing split samples to property owners if requested and if sufficient sample volume is available.

Fourth bullet: It states that borings will be abandoned following sampling collection. It should state that the borings will be abandoned in accordance with Montana Regulations and cite the appropriate regulations.

Wells Installation Section

Soils

First bullet: It states that soil will be logged at five-foot intervals. Presumably this means that the soil will be logged for lithology continuously, but will be screened with a PID every 5 feet. If this is correct, please revise the Work Plan to avoid further confusion.

First bullet: After the end of the last sentence of the first bullet, insert the following: "PID readings will be recorded in the field logbook."

Second bullet: After "…evidence of contamination" in the first sentence, insert what would constitute evidence of contamination "(i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm)".

Second bullet: After the end of the first sentence, insert the following: "The interval from which samples are collected will be recorded in the field logbook, as well as photos of the soil boring as appropriate."

Second bullet: It states that soil samples will be analyzed on a normal turnaround. Please make this consistent with the second bullet of "Boring" section if BNSF is not requesting a 24 hour turnaround on soil samples. A brief description of the soil sample SOP is also appropriate.

Second bullet: It does not specify what analytical methods will be used for TPAH, CPAH, phenols, and zinc. The Work Plan should provide the analytical methods and ensure that detection limits for PAHs are sufficient to adequately determine compliance with TPAH and CPAH cleanup goals.

Second bullet: At the end of the last sentence add "Split samples will be made available to the Agencies and the property owner upon request".

Third bullet: After the last sentence in the bullet, insert the following: "The sketched cross-sections will be included with the descriptions of the work performed, as described in Section 3 of this document."

Groundwater

Fourth bullet, first "dashed" item: It states that monitoring wells will be installed using 0.020 slot screen size. Why will 0.020 size slots be used? Is this consistent with other monitoring wells at the Site?

Fourth bullet, second "dashed" item: It states that if no impacts are observed in any of the borings that well screens will be installed from 25-35 feet bgs. Additional narrative should be included as to why this is an appropriate default screen depth.

Fourth bullet, third "dashed" item: It states that wells will be completed with a one-foot sump. What is the purpose of the one-foot sump? Additional narrative needs to be included.

Fourth bullet, fourth "dashed" item: One of the stipulations presented to the Agencies in the February 2, 2010 letter from Applied Water Consulting, LLC in order to allow access to conduct additional work on the occupied properties was that the installation and construction of monitoring wells will need to be located such that the Agencies are able to obtain the necessary data to complete the evaluation yet minimize disruption to the occupants. If wells are to be installed in private yards, is it really the intent to place bollards around the wells? It's appropriate to include language stating that surface completion will be done in consultation with the property owner and/or resident if property is rented; or include additional qualifications for the completion of monitoring wells on private property.

Fifth bullet: It states that "Groundwater samples will be collected from impacted intervals based on the cross-sections described above, field observations, and PID readings. If no impacts are observed, the well will be completed and groundwater samples will be collected from the screened interval following completion." The bullet should clarify that if no impacts are observed groundwater samples will be collected at 15 foot intervals. In addition, the bullet should be clear about where the screen will be set if no impacts are observed.

Fifth bullet: A brief description of the groundwater sample SOP is appropriate

Fifth bullet, first "dashed" item: It does not specify what analytical methods will be used for TPAH, CPAH, phenols, and zinc. The Work Plan should provide the analytical methods and ensure that detection limits for PAHs are sufficient to adequately determine compliance with TPAH and CPAH cleanup goals.

This section does not discuss well development. Does BNSF plan on developing the newly installed wells? If so, how will this be done?

Section 2.2.

The Work Plan discusses the installation of new monitoring wells to replace wells constructed of galvanized steel. However, the Work Plan does not discuss well development (for the new wells or the replacement wells). Does BNSF plan on developing the newly installed wells? If so, how will this be done?

Second paragraph, first sentence. Change "monitored" to read "sampled". Change the regularly sampling event from "June 2010" to "September 2010".

Section 2.3.

Include provisions for preparation of a boring log for this well.

First paragraph, third sentence: The Work Plan states that S-6 will be replaced with a two-inch schedule 40 PVC casing and a 0.010 slot size screen. Why is the slot size inconsistent with the proposed new monitoring wells?

Second paragraph, first sentence: At the beginning of the first sentence, insert "Soil" before "samples", and after "…if impacts" in the first sentence, insert what would constitute evidence of contamination "(i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm)".

Third paragraph, first sentence: Change "monitored" to read "sampled".

Third paragraph, first sentence: At the beginning of the sentence, insert "Groundwater" before "Sample".

Section 2.4.

The Work Plan states that all wells and boring locations will be surveyed by a licensed surveyor as part of the upcoming agency Five-Year Review. Please provide the following language at the end of the sentence "which is scheduled to be completed by September 2011".

Section 3.0.

First paragraph: The appropriate SOPs need to be referenced in this paragraph and included as an appendix to the Work Plan.

Second paragraph: The Work Plan states that the results of the investigation will be presented in a subsequent Progress Report. The Agencies require that the results of the investigation be presented in an independent report so that results and conclusions are clearly documented, and can be found more readily in the future. Language in the paragraph should be changed to reflect this.

Section 4.2

If the soils are not contaminated, what will be done with them? Also, since the groundwater and soil cleanup values are not the same, even if the soils are below cleanup values, how will BNSF ensure that the water produced during sampling and decontamination activities does not exceed groundwater cleanup values?

We appreciate your efforts in developing the "Draft Work Plan for Additional Data Collection". Please provide a revised draft Work Plan to USEPA and MDEQ by May 7, 2010. If you have any questions or concerns about our comments, please call one of us at the following numbers: Lisa DeWitt at (406) 841-5037; Roger Hoogerheide at (406) 457-5031 or Andrew Schmidt at (303) 312-6283.

Sincerely,

Lisa Dewitt
MDEQ Project Officer

Roger Hoogerheide
USEPA Project Manager

cc: Andrew Schmidt, EPR-PS (electronic copy)
Shelly Young, AECOM Environment (electronic copy)
Ann Colpitts, AECOM Environment (electronic copy)
Larry Scusa, MDEQ (electronic copy)
Joe Vranka, 8MO (electronic copy)
Jim Stearns, LEP (electronic copy)
File

AECOM
207 N. Broadway, Suite 315
Billings, Montana 59101

406-896-4582 tel
406-652-7485 fax

May 7, 2010

Mr. Roger Hoogerheide
U.S. Environmental Protection Agency
Region 8, Montana Office - Federal Building
10 West 15th Street, Suite 3200
Helena, MT 59626

Ms. Lisa Dewitt
Montana Department of Environmental Quality
Remediation Division, Federal Superfund Section
P.O. Box 200901
Helena, MT 59602-0901

Subject: Response to April 19, 2010 Agency Comments on the Draft Work Plan for Additional Data Collection, BNSF Former Tie Treatment Plant, Somers, Montana (EPA ID No. MTD053038386)

Dear Mr. Mr. Hoogerheide and Ms. Dewitt,

On behalf of BNSF Railway Company (BNSF), AECOM Environment (AECOM) is pleased to respond to the April 19, 2010 Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (MDEQ), hereto referred to as the Agency or Agencies, comments on the Draft Work Plan for Additional Data Collection (2010 Work Plan). The 2010 Work Plan has been revised to incorporate the Agency comments and BNSF responses below.

Responses to Agency's comments

GENERAL COMMENTS

Comment:
In general, the Work Plan requires more detail. Typically, a Sampling and Analysis Plan (SAP) or Standard Operating Procedures (SOPs) will accompany a Work Plan and will provide detailed information on sampling and other field procedures, equipment used, analytical methods, detection limit goals, sample container sizes, etc. The draft final Work Plan should include a SAP or SOPs, or the detail of the Work Plan should be increased accordingly.

Response:
Standard Operating Procedures (SOPs) have been incorporated into the revised 2010 Work Plan.

Comment:
The Work Plan does not detail what will happen if multiple impacted intervals are discovered during the installation of the borings. If more than one impacted interval is observed during the installation of a boring then the Agencies will require a nested well set to be installed at that location to monitor all impacted intervals. The Work Plan must provide more detail regarding this possible scenario.

Response:
As indicated in Section 2.1.2 of the 2010 Work Plan, depth discrete groundwater samples will be collected from the borings at 15-foot intervals. Soil samples will be collected if evidence of contamination is encountered above the groundwater table. As per correspondence and discussions preceding this Work Plan, Borings IB-1, IB-2, and IB-3 will not be completed with monitoring wells. Monitoring wells S-10-1 and S-10-2 will be located based on the results obtained from borings IB-1, IB-2, and IB-3. The monitoring wells will be screened over a 10-foot interval below the water table where evidence of impacts is noted. If multiple impacted intervals are observed during the installation of monitoring wells, screen placement will be determined in consultation with the Agencies.

Comment:
The Work Plan does not detail the order in which the proposed borings will be completed. The Agencies recommend that boring IB-1 be completed first, and IB-3 be completed second to allow for flexibility in the final position of boring IB-2. It is possible that based on the results from IB-1 and IB-3, a different location than what is shown on Figure 1 may be appropriate.

Response:
BNSF is in agreement with the proposed order of installation and the related text has been modified in the 2010 Work Plan.

Comment:
The recent December 2009 groundwater sampling event revealed the presence of CPAHs above ROD based cleanup levels and detected the presence of TPAHs in the newly designated background monitoring well S-86-1. In addition, well S-86-1 contained zinc concentrations of 20.5 mg/L during the March 2010 groundwater sampling event. As a result, S-86-1 will not be acceptable as a background monitoring well. Section 2.3 should be expanded to include the language to replace and deepen background monitoring well S-3R as originally requested by the Agencies.

Response:
BNSF has added replacement of monitoring well S-3R to the 2010 Work Plan. As a result of installing a new replacement background well, BNSF has also added abandoning wells S-3R and S-4 as part of the additional activities in the 2010 Work Plan.

Comment:
The Work Plan does not describe how drill cuttings or sample purge water will be disposed.

Response:
Section 4.2 describes how wastes generated during data collection will be managed. As per the text, soil cuttings (drill cuttings) will be containerized and stored within the fenced area of the Somers Site until sample results indicate the appropriate disposal method. The same is true for water produced during sampling (purge water) and decontamination activities.

SPECIFIC COMMENTS

<u>Section 2.1.2, Borings Section, Soils</u>

Comment:
1. *First bullet, first "dashed" item: It states that soil will be logged at five-foot intervals. Presumably this means that the soil will be logged for lithology continuously, but will be screened with a PID every 5 feet. If this is correct, please revise the Work Plan to avoid further confusion.*

Response:
The Work Plan has been revised to indicate each hollow stem auger (HSA) section or the continuous Sonic core will be logged by a site scientist/engineer and portions of the soil sample from each 5-foot interval will be placed in plastic bags and the headspace will be screened using a photo ionization detector (PID).

Comment:
2. *First bullet, second "dashed" item: It states that PID readings will be collected by sealing soil from each five-foot interval in a plastic baggie. Will the soil be composited over the entire 5 foot interval, or will the soil be collected from a more specific interval? The agencies would prefer that every 5 feet, a discrete soil sample be collected for a PID reading, and the discrete depth of the PID sample location and the PID result marked on the boring log. If an impacted area is observed in the 5 foot interval, then the soil sample collected for a PID reading should be collected from the impacted zone.*

Response:
Efforts will be made to collect a discrete PID sample at 5-foot intervals and to collect a soil sample from the same interval for laboratory analysis if an impacted area is observed; however, there is a finite amount of soil available during boring installation and there may be an insufficient volume to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners if requested.

Comment:
3. *First bullet, second "dashed" item: After the end of the sentence, insert the following: "PID readings will be recorded in the field logbook."*

Response:
The text has been modified as indicated.

Comment:
4. *Second bullet: After the first sentence, insert the following: "The interval from which samples are collected will be recorded in the field logbook, as well as photos of the soil boring as appropriate."*

Response:
The text has been modified as indicated.

Comment:
5. *Second bullet, first "dashed" item: A brief description of the soil sample SOP is appropriate.*

Response:
The text has been modified as indicated.

Comment:
6. *Second bullet, second "dashed" item: It does not specify what analytical methods will be used for TPAH, CPAH, phenols, and zinc. The Work Plan should provide the analytical methods and ensure that detection limits for PAHs are sufficient to adequately determine compliance with TPAH and CPAH cleanup goals.*

Response:
The text has been modified as indicated.

Comment:
7. *Second bullet, third "dashed" item: It states that (soil?) samples will be analyzed on a 24-hour turnaround. Although the agencies do not have a problem with requesting a quick turnaround, it is unclear why a 24-hour turnaround time would be necessary for soil samples.*

Response:
BNSF has considered the Agencies comment and has removed this bullet from the text.

Comment:
8. *Second bullet: Another dashed line should be added "Split samples will be made available to the Agencies and the property owner upon request".*

Response:
The text has been modified as indicated. However, there is a finite amount of soil available during boring installation and there may be an insufficient volume to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners if requested.

Section 2.1.2, Borings Section, Groundwater

Comment:
1. *Third bullet, first "dashed" item: A brief description of the groundwater sample SOP is appropriate.*

Response:
The text has been modified as indicated.

Comment:
2. *Third bullet, first "dashed" item, Number 1: It describes the use of packers when collecting groundwater samples. It may not be necessary to use packers if using sonic drilling methodology.*

Response:
The comment is noted.

Comment:
3. *Third bullet, second "dashed" item: It does not specify what analytical methods will be used for TPAH, CPAH, phenols, and zinc. The Work Plan should provide the analytical methods and ensure that detection limits for PAHs are sufficient to adequately determine compliance with TPAH and CPAH cleanup goals.*

Response:
The text has been modified as indicated.

Comment:
4. *Third bullet, third "dashed" item: Include a provision for providing split samples to property owners if requested and if sufficient sample volume is available.*

Response:
The text has been modified as indicated.

Comment:
5. *Fourth bullet: It states that borings will be abandoned following sampling collection. It should state that the borings will be abandoned in accordance with Montana Regulations and cite the appropriate regulations.*

Response:
The text has been modified as indicated.

Section 2.1.2, Wells Installation Section, Soils

Comment:

1. *First bullet: It states that soil will be logged at five-foot intervals. Presumably this means that the soil will be logged for lithology continuously, but will be screened with a PID every 5 feet. If this is correct, please revise the Work Plan to avoid further confusion.*

Response:
The Work Plan has been revised to indicate each HSA section or the continuous Sonic core will be logged by a site scientist/engineer and portions of the soil sample from each 5-foot interval will be placed in plastic bags and the headspace will be screened using a PID.

Comment:

2. *First bullet: After the end of the last sentence of the first bullet, insert the following: "PID readings will be recorded in the field logbook."*

Response:
The text has been modified as indicated.

Comment:

3. *Second bullet: After"...evidence of contamination" in the first sentence, insert what would constitute evidence of contamination "(i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm)".*

Response:
The text has been modified as indicated.

Comment:

4. *Second bullet: After the end of the first sentence, insert the following: "The interval from which samples are collected will be recorded in the field logbook, as well as photos of the soil boring as appropriate."*

Response:

The text has been modified as indicated.

Comment:

5. *Second bullet: It states that soil samples will be analyzed on a normal turnaround. Please make this consistent with the second bullet of "Boring" section if BNSF is not requesting a 24 hour turnaround on soil samples. A brief description of the soil sample SOP is also appropriate.*

Response:
The text has been modified as indicated.

Comment:

6. *Second bullet: It does not specify what analytical methods will be used for TPAH, CPAH, phenols, and zinc. The Work Plan should provide the analytical methods and ensure that detection limits for PAHs are sufficient to adequately determine compliance with TPAH and CPAH cleanup goals.*

Response:
The text has been modified as indicated.

Comment:

7. *Second bullet: At the end of the last sentence add "Split samples will be made available to the Agencies and the property owner upon request".*

Response:
The text has been modified as indicated.

Comment:
8. *Third bullet: After the last sentence in the bullet, insert the following: "The sketched cross sections will be included with the descriptions of the work performed, as described in Section 3 of this document."*

Response:
The text has been modified as indicated.

Section 2.1.2, Wells Installation Section, Groundwater

Comment:
1. *Fourth bullet, first "dashed" item: It states that monitoring wells will be installed using 0.020 slot screen size. Why will 0.020 size slots be used? Is this consistent with other monitoring wells at the Site?*

Response:
Historically, screens have been used at the site with both 0.010 and 0.020 size slots. New monitoring wells will be installed using 0.010 slot size.

Comment:
2. *Fourth bullet, second "dashed" item: It states that if no impacts are observed in any of the borings that well screens will be installed from 25-35 feet bgs. Additional narrative should be included as to why this is an appropriate default screen depth.*

Response:
The Agency requested the screened interval included in the Work Plan. A screened interval of 25-35 feet bgs is consistent with the construction of wells S-91-2 and S-88-2.

Comment:
3. *Fourth bullet, third "dashed" item: It states that wells will be completed with a one-foot sump. What is the purpose of the one-foot sump? Additional narrative needs to be included.*

Response:
BNSF has removed the installation of a sump from the text. Well construction without a sump is consistent with the construction of wells S-91-2 and S-88-2.

Comment:
4. *Fourth bullet, fourth "dashed" item: One of the stipulations presented to the Agencies in the February 2, 2010 letter from Applied Water Consulting, LLC in order to allow access to conduct additional work on the occupied properties was that the installation and construction of monitoring wells will need to be located such that the Agencies are able to obtain the necessary data to complete the evaluation yet minimize disruption to the occupants. If wells are to be installed in private yards, is it really the intent to place bollards around the wells? It's appropriate to include language stating that surface completion will be done in consultation with the property owner and/or resident if property is rented; or include additional qualifications for the completion of monitoring wells on private property.*

Response:
The text has been modified to indicate completion will be done in consultation with the property owner. Completion options are provided and include completion with a stickup casing, with or without bollards, or with flush-mounted casing. In addition to consulting with the property owners on well location and construction, BNSF will seek to obtain an access agreement to conduct the work and to allow for access to collect future samples from installed wells.

Comment:

5. *Fifth bullet: It states that "Groundwater samples will be collected from impacted intervals based on the cross-sections described above, field observations, and PID readings. If no impacts are observed, the well will be completed and groundwater samples will be collected from the screened interval following completion." The bullet should clarify that if no impacts are observed groundwater samples will be collected at 15 foot intervals. In addition, the bullet should be clear about where the screen will be set if no impacts are observed.*

Response:

The monitoring wells are being installed based on results obtained from borings IB-1, IB-2, and IB-3. Part of the data analysis from the borings includes correlating the PID field readings to the analytical results and generating a cross-section as requested by the Agencies on December 2, 2009. The purpose of this cross-section is to determine the appropriate groundwater and screen placement intervals. Groundwater sample collection at 15-foot intervals from a boring that does not have evidence of being impacted will likely not provide beneficial data; therefore, the text has not been modified and groundwater samples will be collected from the completed well as indicated in the draft 2010 Work Plan.

Comment:

6. *Fifth bullet: A brief description of the groundwater sample SOP is appropriate.*

Response:

The text has been modified as indicated.

Comment:

7. *Fifth bullet, first "dashed" item: It does not specify what analytical methods will be used for TPAH, CPAH, phenols, and zinc. The Work Plan should provide the analytical methods and ensure that detection limits for PAHs are sufficient to adequately determine compliance with TPAH and CPAH cleanup goals.*

Response:

The text has been modified as indicated.

Comment:

8. *This section does not discuss well development. Does BNSF plan on developing the newly installed wells? If so, how will this be done?*

Response:

Newly installed wells will be developed by the driller following completion. Section 2.5 in the revised 2010 Work Plan addresses well development.

<u>Section 2.2</u>

Comment:

1. *The Work Plan discusses the installation of new monitoring wells to replace wells constructed of galvanized steel. However, the Work Plan does not discuss well development (for the new wells or the replacement wells). Does BNSF plan on developing the newly installed wells? If so, how will this be done?*

Response:

Newly installed wells will be developed by the driller following completion. Section 2.5 in the revised 2010 Work Plan addresses well development.

Comment:

2. *Second paragraph, first sentence. Change "monitored" to read "sampled". Change the regularly sampling event from "June 2010" to "September 2010".*

Response:
The text has been modified as indicated.

<u>Section 2.3</u>

Comment:
1. *Include provisions for preparation of a boring log for this well.*

Response:
The text has been modified as indicated. Similar text was also added to Section 2.2.

Comment:
2. *First paragraph, third sentence: The Work Plan states that S-6 will be replaced with a two-inch schedule 40 PVC casing and a 0.010 slot size screen. Why is the slot size inconsistent with the proposed new monitoring wells?*

Response:
Wells that are being installed to replace existing wells will be constructed similar to the original wells. Historically, the screen slot size used at Somers has varied between 0.010 and 0.020 slot size. The slot size used during construction of wells S-6 was 0.010.

Comment:
3. *Second paragraph, first sentence: At the beginning of the first sentence, insert "Soil" before "samples", and after " ... if impacts" in the first sentence, insert what would constitute evidence of contamination "(i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm)",*

Response:
The text was modified to include what would constitute evidence of contamination. The word “soil” was not inserted at the beginning of the first sentence because the first sentence is referring to both soil and groundwater sample collection. Details on each are provided later in the paragraph.

Comment:
4. *Third paragraph, first sentence: Change "monitored" to read "sampled".*

Response:
The text has been modified as indicated.

Comment:
5. *Third paragraph, first sentence: At the beginning of the sentence, insert "Groundwater" before "Sample".*

Response:
The text has been modified as indicated.

<u>Section 2.4</u>

Comment:
1. *The Work Plan states that all wells and boring locations will be surveyed by a licensed surveyor as part of the upcoming agency Five-Year Review. Please provide the following language at the end of the sentence "which is scheduled to be completed by September 2011".*

Response:
The text has been modified as indicated.

Section 3.0

Comment:

1. *First paragraph: The appropriate SOPs need to be referenced in this paragraph and included as an appendix to the Work Plan.*

Response:
The text has been modified as indicated and the SOPs are provided in the Work Plan.

Comment:

2. *Second paragraph: The Work Plan states that the results of the investigation will be presented in a subsequent Progress Report. The Agencies require that the results of the investigation be presented in an independent report so that results and conclusions are clearly documented, and can be found more readily in the future. Language in the paragraph should be changed to reflect this.*

Response:
The text has been modified and a separate report will be prepared and submitted to the Agency.

Section 4.2

Comment:

1. *If the soils are not contaminated, what will be done with them? Also, since the groundwater and soil cleanup values are not the same, even if the soils are below cleanup values, how will BNSF ensure that the water produced during sampling and decontamination activities does not exceed groundwater cleanup values?*

Response:
Section 4.2 indicates soils that are determined non-hazardous will be spread on the ground within the fenced area of the Site. The text has been modified to indicate water disposal will be dependent on the ROD target cleanup levels.

Once BNSF and the Agencies have agreed on a final 2010 Work Plan, the field work will be scheduled and an effort will be made to obtain access agreements from private property owners. If you have questions or comments, please contact Shelly Young with AECOM at (406) 896-4582.

Yours sincerely,

Ann M. Colpitts

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Enclosure

cc: D. Smith, BNSF
C. Trueblood, PG&E
A. Colpitts, AECOM
AECOM Somers Field Office
File No. 01140-176-230

Young, Shelly

From: Young, Shelly
Sent: Monday, May 10, 2010 9:10 AM
To: 'Hoogerheide.Roger@epamail.epa.gov'; lidewitt@mt.gov
Cc: Smith, David M; Colpitts, Ann
Subject: BNSF Somers Revised 2010 Work Plan
Attachments: Somers 2010 Work Plan_Revised Final w Figure.pdf

Good morning, Roger and Lisa.

Hard copies and CD's of the attached revised work plan were sent to you Friday. The attachment to this e-mail includes the revised plan and figure. The appendices are not included in an effort to keep the file size manageable for all. The figure was inadvertently left off of the CDs mailed on Friday; however, I spoke with Roger this morning and we agreed I will wait to reissue the CDs until after the Agency reviews the revised work plan.

Thanks and please us know if you have any questions.

Shelly Young
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Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, MT
60136257
May 7, 2010

Work Plan for Additional Data Collection

BNSF Former Tie Treatment Plant
Somers, Montana

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May 7, 2010

Work Plan for Additional Data Collection

BNSF Former Tie Treatment Plant
Somers, Montana

Prepared By
Shelly Young, Project Manager

Ann M. Colpitts

Reviewed By
Ann Colpitts, Senior Program Manager

Contents

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1.0 Introduction

This work plan for additional data collection (2010 Work Plan) at the BNSF Former Tie Treatment Plant in Somers, Montana (Site) has been prepared by AECOM Environment on behalf of BNSF Railway Company (BNSF) at the direction of the Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (MDEQ), hereafter referred to as Agency or Agencies. A draft work plan was submitted in January 2010 for Agency review and reflected correspondence BNSF received from the Agencies in July and October 2009 as well as verbal comments made during a series of conference calls in occurring in late 2009 and early 2010 between BNSF, the Agencies, and AECOM covering the approach for additional data collection. This revised 2010 Work Plan incorporates Agency comments dated April 19, 2010 to the draft work plan. The objectives of the work discussed in this 2010 Work Plan are the following.

1. Evaluate extent of dissolved constituents of concern (COCs) in groundwater that may exceed cleanup levels set forth in the EPA Record of Decision (ROD) or subsequent Explanation of Significant Differences (ESDs) by installing additional wells and borings and collecting samples and by replacing existing well S-6 with a deeper well and collecting samples.
2. Determine if the current technical impracticability (TI) boundary proposed by the Agencies is sufficient.
3. Better assess the source of zinc in groundwater that exceeds the cleanup level in the ROD by replacing galvanized steel constructed wells S-85-5B, S-85-6B, and S-85-5A with poly vinyl chloride (PVC) constructed wells.
4. Replace monitoring wells S-3R and S-6 with deeper wells.

The objectives of the data collection activities are provided in this introduction section. The scope of work is presented in Section 2. Section 3 addresses sample handling and reporting. Health and safety requirements are discussed in Section 4.

2.0 Scope of Work

This chapter presents the scope of work to meet the objectives of additional data collection, including discussion of the borings that will be installed, types of data that will be collected, field methods for collection, laboratory analytical methods, and data collection locations. Data collection activities will be conducted in a manner consistent with the procedures set forth in the Project Operating Procedures (POPs) (**Appendix A**). Note that the text of this work plan supercedes any POP text if the work plan and POP differ. In addition, the field investigation activities will be conducted in a manner consistent with the procedures set forth in the *Health and Safety Plan* (HASP) (AECOM 2009). **Figure 1** presents the site layout, existing wells and borings discussed in this plan, and locations and proposed borings and wells.

2.1 Extent of Dissolved Plume and TI Boundary Location

Additional activities are proposed to confirm the extent of the dissolved plume downgradient of the source area originating from the former CERCLA lagoon toward monitoring well S-91-2. The data will also help determine if the current TI boundary proposed by the Agencies is sufficient in that direction (**Figure 1**).

2.1.1 Boring Locations

Soil borings will be installed between existing wells S-93-5S and S-88-2 within the source area and well S-91-2 downgradient from the source area and current TI boundary to meet the objectives. Borings will be located as follows.

- Soil boring IB-1 will be installed approximately midway between S-93-5S and S-91-2 and will be located near Somers Road.
- Soil boring IB-2 will be installed approximately midway between S-88-2 and S-91-2. The location for this boring was adjusted per Agency request.
- Soil boring IB-3 will be installed between the CERCLA lagoon borings CB-10 and CB-11 installed in 1991 as requested by the Agencies in their comments to the approach for the Somers field effort dated December 2, 2009.

Actual boring locations will be determined in the field and will take into account existing structures, utility locations, and access agreements. If the location varies more than 50 feet from the proposed location, placement will be determined in consultation with the Agencies. Soil borings IB-1 and IB-3 will be installed first as observations during the installation of these borings may bear on the placement of IB-2.

Monitoring wells S-10-1 and S-10-2 will be installed based on the groundwater results obtained from IB-1, IB-2, and IB-3. If results exceed the groundwater target cleanup goals for the COCs at the Site, the wells will be installed downgradient of the borings. If results do not exceed the groundwater target cleanup goals, the wells will be installed upgradient from the borings. Well placement will be determined through consultation with the Agencies based on the data collected from borings IB-1, IB-2, and IB-3.

2.1.2 Installation and Sampling Methods

Borings will be installed and sampled per the following protocol.

- Borings will be installed using Sonic or hollow stem auger (HSA) drilling to approximately 65 to 70 feet below ground surface (bgs) or until evidence of contamination is no longer observed, whichever is greater. (**POP 210** and **POP 310)**
  - Each HSA section or the continuous Sonic core will be logged by a field scientist/engineer.

  - Portions of the soil sample will be placed in plastic bags and the headspace will be screened using a photo ionization detector (PID) after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook.
  - A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized. Soil will be managed as indicated in Section 4.2.

- Soil samples will be collected if evidence of contamination (i.e. dark staining, hydrocarbon odors, or PID readings greater than 10 ppm) is encountered above the groundwater table. The interval from which samples are collected will be recorded in the field logbook, as well as photos of the soil boring as appropriate. (**POP 110** and **POP 210)**
  - Samples will be collected from the continuous Sonic core or from split spoons, depending on the drilling method used, where PID readings or staining indicates the greatest area of impact. Samples will be collected in accordance with POP 210.
  - Samples will be sent to Pace Analytical Services, Inc. (Pace) in Minneapolis, Minnesota and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020.
  - Split samples will be made available to the Agencies and the property owner upon request; however, there is a finite amount of soil available during boring installation and there may be an insufficient volume to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners.

- Discrete groundwater samples will be collected at 15-foot intervals from the start of the groundwater table to the end of the boring. (**POP 110, POP 210,** and **POP 230**)
  - Samples will be collected by either:
    1. pulling back the sonic casing and installing a packer assembly or power punch into the exposed borehole and collecting groundwater at the desired depth. Samples collected using a packer assembly would be collected from a stainless screen attached to a two inch diameter black pipe; the packer is inflated to isolate the desired depth interval and a bailer or peristaltic pump is used to collect the sample. Samples collected using a power punch would be collected by driving the sampler to the desired depth, pulling back on the sampler to expose the screen, and withdrawing the tool after a sufficient collection time has elapsed. – or –
    2. advancing a power punch sampling tool past the drilling auger at the desired depth and collecting groundwater from a three-quarter inch screen exposed at the desired depth by using a small diameter bailer or a peristaltic pump or by the method described above in sub bullet 1.
  - Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020.
  - A 24-hour turnaround will be requested on groundwater samples collected from IB-1, IB-2, and IB-3 as results collected from these borings will determine the location of additional borings or monitoring wells.
  - Groundwater sampling logs will be completed and/or notes will be added to the field logbook. If a sufficient volume of water can be collected, field reading of temperature, pH, and conductivity will be collected and recorded in the field logbook or on the groundwater sampling log.
  - Split samples will be made available to the Agencies and property owners upon request provided a sufficient volume of water can be collected from the boring.

- Borings will be abandoned following sample collection. Well abandonment activities will be conducted in accordance with Montana Administrative Code 36.21.670. The boring will be filled with sealing material (bentonite) to within three feet of the surface to prevent vertical movement of groundwater in the bore hole. Any remaining hole will be filled with naturally occurring soils.

As indicated in Section 3.1.1, additional borings or monitoring wells will be installed based on the results obtained from samples collected from borings IB-1, IB-2, and IB-3. Wells will be installed and sampled per the following protocol.

- Wells will be drilled using Sonic or hollow stem auger drilling to approximately 65 to 70 feet below ground surface (bgs) or until evidence of contamination is no longer observed, whichever is greater. (**POP 210** and **POP 310**)
  - Each HSA section or continuous Sonic core will be logged by a field scientist/engineer and PID readings will be collected as described in previous text regarding soil boring installation.
  - Portions of the soil sample will be placed in plastic bags and the headspace will be screened using a photo ionization detector (PID) after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook.
- Soil samples will be collected if evidence of contamination is encountered above the water table (i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm). Soil samples will be collected in accordance with POP 210. (**POP 110** and **POP 210)**
  - The interval from which samples are collected will be recorded in the field logbook, as well as photos of the soil boring as appropriate.
  - Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020.
  - Split samples will be made available to the Agencies and the property owner upon request; however, there is a finite amount of soil available during boring installation and there may be an insufficient volume to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners.
- As requested by the Agencies in the December 2, 2009 correspondence, a cross-section between existing wells and the new borings will be sketched. Geological, PID, and analytical data will be used to determine the appropriate groundwater sampling and screen placement intervals. The PID readings at the well locations and the information from the sketched cross sections will be used to select the most likely intervals where creosote impacts may be encountered. The sketched cross sections will be included with the descriptions of the work performed, as described in Section 3 of this document.
- The wells will be completed as follows: (**POP 006**)
  - Two inch diameter schedule 40 PVC casing and 0.010 inch slotted screen.
  - The wells will be screened over a 10 foot interval below the water table where evidence of creosote impacts is noted. If multiple zones of impacts are observed, screen placement will be determined through consultation with the Agencies. If no impacts are observed, the screen will be placed from 25 to 35 feet bgs (wells S-91-2 and S-88-2 are screened over a similar interval).
  - Surface completion will be done in consultation with the property owners. Completion may consist of a two to three foot stickup casing with a locking lid; bollards may placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well. However, if the well is located in or very near a roadway, the well may be completed as a flush-mount well.
- Groundwater samples will be collected from impacted intervals based on the cross-sections described above, field observations, and PID readings. If no impacts are observed, the well will be completed and groundwater samples will be collected from the screened interval following completion. Samples

will be collected following POP 230. The depth to water will be measured prior to sample collection. (**POP 110, POP 230,** and **POP 231**).

- Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020.
- A normal turnaround time will be requested.
- Split samples will be made available to the Agencies and/or property owners upon request provided a sufficient volume of water can be collected from the boring.

2.2 Galvanized Steel Constructed Well Replacement

Wells S-85-5B, S-85-6B, and S-85-8A will be replaced with wells constructed with PVC casing and screen material. The replacement wells will be installed approximately 25 feet upgradient from the existing wells. The distance is to ensure they are installed outside of the influence of zinc suspected to originate from the galvanized steel casing used to construct the original wells. The replacement wells will be installed at a similar depth as the original wells using two-inch schedule 40 PVC. A 0.010 or 0.020 inch slotted screen will be used depending on the screen in the existing well that is being replaced. The well completion logs from S-85-5B, S-85-6B, and S-85-8A are included in **Appendix B**. New well completion logs will be created for S-85-5B, S-85-6B, and S-85-8A.

The replacement wells will be sampled during the regularly scheduled sampling event following installation, which will likely be in September 2010. Sample results collected during four consecutive events will be evaluated to determine compliance with the target cleanup goals. If the replacement wells are determined to be in compliance after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011). If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, a monitoring plan will be developed in coordination with the Agencies.

Wells S-85-5B, S-85-6B, and S-85-8A will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2. Where possible, the casing will be removed from the ground. In the event that the casing cannot be removed, it will be cut off or driven downward so that the top of the casing is at least three feet below the ground surface. The well will then be filled with sealing material (bentonite) to within three feet of the surface. Any remaining hole will be filled with naturally occurring soils.

2.3 Background Well Replacement

Monitoring wells S-3R and S-4 were initially selected as the background wells for the Site in the FINAL Groundwater Treatment System Interim Monitoring Plan (Plan) submitted February 2008 (modified May 2008). Well S-3R is also designated as the background well for the LTU network. Because wells S-3R and S-4 have contained an insufficient volume of water to allow reliable sample collection, the revised Plan submitted in October 2009 designated well S-86-1 as the background well.

Well S-86-1 was sampled in December 2009 following extensive well development. Analysis of samples collected from the well during the December 2009 event detected the presence of TPAHs and reported CPAH compounds above the ROD based cleanup levels. In addition, well S-86-1 contained zinc concentrations of 20.5 mg/L during the March 2010 groundwater sampling event. As a result, the Agency deemed S-86-1 not acceptable as a background monitoring well and a replacement well for S-3R will be installed similar to, but will be screened deeper than, S-3R (see **Appendix B** for the well completion log from S-3R) if bedrock is not encountered first and will be constructed with two-inch schedule 40 PVC casing and 0.010 slotted screen. A new well completion log will be created for S-10-3R. As the newly installed well is a background well and is being installed upgradient of the source area, impacted intervals are not expected to be encountered. Well S-3R and S-4 will be abandoned as described in Section 2.1.2.

The replacement well will be sampled during the regularly scheduled sampling events following installation. Groundwater sample results will continue to be collected quarterly during the remainder of the interim monitoring period. The newly installed well S-10-3R will also be used as the LTU network background well for the remainder of the post-closure monitoring period.

2.4 Well S-6 Replacement

Monitoring well S-6 is included in the interim monitoring period plume stability network and also sampled as part of the land treatment unit post-closure monitoring program. This well regularly has an insufficient volume of water in the well to collect samples; therefore, a deeper well will be installed to replace S-6. Well S-6R will be installed similar to but will be screened slightly deeper than S-6 (see **Appendix B** for the well completion log from S-6) and will be constructed with two-inch schedule 40 PVC casing and 0.010 slotted screen. A new well completion log will be created for S-6R. If impacted intervals are encountered, the screen may be placed at the impacted interval. Well S-6 will be abandoned as described in Section 2.2 above.

Samples will be collected from the replacement well if impacts are observed in the boring (i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm). A soil sample will be collected and analyzed as described in Section 2.1.2 if impacted soil is observed above the groundwater table. Groundwater samples will be collected as described in Section 2.1.2 if impacted intervals are observed below the water table. A normal turnaround time will be requested on all samples as no additional boring locations will be dependent on results obtained from boring S-6R.

The replacement well will be sampled during the regularly scheduled sampling events following installation. Groundwater sample results collected during four consecutive quarters will be evaluated to determine compliance with the target cleanup goals.

2.5 Well Development

Newly installed monitoring wells installed in conjunction with this 2010 Work Plan will be developed following installation to remove silt and other fine-grained sediments that may accumulate within the monitoring well during installation. Development will be done by the drilling company through one or a combination of techniques including surging and pumping. (**SOP 221**)

- Pumping involves using a pump to evacuate water and silt from the well.
- With surging, a tool is used to scour the screened interval in an up and down repetitive motion, causing the groundwater to surge in and out through the screen and forcing fines out of the formation.

The monitoring wells will be developed until water is relatively free of sediment or until all of the groundwater had been removed. The final completion report will indicate the development methods used. Water generated during well development activities will be collected, drummed, and analyzed as indicated in Section 4.2 to determine the appropriate disposal method.

2.6 Well Survey

All wells and boring locations will be surveyed by a licensed surveyor as part of the upcoming Agency Five-Year Review which is scheduled to be completed by September 2011. Surveying will be provided by Montana licensed professional land surveyor. Surveying will be based on the horizontal datum of NAD 83 Montana State Plane Feet and the vertical datum of NAVD 88. Positional accuracy of the survey will meet the Accuracy Standards for ALTA/ACSM Land Title Surveys, as adopted by the American Land Title Association and the National Society of Professional Surveyors. The well elevations obtained will be incorporated in all future routine sampling and well gauging events.

3.0 Sample Handling and Reporting

All samples will be shipped overnight to the project laboratory. Sample collection, storage, and shipment will follow chain of custody protocol. All sampling equipment will be subject to appropriate decontamination protocol. (**SOP 110, SOP 120**)

To assess the adequacy of decontamination procedures, rinsate blanks should be collected and analyzed for the same parameters as the field samples. In general, one rinsate blank will be collected per 20 samples.

A summary data table and copies of laboratory reports will be included in a summary report following completion of the work, receipt of analytical samples, and data validation. Groundwater summary tables will include a comparison to the cleanup levels in the ROD and will indicate which results, if any, exceeded the levels. The report will include a description of all activities conducted under this 2010 Work Plan, deviations to the planned work, an evaluation of data quality, and copies of all field log books and field forms.

4.0 Health and Safety

A site-specific health and safety plan (HASP) has been developed for the Somers site and is reviewed and updated annually. The HASP contains emergency contact information and directions to the hospital, as well as information on hazards generally present on AECOM field sites. A copy of the HASP will remain on-site in the treatment building office throughout the data collection activities; all personnel working on site must read and sign the HASP. Task Hazard Analyses (THAs) have been prepared for tasks expected during the additional activities and are included in the HASP.

Safety equipment is available on site and personnel involved in the work activities need to be familiar with its proper use and location. Equipment includes the safety shower eyewash station and fire extinguishers. Minimum personal protective equipment (PPE) requirements include safety glasses with side shields, hard hats, and steel-toed boots. Gloves shall be worn when handling equipment and materials. Nitrile or other chemically impervious gloves shall be worn when working with contaminated liquids or sludges. Orange vests will also be worn when working around moving vehicles or near public roads.

Below is a list of general safety guidelines which will be followed during the additional data collection activities.

- All contractors will have completed the BNSF Contractor Orientation Training prior to conducting work on site. Annual certification is required.
- All manufacturers' recommended safety precautions for all chemicals will be followed. Refer to the Material Safety Data Sheets (MSDS) located in the HASP.
- A task or job hazard analysis will be conducted prior to performing interim monitoring tasks. If a THA already exists for the activity, it will be reviewed by all personnel involved in the task. New THAs will be filed in the HASP.
- All required PPE shall be worn while conducting work on site.
- Special precautions will be taken with moving liquids. This requires the use of protective clothing and maintaining a safe distance.
- When installing wells outside of the fenced Site, exclusion zones will be established around working areas to protect untrained and unqualified individuals.
- Utility locates will be conducted prior to installing borings and wells.

All personnel are empowered to stop work activities if a deviation from planned activities occurs or if an unsafe condition is present.

4.1 Access Agreements

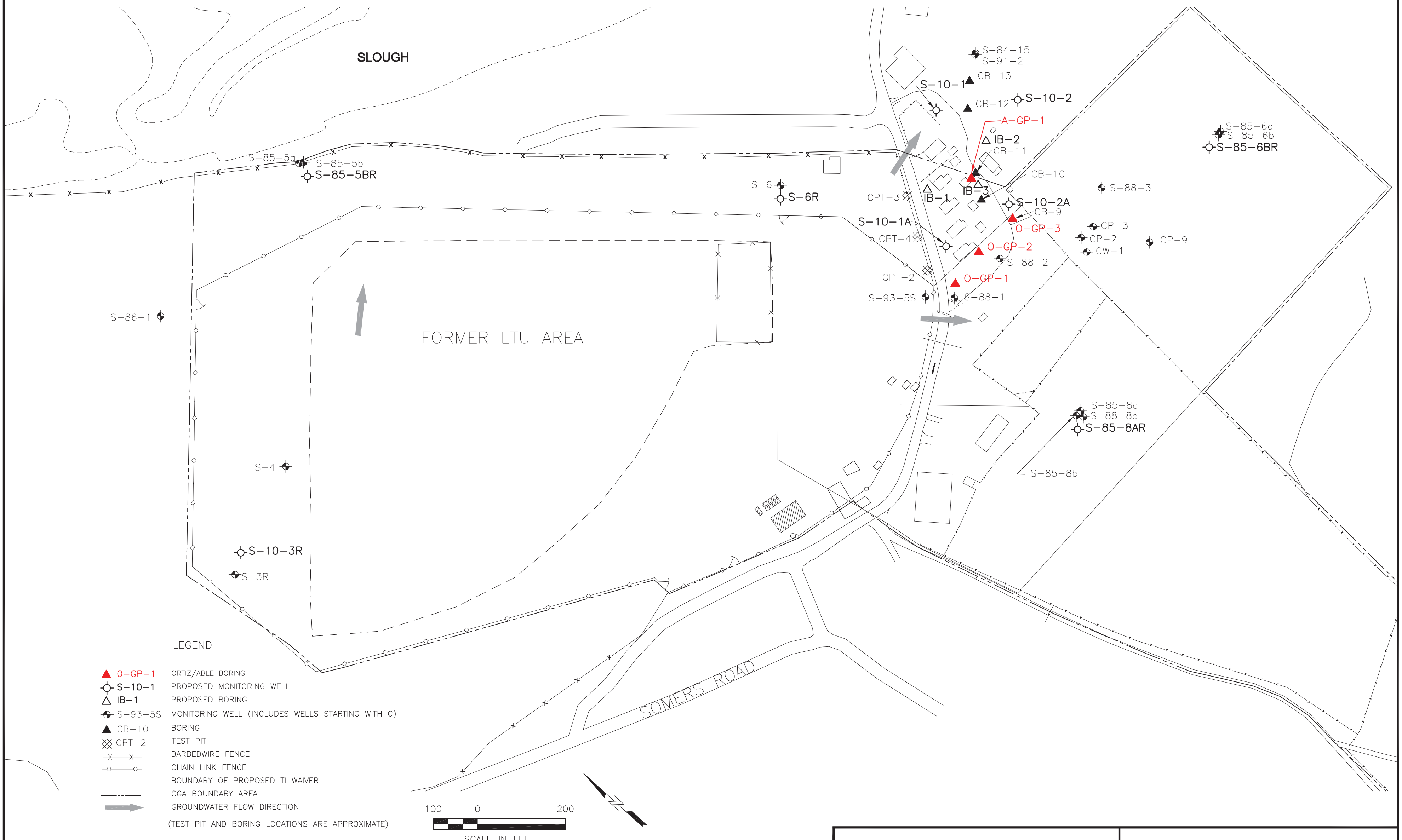
The borings and monitoring wells proposed to determine the extent of the dissolved plume are located off of BNSF owned property. Owners of the property where borings and wells may be located will be contacted prior to commencing work to gain access to their property. An effort will be made to locate borings and wells away from structures and utilities. If a property owner will not grant access, county authorities will be contacted for permission to install borings within the county right-of-way. If a monitoring well is installed an access agreement will be drafted with which the property owner will grant BNSF access to the well for future monitoring purposes.

No personnel or individuals shall be allowed within the work area without prior approval. Property owners will be notified of the work activities and health and safety concerns. Access to the work area will be controlled with barricades, temporary fencing, or other means to limit entry. The AECOM field manager will be responsible for ensuring unauthorized access to the work area is prevented.

4.2 Data Collection-Derived Waste Management

Soil generated during the field work will be containerized and stored within the fenced area of the Somers Site until appropriate disposal can be arranged. A sample will be collected from the containerized soil and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020. Soil cuttings that are non-hazardous will be spread on the ground surface within the fenced area of the Site. If soil cuttings are determined to be hazardous waste (F034), they will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

Water produced during sampling and decontamination activities will be collected, drummed, and analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020. Water that does not exceed the ROD target cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc) will be poured onto the ground surface within the fenced area of the Site. If collected water exceeds the ROD target cleanup level, the drums will be sent off-site for disposal at an appropriate hazardous waste disposal facility.



AECOM

BNSF RAILWAY COMPANY
SOMERS, MONTANA (60147072-510)

DATE: 5/3/10 DRWN: LP/FTC

ADDITIONAL SITE INVESTIGATION SITE MAP

FIGURE 1

File: S:\CADD\CADD FORT COLLINS\BNSF Somers\60136257\Additional Site Investigation Map.dwg Layout: Layout1 User: paull Plotted: May 03, 2010 - 1:18pm Xref's:

Appendix A

Project Operating Procedures (POPs)

Appendix B

Boring and Well Logs

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Friday, May 21, 2010 2:23 PM
To: Young, Shelly
Cc: Schmidt.Andrew@epamail.epa.gov; lidewitt@mt.gov
Subject: Workplan

A 2009 AECOM HASP is referenced in the report. It is not necessary for the Agencies to review the HASP for this work plan but we would like to have it included as an appendix if possible.

We will also need a QAPP/FSP (SAP) to accompany this work plan. The work plan as written kind of serves the purpose of the FSP although the format would need to be modified a bit but we would need a QAPP that includes DQOs and such.

I would appreciate it if you could discuss the need to have a SAP included for this work plan with Ann and Dave about whether we need to discuss as a group and/or provide a deliverable date for when a draft could be provided to review.

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Monday, June 07, 2010 3:34 PM
To: Young, Shelly
Cc: Smith, David M; Schmidt.Andrew@epamail.epa.gov; lidewitt@mt.gov
Subject: Request

Shelly,

Can I get an electronic copy of the work plan in word so that I can cut and paste the DQOs directly into the document and make modifications to the workplan to reflect the DQO process? It will make it so much more simpler for everyone than to prepare formal comments that AECOM incorporates. I haven't looked at the disks you gave me to see if one is attached. If it is, I apologize and will look at it tomorrow. Just let me know.

Young, Shelly

From: Young, Shelly
Sent: Tuesday, June 08, 2010 3:33 PM
To: 'Hoogerheide.Roger@epamail.epa.gov'
Cc: Smith, David M; Schmidt.Andrew@epamail.epa.gov; lidewitt@mt.gov
Subject: RE: Request
Attachments: 2010 Work Plan_Revised Final.docx

Hi Roger,

Sorry we keep missing each other on the phone calls. I have attached the Word version of the 2010 Work Plan for Somers. Please let me know if you need any of the figures or attachments sent as well.

Shelly Young
Project Manager/Environmental Engineer
AECOM Environment
Office 406.652.7481
Direct 406.896.4582
shelly.young@aecom.com

-----Original Message-----
From: Hoogerheide.Roger@epamail.epa.gov [mailto:Hoogerheide.Roger@epamail.epa.gov]
Sent: Monday, June 07, 2010 3:34 PM
To: Young, Shelly
Cc: Smith, David M; Schmidt.Andrew@epamail.epa.gov; lidewitt@mt.gov
Subject: Request

Shelly,

Can I get an electronic copy of the work plan in word so that I can cut and paste the DQOs directly into the document and make modifications to the workplan to reflect the DQO process? It will make it so much more simpler for everyone than to prepare formal comments that AECOM incorporates. I haven't looked at the disks you gave me to see if one is attached. If it is, I apologize and will look at it tomorrow. Just let me know.

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Wednesday, June 09, 2010 11:52 AM
To: Young, Shelly
Cc: Colpitts, Ann; Smith, David M; lidewitt@mt.gov
Subject: Re: BNSF Somers - summary of conversation

You have summarized our conversation appropriately with the caveat that these were my initial thoughts that should be considered fluid and subject to change as we proceed forward and get input from MDEQ and our Denver office.

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| From: |
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  |"Young, Shelly" <Shelly.Young@aecom.com>
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| To: |
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  >--|
  |Roger Hoogerheide/MO/R8/USEPA/US@EPA
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  >--|
|------------>
| Cc: |
|------------>
  >--|
  |<lidewitt@mt.gov>, "Smith, David M" <David.Smith4@bnsf.com>, "Colpitts, Ann" <Ann.Colpitts@aecom.com> |
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| Date: |
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  |06/09/2010 09:47 AM
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| Subject: |
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|BNSF Somers - summary of conversation |
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Hi Roger,

I'm glad we were able to touch base today on the various reports for Somers. I'm sending this e-mail to 1) summarize our discussion for the rest of the team and 2) to confirm I understood everything accurately. We discussed the following items:

· EPA has reviewed the Revised Annual and the 1st Quarter 2010 reports; MDEQ is currently reviewing the approval/response letter and BNSF should receive the letter soon. The next quarterly report is due July 10th.
· The 2010 Work Plan is being revised by EPA to add DQOs and applicable text modifications (vs. the Agency sending a comment letter to BNSF, BNSF revising the Work Plan per comments, and the Agency reviewing the revision to determine if the DQOs were incorporated as they intended them to be). The modifications have been minor and BNSF should expect a modified Work Plan by June 30th.
· Modifications to the Work Plan include a proposed schedule of the following:
    - June 30th, Agency submits modified work plan to BNSF
    - July 16th, BNSF submits Draft Final work plan to Agency
    - July 31st, work plan finalized
    - Efforts to obtain access agreements from property owners commence following approval of final work plan
    - Field investigations completed by October 31st
    - Initial report completed in December
· The Agency will likely provide oversight during the additional activities. The site inspection and community interviews for the upcoming 5-year review will be conducted in conjunction with the oversight.
· The next public meeting will likely be held in the spring of 2011 to allow for collection and evaluation of two sampling rounds from the new wells; however, the Agency will gauge community interest during the interviews conducted in conjunction with the additional work activities.

Please add to or correct this list if I missed/misunderstood anything.

Thanks!

Shelly Young
Project Manager/Environmental Engineer
AECOM Environment
Office 406.652.7481
Direct 406.896.4582

shelly.young@aecom.com

AECOM
207 North Broadway, Suite 315
Billings, Montana 59101

www.aecom.com

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Friday, July 02, 2010 1:40 PM
To: Smith, David M
Cc: Young, Shelly; Colpitts, Ann; lidewitt@mt.gov; Schmidt.Andrew@epamail.epa.gov; Stearns.James@epamail.epa.gov; Vranka.Joe@epamail.epa.gov; lscusa@mt.gov
Subject: Work Plan Revisions BNSF Somers
Attachments: Work Plan for Additional Data Collection7_2.doc; img-702141603-0001.pdf

(See attached file: Work Plan for Additional Data Collection7_2.doc)
-

(See attached file: img-702141603-0001.pdf)

Attached, please find a revised Work Plan for additional data collection at the BNSF Former Tie Treatment Plant. The word document contains a clean markup of Agency changes while the PDF file shows the changes with track changes turned on. A schedule of deliverables has been included as Section 5.0 requiring a revised Final Draft Work Plan by July 16.

Upon your review of this revision, we are amenable to a short conference call to discuss the contents and the deliverable date.

Have a great holiday weekend.

AECOM Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, MT
60136257
May 7, 2010

~~Work Plan~~Work Plan for Additional Data Collection

BNSF Former Tie Treatment Plant Somers, Montana

AECOM Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, MT
60136257
May 7, 2010

~~Work Plan~~Work Plan for Additional Data Collection

BNSF Former Tie Treatment Plant Somers, Montana

Prepared By
Shelly Young, Project Manager

Ann M. Colpitts
Reviewed By
Ann Colpitts, Senior Program Manager

Contents

List of Appendices

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List of Figures

Comment [rch1]: A page containing all acronyms should be included in the Table of Contents

1.0 Introduction

This ~~work plan~~Work Plan for additional data collection ~~(2010 Work Plan) ~~at the BNSF Former Tie Treatment Plant in Somers, Montana (Site) has been prepared by AECOM Environment on behalf of BNSF Railway Company (BNSF). A Work Plan for additional investigation was requested by the Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (MDEQ), hereafter referred to as Agency or Agencies in a July 15, 2009 letter to BNSF. A draft work plan was submitted in January 2010 for Agency review and reflected correspondence BNSF received from the Agencies in July and October 2009 as well as verbal comments made during a series of conference calls in occurring in late 2009 and early 2010 between BNSF, the Agencies, and AECOM covering the approach for additional data collection. This revised 2010 Work Plan incorporates Agency comments dated April 19, 2010 to the draft work plan and also includes the revised draft prepared by the Agencies and submitted to BNSF on June 30, 2010. All correspondence between the Agencies and BNSF pertaining to this Work Plan and the June 2010 draft version of the Work Plan with Agency comments are included in **Appendix D** of this Work Plan.

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EPA is the lead agency for implementation of work under this Work Plan pursuant to the 1991 Consent Decree (CV91-32-M-CCL). The EPA Project Coordinator, in consultation with the MDEQ Project Officer, has the authority to halt, conduct or direct work approved in this Work Plan pursuant to the Consent Decree that is in the judgment of the EPA Project Coordinator to be inconsistent with the NCP, the ROD, the Consent Decree or this Work Plan.

At the BNSF Former Tie Treating Plant in Somers, Montana, the dissolved creosote constituent groundwater plume was treated using a groundwater recovery system (GWTS) located in the former CERCLA lagoon and treated at an onsite groundwater treatment system (**GWTS – Figure 1**). However, BNSF requested termination of the GWTS in 2007 based on modeling results that indicated the GWTS provided only minimal contaminant removal and the groundwater contamination was not likely to migrate, whether or not the GWTS was operating, due to geologic conditions that limit the movement of groundwater and creosote onsite. Approval to shutdown GWTS operations for an interim period was granted in October 2007 (**Appendix D**). Since that time, BNSF has collected quarterly monitoring data in accordance with the Groundwater Treatment System Interim Monitoring Plan (AECOM, 2008) to evaluate the stability of the dissolved phase plume of constituents of concern (COCs) and to verify that the plume is naturally attenuating.

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Comment [rch2]: Please provide the approval letter in the same appendix cited in previous paragraph and reference the appendix here.

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Review of groundwater data collected during the interim monitoring period indicates a possible increasing trend in phenol concentrations downgradient of the proposed technical impracticability (TI) and controlled groundwater area (CGA) boundaries, suggesting that the dissolved phase plume may be migrating laterally and vertically. The additional monitoring requirements outlined in Section 5.0 of the Groundwater Treatment System Interim Monitoring Plan (IMP) were invoked because phenol concentrations in well S-91-2 was greater than 50% of the cleanup level during the June 2009 and September 2009 quarterly sampling events. Well S-91-2 was resampled in July 2009 and October 2009 upon EPA notification in compliance with contingency plan outlined in the IMP. Recent investigations on the neighboring properties adjacent to the BNSF Somers Site (Applied Water Consulting, 2010) also indicate that creosote and/or dissolved phase constituents above the cleanup levels established in the Record of Decision may have migrated in the subsurface beyond the proposed TI boundary.

In addition to the discovery of elevated phenols and other creosote related impacts off-Site, two issues related to the construction of plume stability monitoring wells have come to light; (1) monitoring wells S-85-5B, S-85-6B, and S-85-8A exceed zinc cleanup levels but are constructed with galvanized steel casing, which may be causing the exceedances through dissolution or loss of the zinc coating used for galvanization; and (2) upgradient and background well S-3R and downgradient well S-6 have been dry during the interim monitoring period, preventing adequate collection of groundwater monitoring data. As a

Formatted: Line spacing: Exactly 12 pt, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers result of the aforementioned discoveries and issues, EPA has determined that additional work, as defined in Section III of the Consent Decree is necessary and provided written notification of such additional work to BNSF's Project Coordinator on July 15, 2009. This Work Plan details the investigation agreed upon by the Agencies and BNSF Railway.

~~at the direction of the Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (MDEQ), hereafter referred to as Agency or Agencies. A draft work plan was submitted in January 2010 for Agency review and reflected correspondence BNSF received from the Agencies in July and October 2009 as well as verbal comments made during a series of conference calls in occurring in late 2009 and early 2010 between BNSF, the Agencies, and AECOM covering the approach for additional data collection. This revised 2010 Work Plan incorporates Agency comments dated April 19, 2010 to the draft Work Plan.~~ The objectives of the work discussed in this ~~2010 Work Plan~~Work Plan are the following.

1. Evaluate the extent of creosote and/or dissolved phase constituents ~~dissolved creosote constituents~~ in groundwater that may exceed cleanup levels set forth in the EPA Record of Decision (ROD) as amended through subsequent Explanation of Significant Differences (ESDs), hereafter referred to as the ROD. This will be achieved through the installation of additional borings and wells, and collection of~~ed~~ samples between the former CERCLA lagoon and wells S-84-15 and S-91-2.

2. Better assess the source of zinc in groundwater that exc~~c~~eeds the cleanup level in the ROD by replacing galvanized steel constructed wells S-85-5B, S-85-6B, and S-85-8A with wells constructed of poly vinyl chloride (PVC) ~~contructed wells~~.

3. Replace monitoring wells S-3R~~, S-4,~~ and S-6, which have been dry during recent years, with deeper screen interval wells.

Data obtained from this investigation will be used in accordance with the provisions outlined in the 1991 Consent Decree, the Data Quality Objectives (DQOs) outlined in **Appendix C** of this Work Plan and the Quality Assurance Project Plan included as **Appendix E** of this Work Plan~~discussed in Section 2.0~~. In the event of conflict between this Work Plan and Consent Decree, the Consent Decree shall control

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~~.~~ The scope of work is presented in Section 2~~3~~.0. Section 3~~4~~.0 briefly discusses major ~~addresses sample handling and~~components of the Quality Assurance Project Plan. A Health and Safety Plan that specifies employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 29 CFR 1910.120(l)(1) and (l)(2) is included as **Appendix F** to this Work Plan and is briefly discussed in Section 4.0. ~~reporting while Health and safety requirements are discussed in Section 5.0.~~ Section 6~~5~~.0 includes the schedule for completing all activities associated with this ~~workplan~~Work Plan while Section 6.0 describes the reporting requirements for these activities.

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~~2.0~~ 2.0 Scope of Work

This chapter presents the scope of work to meet the objectives of additional data collection specified in Section 1.0, including data collection locations, discussion of the borings and monitoring wells that will be installed, types of data that will be collected, field methods for collection, laboratory analytical methods, and data collection locations[2]. Data collection activities will be conducted in a manner consistent with the procedures set forth in the Project Operating Procedures (POPs) ~~(~~and included in **Appendix A** of this Work Plan~~)~~. T~~Note that t~~he text procedures described in ~~of~~ this W~~w~~ork P~~p~~lan supercedes any POP text if the ~~work plan~~Work Plan and POP differ but are not intended to modify the Consent Decree. F~~In addition, the f~~ield investigation activities will be conducted in a manner consistent with the procedures set forth in Consent Decree, this Work Plan as well as the *Health and Safety Plan* (HASP) (AECOM 2009) as amended for the additional work outlined in this Work Plan. **Figure 1** presents the site layout~~, existing wells and borings discussed in this plan,~~ and the locations and proposed borings and monitoring wells.

2.1 E

~~2.1~~ Extent of Creosote and/or Dissolved Phase Constituents ~~Dissolved Plume~~ and Proposed TI Boundary Location

Additional activities are proposed to determine~~confirm~~ the extent of the ~~d~~creosote and/or dissolved phase constituents ~~esolved plume d~~downgradient of the source area originating from the former CERCLA lagoon toward monitoring well S-91-2 to fulfill the primary objective of this ~~work plan~~Work Plan. The data collected during this investigation and in future quarterly monitoring events will also help evaluate the stability of the ~~dissolved creosote constituent~~ plume and to verify that natural processes are present to aid in breaking down these ~~creosote~~ constituents. The data will also help ~~and~~ determine if the proposed TI ~~boundary~~ and the existing CGA boundaries should be revised to remain protective of human health and the environment (**Figure 1**).

~~2.1.1~~ 2.1.1 Boring Locations

Soil borings will be installed~~developed~~ between existing wells S-93-5S and S-88-2 within the source area and well S-91-2 downgradient from the source area and ~~current~~ proposed TI boundary to initiate field investigations that fulfill the primary objective and principal study question discussed in ~~previous Sections~~**Appendix C** of this ~~workplan~~Work Plan. Borings will be located as follows (**Figure 1**).

- Soil boring IB-1 is proposed to be installed approximately midway between S-93-5S and S-91-2 and will be located near Somers Road.
- Soil boring IB-2 is proposed to be installed approximately midway between S-88-2 and S-91-2. The location for this boring has been adjusted per Agency request and is outside the existing controlled groundwater area.
- Soil boring IB-3 is proposed to be installed between the CERCLA lagoon borings CB-10 and CB-11 installed in 1991 as requested by the Agencies in their comments to the approach for the Somers field effort dated December 2, 2009 **(Appendix D)**.

[2] BNSF shall promptly provide any data resulting from the field investigation, validated or unvalidated, to EPA upon request not withstanding the schedule as specified in Section 5.0 of this Work Plan

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Comment [rch3]: Well S-10-1 and S-10-2 locations will need to be revised on this Figure based on language in 3rd paragraph of Section 2.1.1 below.

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Actual boring locations ~~will be determined in the field and will take into account~~may vary due to existing structures, utility locations, and/or conditions set forth in access agreements discussed in Section 4.1. If the location varies more than 50 feet from the ~~proposed~~ location proposed in this Work Plan, placement will be determined in consultation with the Agencies and will be documented in the ~~field notes and discussed in the sampling activities~~Investigative Results ~~r~~Report. Soil borings IB-1 and IB-3 will be installed first as observations during the installation of these borings may ~~bear on~~affect the placement of IB-2.

Proposed ~~M~~monitoring wells S-10-1, ~~and S~~-10-2 and S-10-3 will be installed based on the groundwater results obtained from IB-1, IB-2, and IB-3 (Figure 1). If groundwater analytical results from ~~from the~~ boring IB-1, IB-2, and IB-3 ~~investigation~~ exceed the groundwater target cleanup goals for the COCs at the Site, two~~he~~ wells (S-10-1 and S-10-2) will be installed downgradient of all the borings, ~~and o~~outside the existing controlled groundwater area, and upgradient of monitoring wells S-84-15 and S-91-2 while the third ~~-~~ well (S-10-3) will be installed at the closest proximity to the existing controlled groundwater area. If results do not exceed the groundwater target cleanup goals, ~~the wells~~ S-10-1 and S-10-2 will be installed between borings IB-1/IB-3 within the controlled groundwater area and IB-2 at the closest proximity to the existing controlled groundwater area boundary~~, and may be considered compliance wells for long-term monitoring~~. Precise ~~w~~Well locations~~placement~~ will be determined through consultation with the Agencies ~~based on the data collected from borings IB-1, IB-2, and IB-3. If the location varies more than 50 feet from the proposed location, placement will be determined in consultation with the Agencies~~ and will be documented in the Investigative Results Report~~and documented in the field notes and discussed in the sampling activities report~~.

2.1.2 Installation and Sampling Methods

Borings will be install~~developeped~~ and sampled per the following protocol.

- Borings will be developed using Sonic or hollow stem auger (HSA) drilling to approximately 65 to 70 feet below ground surface (bgs) or until evidence of contamination is no longer observed, whichever is greater (**POP210**).
  - Each HSA section or the continuous Sonic core will be logged by a field scientist/engineer and recorded in the field logbook **(POP210)**.
  - Portions of the soil sample will be placed in plastic bags and the headspace will be screened using a photo ionization detector (PID) after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook **(POP 310)**. ~~Soil will be managed as indicated in Section 4.2.~~
  - A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized **(POP006)**. Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of **(POP006)**. Soils and liquid will be managed as indicated in Section 4.2.
  - ~~A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized **(POP006)**.~~
  - ~~Regardless of the method employed, any drilling mud or well development/purge liquid collected must be properly contained and disposed of **(POP006)**. Liquids will be managed as indicated in Section 4.2.~~
- A grab sample of soil will be collected if evidence of contamination (i.e. dark staining, hydrocarbon odors, or PID readings greater than 10 ppm) is encountered above the groundwater table. The interval from which samples are collected will be recorded in the field logbook, as well as photos of the soil boring as appropriate (**POP 210**). Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110**.

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- Samples will be collected from the continuous Sonic core or from split spoons, depending on the drilling method used, where PID readings or staining indicates the greatest area of impact. Samples will be collected in accordance with **POP 210**.
- Samples will be sent to Pace Analytical Services, Inc. (Pace) in Minneapolis, Minnesota and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020.
- Split samples will be made available to the Agencies and the property owner upon request; however, there is a finite amount of soil available during boring installation and there may be an insufficient volume to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners. The Agencies will follow proper methods established in **POP110** and **POP210** if split samples are taken.

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- Discrete groundwater samples will be collected at 15-foot intervals from the start of the groundwater table to the end of the boring. (**POP 210,** and **POP 230**). Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110.**

Comment [rch4]: We need to consider the possibly that a sample may not be collected and present appropriate protocol for what to do.

Comment [rch5]: Is this POP written to cover sampling of a boring or for a an established monitoring well?

  - Samples will be collected by either:
    1. pulling back the sonic casing and installing a packer assembly or power punch into the exposed borehole and collecting groundwater at the desired depth. Samples collected using a packer assembly would be collected from a stainless screen attached to a two inch diameter black pipe; the packer is inflated to isolate the desired depth interval and a bailer or peristaltic pump is used to collect the sample. Samples collected using a power punch would be collected by driving the sampler to the desired depth, pulling back on the sampler to expose the screen, and withdrawing the tool after a sufficient collection time has elapsed. – or –
    2. advancing a power punch sampling tool past the drilling auger at the desired depth and collecting groundwater from a three-quarter inch screen exposed at the desired depth by using a small diameter bailer or a peristaltic pump or by the method described above in sub bullet 1.

Comment [rch6]: 1.If AECOM doesn't think packers are needed, and thinks not using packers will increase the efficiency of the investigation, the Agencies are comfortable with collecting samples from the open bottom of the casing.

  - Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020 to see if they are below ROD cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc).
  - A 24-hour turnaround will be requested on groundwater samples collected from IB-1, IB-2, and IB-3 as results collected from these borings will determine the location of additional borings or monitoring wells.
  - Groundwater sampling logs will be completed and/or notes will be added to the field logbook and presented in the Investigative Results Report~~sampling activities report~~ (**POP230**). If a sufficient volume of water can be collected, field reading of temperature, pH, and conductivity will be collected and recorded in the field logbook or on the groundwater sampling log.
  - Split samples will be made available to the Agencies and property owners upon request provided a sufficient volume of water can be collected from the boring.

Comment [rch7]: Is this the same form presented on final page of POP230?

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Comment [rch8]: 2.The way the section is phrased, it sounds like field parameters will be collected after the samples for laboratory analysis. Is this correct? This should only be done if there is an extremely low volume of water and there is some question as to whether all the sample containers can be filled.

- Borings will be abandoned following sample collection. ~~Well~~ Boring abandonment activities will be conducted in accordance with Montana Administrative Code 36.21.670. The boring will be filled with sealing material (bentonite) to within three feet of the surface to prevent vertical movement of groundwater in the bore hole. Any remaining hole will be filled with unimpacted or clean naturally occurring soils.

As indicated in Section 2~~3~~.1.1, additional borings or monitoring wells will be installed based on the results obtained from samples collected from borings IB-1, IB-2, and IB-3. Wells will be installed and sampled per the following protocol.

- Wells will be drilled using Sonic or hollow stem auger drilling to approximately 65 to 70 feet below ground surface (bgs) or until evidence of contamination is no longer observed, whichever is greater.

Comment [rch9]: Did we discuss taking samples every 15 feet for the monitoring wells or not?

- Each HSA section or the continuous Sonic core will be logged by a field scientist/engineer and recorded in the field logbook **(POP210)**.
- A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized **(POP006)**. Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of (POP006). Soils and liquids will be managed as indicated in Section 4.2.

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- Portions of the soil sample will be placed in plastic bags and the headspace will be screened using a photo ionization detector (PID) after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook **(POP 310)**.
- Grab samples of soil will be collected if evidence of contamination is encountered above the water table (i.e., dark staining, hydrocarbon odors). Soil samples will be collected in accordance with **POP 210**.
- ~~A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized **(POP006)**. . Soil will be managed as indicated in Section 4.2.~~
- ~~Regardless of the method employed, any drilling mud or well development/purge liquid collected must be properly contained and disposed of **(POP006)**. Liquids will be managed as indicated in Section 4.2.~~
- The interval from which samples are collected will be recorded in the field logbook, as well as photos of the soil borings as appropriate.
  - Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020.
  - Split samples will be made available to the Agencies and the property owner upon request if ~~; however, there is a finite amount of soil available during boring installation and there may be an in~~sufficient volume is available to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners.
- As requested by the Agencies in the December 2, 2009 correspondence **(Appendix D)**, a cross-section between existing wells and the new borings will be sketched. Geological, PID, and analytical data will be used to determine the appropriate groundwater sampling and screen placement intervals. The PID readings at the well locations and the information from the sketched cross sections will be used to select the most likely intervals where creosote impacts may be encountered. The sketched cross sections will be included with the descriptions of the work performed in the Investigative Results Report.

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- ~~, as described in Section 4 of this work plan.~~
- The wells will be completed as follows~~:~~ **(POP 006)**:
  - Two inch diameter schedule 40 PVC casing and 0.010 inch slotted screen.
  - The wells will be screened over a 10 foot interval across~~below~~ the water table where evidence of creosote impacts is noted. If multiple zones of impacts are observed, screen placement will be determined through consultation with the Agencies. If no impacts are observed, the screen will be placed from 25 to 35 feet bgs since ~~(~~wells S-91-2 and S-88-2 are screened over a similar interval~~)~~.
  - Surface completion will be done in consultation with the property owners. Completion may consist of a two to three foot stickup casing with a locking lid; bollards may be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well or ~~.~~

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~~However, if the well is located in or very near a readway,~~ the well may be completed as a flush-mount well.

- Groundwater samples will be collected from impacted intervals based on the cross-sections described above, field observations, and PID readings. If no impacts are observed, the well will be completed and developed and groundwater samples will be collected from the screened interval following well development. The depth to water will be measured and recorded prior to sample collection. (**POP 110, POP221, POP 230,** and **POP 231**).
  - Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020 to see if they are below ROD cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc).
  - A normal turnaround time will be requested.
  - Split samples will be made available to the Agencies and/or property owners upon request provided a sufficient volume of water can be collected from the boring.

2.2 Galvanized Steel Constructed Well Replacement

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Wells S-85-5B, S-85-6B, S-86-1 and S-85-8A will be replaced with wells constructed with PVC casing and screen material to fulfill the first secondary objective of this ~~workplan~~Work Plan. The replacement wells will be installed approximately 25 feet upgradient from the existing wells. ~~The distance is~~ to ensure these wells are installed outside of the influence of zinc suspected to originate from the galvanized steel casing used to construct the original wells. The replacement wells will be installed at a similar depth as the original wells using two-inch schedule 40 PVC. A 0.010 or 0.020 inch slotted screen will be used depending on the screen in the existing well that is being replaced. The well completion logs from S-85-5B, S-85-6B, S-86-1 and S-85-8A are included in **Appendix B**. New well completion logs will be created for S-85-5B, S-85-6B, and S-85-8A and have been designated S-85-5BR, S-85-6BR, S-86-1R and S-85-8AR and will be provided in the Investigative Results Report.

Comment [rch10]: If installed with a galvanized steel casing

- The wells will be completed as follows: (**POP 006**):
  - Two inch diameter schedule 40 PVC casing and 0.010 inch slotted screen depending on the screen in the existing well that is being replaced
  - The replacement wells will be installed at a similar depth as the original wells
  - A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized. Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of. ~~(**POP006**).~~ Soils and liquids will be managed as indicated in Section 4.2.
  - ~~Any drilling mud or well development/purge liquid collected must be properly contained and disposed of (**POP006**). Liquids will be managed as indicated in Section 4.2.~~
  - Completion may consist of a two to three foot stickup casing with a locking lid; bollards may placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well.

Comment [rch11]: You do not know what type of screen is in the existing three wells to be replaced? Please specify what type of screen will be used for each well.

Comment [rch12]: Is this what you want for these wells?

The replacement wells will be sampled during the regularly scheduled sampling event following installation. ~~, which will likely be in December 2010~~. Sample results collected during four consecutive events will be evaluated to determine compliance with the target cleanup goals for site COCs. If the replacement wells are determined to be in compliance after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011). If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, a monitoring plan will be developed in coordination with the Agencies.

Wells S-85-5B, S-85-6B, and S-85-8A will be abandoned according to the Montana well abandonment requirements described in Section 2~~3~~.1.2. Where possible, the casing will be removed from the ground. In the event that the casing cannot be removed, it will be cut off three feet bgs ~~or driven downward so that the top of the casing is at least three feet below the ground surface~~. The well will then be filled with sealing material (bentonite) to within three feet of the surface. Any remaining hole will be filled with unimpacted or clean naturally occurring soils.

~~Any remaining hole will be filled with naturally occurring soils.~~

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2.3 Background Well Replacement

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Monitoring wells S-3R and S-4 were initially selected as the background wells for the Site in the FINAL Groundwater Treatment System Interim Monitoring Plan (Plan) submitted February 2008 (modified May 2008). Well S-3R is also designated as the background well for the LTU network. Because wells S-3R and S-4 have contained an insufficient volume of water to allow reliable sample collection, the revised Plan submitted in October 2009 designated well S-86-1 as the background well.

Well S-86-1 was sampled in December 2009 following extensive well development **(POP221)**. Analysis of samples collected from the well during the December 2009 event detected the presence of TPAHs and reported CPAH compounds above the ROD based cleanup levels. In addition, well S-86-1 contained zinc concentrations of 20.5 mg/L during the March 2010 groundwater sampling event. As a result, the Agency deemed S-86-1 not acceptable as a background monitoring well **(Appendix D)**.

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A replacement well for S-3R will be installed similar to, but will be screened deeper than, S-3R (see **Appendix B** for the well completion log from S-3R) if bedrock is not encountered first and will be constructed with two-inch schedule 40 PVC casing and 0.010 slotted screen. A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized **(POP006)**. ~~A and a~~Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of **(POP006)**. Soils and liquids generated during well installation will be managed as indicated in Section 4.2. Completion may consist of a two to three foot stickup casing with a locking lid; bollards may placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well.

Comment [rch13]: Specify what depth

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Comment [rch14]: Is this what you want for this well?

A new well completion log will be created for S-10-3R and will be provided in the Investigative Results Report. As the newly installed well is a background well and is being installed upgradient of the source area, impacted intervals are not expected to be encountered. Well S-3R ~~and S-4~~ will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2~~as described in Section 3.1.2~~.

Comment [rch15]: 3 What does this mean in terms of how you will log and/or sample the boring? Ideally, you would log the boring.

Comment [rch16]: Even though we are currently not getting samples from this well, we do not want to lose this monitoring point

The replacement well will be sampled during the regularly scheduled sampling events following installation. Groundwater sample results will continue to be collected and reported quarterly during the remainder of the interim monitoring period. The newly installed well S-10-3R **(Figure 1)** will also be used as the LTU network background well for the remainder of the post-closure monitoring period.

2.4 Well S-6 Replacement

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Monitoring well S-6 is included in the interim monitoring period plume stability network and also sampled as part of the land treatment unit post-closure monitoring program. This well regularly has an insufficient volume of water in the well to collect samples; therefore, a deeper well will be installed to replace S-6 (S-6R). The boring for monitoring well S-6R will be installed and sampled in the same fashion as borings IB-1, IB-2, and IB-3.

If soil and groundwater samples from the boring do not indicate the presence of COCs above target cleanup levels, the well ~~Well S-6R~~ will be installed similar to but ~~will be~~ screened slightly deeper than S-6 (see **Appendix B** for the well completion log from S-6). Monitoring well S-6R ~~and~~ will be constructed with two-inch schedule 40 PVC casing and 0.010 slotted screen. A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized, and any drilling mud or well development/purge liquid collected must be properly contained and disposed of (**POP006**). Soils and liquids generated during well installation will be managed as indicated in Section 4.2. Completion may consist of a two to three foot stickup casing with a locking lid; bollards may placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well. A new well completion log will be created for S-6R and will be provided in the Investigative Results Report. If impacted intervals are encountered, the screen may be placed at the impacted interval. Well S-6 will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2~~as described in Section 3.2 above~~.

Comment [rch17]: Specify what depth rather than state slightly deeper.

Comment [rch18]: Is this what you want for this well?

Samples will be collected from the replacement well if impacts are observed in the boring (i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm). A soil sample will be collected and analyzed as described in Section 2.~~3.~~1.2 if impacted soil is observed above the groundwater table. Groundwater samples will be collected as described in Section 2~~3~~.1.2 if impacted intervals are observed below the water table. A normal turnaround time will be requested on all samples as no additional boring locations will be dependent on results obtained from boring S-6R.

The replacement well will be sampled during the regularly scheduled sampling events following installation~~ if no impacted intervals are observed below the water table. Quarterly monitoring data will be collected for at least four quarters to evaluate the stability of the dissolved creosote constituent plume and to verify that natural processes are present to aid in breaking down creosote constituents.~~

2.5 Well Development

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M~~Newly installed m~~onitoring wells installed in conjunction with this 2010 ~~Work Plan~~Work Plan will be developed following installation to remove silt and other fine-grained sediments that may accumulate within the monitoring well during installation. Development will be done by the drilling company through one or a combination of techniques including surging and pumping. (**POP 221**).

- Pumping involves using a pump to evacuate water and silt from the well.
- With surging, a tool is used to scour the screened interval in an up and down repetitive motion, causing the groundwater to surge in and out through the screen and forcing fines out of the formation.

The monitoring wells will be developed until water is relatively free of sediment or until all of the groundwater has~~d~~ been removed. The ~~final completion report~~Investigative Results Report will indicate the development methods used. Water generated during well development activities will be collected, drummed, and analyzed as indicated in Section 4.2~~ to determine the appropriate disposal method~~.

2.6 Well Survey

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All wells and boring locations will be surveyed by a licensed surveyor as part of the upcoming Agency Five-Year Review which is scheduled to be completed by September 2011. Surveying will be provided by Montana licensed professional land surveyor. Surveying will be based on the horizontal datum of NAD 83 Montana State Plane Feet and the vertical datum of NAVD 88. Positional accuracy of the survey will meet the Accuracy Standards for ALTA/ACSM Land Title Surveys, as adopted by the American Land Title Association and the National Society of Professional Surveyors. The well elevations obtained will be incorporated in all future routine sampling and well gauging events.

~~3.0~~ 3 ~~Sample Handling and Analysis~~ Quality Assurance and Project Plan

When sampling and analyzing samples, appropriate quality assurance/quality control and chain of custody procedures shall be used that are in accordance with EPA's "Requirements for Quality Assurance Project Plans" and any other pertinent EPA guidance. These requirements are incorporated in the Quality Assurance Project Plan (QAPP) that has been prepared, submitted and included as **Appendix E** pursuant to this Work Plan. Major components of the QAPP are discussed below.

Decontamination

All sampling equipment will be subject to appropriate decontamination protocol. (POP 110, POP 120)To assess the adequacy of decontamination procedures, rinsate blanks should be collected and analyzed for the same parameters as the field samples. In general, one rinsate blank will be collected per 20 samples.

Chain of Custody

All samples will be shipped overnight to the project laboratory. Sample collection, storage, and shipment will follow chain of custody protocol outlined in the QAPP.
~~All samples will be shipped overnight to the project laboratory. Sample collection, storage, and shipment will follow chain of custody protocol. All sampling equipment will be subject to appropriate decontamination protocol. (POP 110, POP 120)To assess the adequacy of decontamination procedures, rinsate blanks should be collected and analyzed for the same parameters as the field samples. In general, one rinsate blank will be collected per 20 samples.~~
Sample language ~~to~~ to consider as ~~use in~~ part of this Section

Data Validation and Usability

Laboratory data validation and verification will begin at the sample log-in stage where a sample log-in technician or chemist will compare received samples against chain of custody forms and document sample condition (damage, temperature, etc.). Validation and verification of data will be performed by QA/QC personnel following USEPA National Functional Guidance (EPA 2002) in order to determine if the data quality objectives were met. Sample data deemed outside the expected range will be investigated, communicated to the analytical chemistry staff, flagged (if needed) and potentially re-sampled to verify or discredit the data. Data that have proven to be incorrect may be flagged, further reviewed, or invalidated. The cause of incorrect data will be investigated and appropriate response actions will be taken, including communication of any issues to the user in the data report.

Uncertainty of validated data will be evaluated by the ~~RPM~~ project manager to determine if the data quality objectives were met. In the event that the data quality objectives were not met, they will be reviewed to determine if they are achievable and may be revised if necessary, and the data may be further evaluated to determine the impact to the project. Data usability and limitations will be evaluated by the project manager ~~RPM~~.

Full Verification

Full verification will be conducted on data generated on analytical instrumentation that does not provide an electronic output ~~that can be directly uploaded into the ESAT LIMS and requires manual data entry into the ESAT LIMS. This verification applies to Dissolved Organic Carbon and Alkalinity~~. This will be performed to

Comment [rch19]: Every Work Plan should be accompanied by a QAPP. There should already be a good site template for a QAPP that can be modified for this upcoming field event and included as an appendix to this Work Plan with some of the QAPP components, briefly discussed in this Section.

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Comment [rch21]: Template language that can be tweeked to serve the purposes of the Work Plan has been included below this comment

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Formatted: Space After: 0 pt, Line spacing: single ensure that data were produced in accordance with procedures outlined in th~~is project plan~~eQAPP ~~and that no transcription errors were made during the manual entry of the data into LIMS~~. The following elements will be reviewed for compliance as part of the full data verification:

- Methodology
- Holding Times
- Calibration
- Blanks
- Spikes
- Duplicates
- LCSs
- Reporting Limits
- Analyte Identification
- Analyte Quantification
- Comparison of hardcopy results to EDD

Abbreviated Data Verification

Abbreviated verification will be completed on 10% of the analytical results ~~for data which is electronically uploaded directly from the analytical instrumentation into the ESAT LIMS~~. This will be performed to ensure that data were produced in accordance with procedures outlined in ~~this project plan~~the QAPP. The following elements will be reviewed for compliance as part of the abbreviated data validation:

- Holding Times
- Calibration
- Blanks
- Spikes
- Duplicates
- LCSs
- Reporting Limits
- Analyte Quantification
- Comparison of hardcopy results to EDD

Data Validation

The analytical data will be validated for 10% of the results by ~~either the acting Region 8 EPA Laboratory Quality Assurance Officer or by~~ a designated ~~TechLaw, Inc.~~AECOM Quality Assurance officer ~~outside of the Region 8 ESAT office.~~ The validation will include reviewing 10% of the samples for 100% of the analytical analysis performed and reported.

This will be performed to ensure that data were produced in accord with procedures outlined in this project plan. The following elements will be reviewed for compliance as part of the abbreviated data validation:

- Holding Times
- Calibration
- Blanks
- Spikes

- Duplicates
- LCSs
- Reporting Limits
- Analyte Identification
- Analyte Quantification
- Comparison of hardcopy results to EDD

Data Quality Assessment

Information obtained from the Field Investigation will be evaluated through the Data Quality Assessment (DQA) process to determine if the data obtained are of adequate quality and quantity to support their intended use. The DQA process consists of five steps, as summarized below (USEPA 1998, 2000b):

1.) Review the DQOs and Sampling Design: DQO outputs will be reviewed to ensure that they are still applicable. The sampling analysis and data collection documentation will also be reviewed for completeness and consistency with DQOs.

2.) Conduct a Preliminary Data Review: Data validation reports will be reviewed to identify any limitations associated with the analytical data. Basic statistics will be utilized where applicable and meaningful graphs of the data will be prepared. This information will be used to learn about the structure of the data and to identify patterns, relationships or potential anomalies/outliers.

3.) Select the Statistical Method: Select the appropriate procedures for summarizing and analyzing the data, based on the review of the performance and acceptance criteria associated with the project objectives, the sampling design, and the preliminary data review. Identify the key underlying assumptions associated with the statistical tests.

4.) Verify the Assumptions of the Statistical Method: Evaluate whether the underlying assumptions hold, or whether departures are acceptable, given the actual data and other information about the study.

5.) Draw Conclusion from the Data: Perform the calculations necessary to draw reasonable conclusions from the data. If the design is to be used again, evaluate the performance of the sampling design.

Uncertainty of validated data will be identified in the report and evaluated by the Site team to determine if the data quality objectives were met. In the event that the data quality objectives were not met, they will be reviewed to determine if they are achievable and may be revised if necessary, and the data may be further evaluated to determine the impact to the project. Data usability and limitations will be evaluated by the Site team.

~~4.0~~ 4 Health and Safety

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A site-specific health and safety plan (HASP) has been developed for the Somers site~~,~~. ~~and~~ The HASP is reviewed and updated annually. The HASP contains emergency contact information and directions to the hospital, as well as information on hazards generally present on AECOM field sites. A copy of the HASP is included as **Appendix F** of this Work Plan and will remain on-site in the treatment building office throughout the data collection activities; all personnel working on site must read and sign the HASP. Task Hazard Analyses (THAs) have been prepared for tasks expected during the additional activities and are included in the HASP.~~;~~

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Comment [rch22]: Make sure these THAs are included in the HASP that is included as an appendix

Safety equipment is available on site and personnel involved in the work activities need to be familiar with its proper use and location. Equipment includes the safety shower eyewash station and fire extinguishers. Minimum personal protective equipment (PPE) requirements include safety glasses with side shields, hard hats, and steel-toed boots. Gloves shall be worn when handling equipment and materials. Nitrile or other chemically impervious gloves shall be worn when working with contaminated liquids or sludges. Orange vests will also be worn when working around moving vehicles or near public roads.

Below is a list of general safety guidelines which will be followed during the additional data collection activities.

- All contractors will have completed the BNSF Contractor Orientation Training prior to conducting work on site. Annual certification is required.
- All manufacturers' recommended safety precautions for all chemicals will be followed. Refer to the Material Safety Data Sheets (MSDS) located in the HASP.
- A task or job hazard analysis will be conducted prior to performing interim monitoring tasks. If a THA already exists for the activity, it will be reviewed by all personnel involved in the task. New THAs will be filed in the HASP.
- All required PPE shall be worn while conducting work on site.
- Special precautions will be taken with moving liquids. This requires the use of protective clothing and maintaining a safe distance.
- When installing wells outside of the fenced Site, exclusion zones will be established around working areas to protect untrained and unqualified individuals.
- Utility locates will be conducted prior to installing borings and wells.

All personnel are empowered to stop work activities if a deviation from planned activities occurs or if an unsafe condition is present.

4.1 Access Agreements

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The borings and monitoring wells proposed to determine the extent of the dissolved plume are located off of BNSF owned property. Owners of the property where borings and wells may be located will be contacted sufficiently in advance to allow time for obtaining access - no less than 30 days prior to commencing work. BNSF shall make best efforts to locate borings and wells away from structures and utilities. BNSF shall also use best efforts to obtain written access agreements to such property. Such agreements shall ensure access for the United States and it authorized representatives. If BNSF is unable to obtain access within that time frame, no later than 27 days prior to the time access is needed, BNSF shall notify EPA of the failure to obtain access, and the efforts made to obtain it.

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If BNSF is unable to obtain access, where EPA has determined it to be necessary for carrying out the work under this Work Plan, EPA may then assist BNSF in gaining access, to the extent necessary to effectuate the investigations described in this Work Plan, using such means as EPA deems appropriate. EPA may at its discretion also consider alternate locations, including but not limited to existing County rights-of-way on the property, as appropriate. If EPA determines that placing the well/boring in a County right-of-way is acceptable (in the event a property owner refuses access), BNSF agrees it will make best efforts to obtain access for such placement from the County. Nothing in Section 4.1 is intended to modify the Consent Decree.

~~The borings and monitoring wells proposed to determine the extent of the dissolved plume are located off of BNSF owned property. Owners of the property where borings and wells may be located will be contacted prior to commencing work to gain access to their property. An effort will be made to locate borings and wells away from structures and utilities. If a property owner will not grant access, county authorities will be contacted for permission to install borings within the county right-of-way. If a monitoring well is installed an access agreement will be drafted with which the property owner will grant BNSF and the Agencies access to the well for future monitoring purposes.~~

No personnel or individuals shall be allowed within the work area without prior approval. Property owners will be notified of the work activities and health and safety concerns. Access to the work area will be controlled with barricades, temporary fencing, or other means to limit entry. The AECOM field manager will be responsible for ensuring unauthorized access to the work area is prevented.

If a monitoring well is installed off of BNSF owned property, an access agreement will be drafted with which the property owner will grant BNSF and the Agencies access to the well for future monitoring and operation and maintenance.

4.2 Data Collection-Derived Waste Management

Waste material~~Soil~~ including but not limited to soils and liquids generated during the field work will be containerized and stored within the fenced area of the Somers Site until appropriate disposal can be arranged. "Waste Material" shall mean 1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); 2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); 3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and 4) any "hazardous waste" under State law.

Soils

A composite sample will be collected from the containerized soil and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, ~~and~~ zinc by EPA Method 6020 and potentially other methods required to appropriately profile the waste. Soil cuttings that are non-hazardous will be spread on the ground surface within the fenced area of the Site. If soil cuttings are determined to be hazardous waste (F034), they will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

Liquids

Liquid produced during ~~each?~~ sampling and decontamination activities will be collected, drummed, and analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020. Liquid that does not exceed the ROD target cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc) will be poured onto the ground surface within the fenced area of the Site. If collected liquid exceeds the ROD target cleanup level, the drums will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

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Comment [rch23]: It is possible that waste will be non hazardous, but above cleanup levels. Please specify how this waste will be disposed of.

~~6.0 Reporting~~

~~The draft report is due on December 31, 2010 and will include a description of all activities conducted under this 2010 Work Plan, deviations to the planned work, an evaluation of data quality, and copies of all field log books and field forms~~

~~A summary data table and copies of laboratory reports will be included in a summary report following completion of the work, receipt of analytical samples, and data validation. Groundwater summary tables will include a comparison to the cleanup levels in the ROD and will indicate which results, if any, exceeded the levels.~~

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~~7~~5.0 Schedule

The schedule for the scope of work included in his ~~work plan~~Work Plan is as follows:

Final Draft ~~Work Plan~~Work Plan for Additional Data Collection submittal – July 16, 2010

Receive Agency approval of ~~work plan~~Work Plan – July 31, 2010

Access Agreements in Place – No later than September 30, 2010

Complete Field Investigation – October 31, 2010

Submit Draft ~~Subsurface~~ Investigati~~on~~ve Results Report – December 31, 2010

Submit Final ~~Subsurface~~ Investigative Results Report~~on~~ – 30 days after receipt of Agency comments

6.0 Reporting

Upon completion of field activities and receipt of analytical results, an investigative results report shall be prepared and submitted to the Agencies for review and approval. The draft report, due on December 31, 2010, will include but not be limited to the following information:

- Description of all activities conducted under this 2010 Work Plan
- Deviations to the Planned work
- Access agreements
- Evaluation of data quality
- Boring and/or well logs
- Analytical results for both soils and groundwater, in summary table format, including comparison to the cleanup levels in the ROD
- Water levels measured
- Cross sections and lithology diagrams
- Copies of field logbooks and photos taken
- Field data
- Contaminant concentration contour diagrams

The final investigative results report shall be submitted 30 days after receipt of Agency comments, and shall include a formal response to Agency comments.

~~6~~8.0 References

Comment [rch24]: Cite all references in this Work Plan and include these as Section 8.0

Appendix A

Project Operating Procedures (POPs)

Agency comments on POPs

1. POP 006 does not contain Sections 1-4 (pages 1& 2 of the POP
2. POP 006, Section 8.2 appears to have residual language discussing the Iowa DNR.
2. POP 210, Section 5.3 discusses the notation of contamination using high, medium, and low, and corresponding to a percentage of oil contamination. Is this classification conducted in the field, and is it solely at the discretion of the field geologist?
3. POP 210 provides a boring log form for logging lithology and samples. The form provided is not familiar to Andrew. Does AECOM use a traditional boring log form, or is the attached form used to create a more typical boring log? Presumably PID observations would be recorded in the "sample description" section? — Andrew ~~I~~ would like to talk to AECOM about this form.
4. POP 230, Section 5.2 is not terribly clear in differentiating low flow sampling methodology versus sampling after three casing volumes are removed.
5. POP 231 provides a Fluid-Level Monitoring Log, however, the log does not have a column for depth to product and thickness of product, if present.

Appendix B

Boring and Well Logs

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Appendix C

Data Quality Objectives

1.0 Data Quality Objectives

The DQO process is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. These DQOs shall also be the determinative factor for assessing the success or failure of the sampling. EPA has issued guidelines to help data users develop site-specific DQOs (EPA, 2000). The DQO process is intended to:

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Comment [rch25]: http://www.epa.gov/quality/qs-docs/g4hw-final.pdf

- Clarify the study objective;
- Define the most appropriate type of data to collect;
- Determine the most appropriate conditions from which to collect the data; and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the design

1.1 Data Quality Objective Process

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate data are justified. The DQO process consists of seven steps; the output from each step influences the choices that will be made later in the process. These steps are as follows:

Step 1: State the problem

Step 2: Identify the decision

Step 3: Identify the inputs to the decision

Step 4: Define the study boundaries

Step 5: Develop a decision rule

Step 6: Specify tolerable limits on decision errors

Step 7: Optimize the design

During the first six steps of the process, the planning team[3] develops decision performance criteria that will be used to develop the data collection design. The final step of the process involves developing the data collection design based on the DQOs. A brief discussion of these steps and their application to this Work Plan is provided below.

1.1.1 State the Problem

At the BNSF Former Tie Treating Plant in Somers, Montana, a dissolved creosote constituent groundwater plume had been contained by a groundwater recovery system located in the former CERCLA lagoon and treated at an onsite water treatment plant (GWTS). However, BNSF requested termination of the GWTS in 2007 based on modeling results that indicated the groundwater contamination is not likely to migrate, whether or not the GWTS is operating, due to geologic conditions that the movement of groundwater and

[3] Includes EPA, MDEQ and BNSF Railway representatives

creosote onsite. Approval to shutdown GWTS operations for an interim period was granted in October 2007. Since that time, BNSF has collected quarterly monitoring data to evaluate the stability of the dissolved creosote constituent plume and to verify that natural processes are present to aid in breaking down creosote constituents.

Review of groundwater data collected during the interim monitoring period indicates a possible increasing trend in phenol concentrations (particularly 2,4-Dimethylphenol) in S-91-2 suggesting that the dissolved phase plume may be migrating laterally and vertically beyond the proposed technical impracticability (TI) and controlled groundwater area (CGA) boundaries.

Comment [rch26]: Figure 1should provide different colors to delineate between the CGA, proposed TI area and the study area boundaries which is introduced in step 4 of the DQO process.

Recent investigations on the neighboring Ortiz and Abel property (Applied Water Consulting, 2010 – Figure 1) have also indicated that creosote and/or dissolved phase constituents above the ROD cleanup levels have migrated in the subsurface beyond the proposed TI boundary.

In addition to the potential migration of the dissolved phase creosote plume, several monitoring wells have concentrations of zinc above ROD cleanup levels. The wells with concentrations of zinc above ROD cleanup levels were constructed of galvanized steel casings and it is hypothesized that the exceedances are a result of these casings.

Based on the above observations, additional site investigations and monitoring are proposed. The ability to determine whether the proposed technical impracticability boundaries and the existing controlled groundwater area need revision in order to be protective of human health and the environment depends on the results of this field investigation and future monitoring.

1.1.2 Identify the Decision

The purpose of this step is to define the decision statements this study will attempt to resolve. Decision statements are developed by combining principal study questions (PSQs) and alternative actions (AAs). PSQs are derived from the problem statement presented in Section 2.1.1. For each PSQ, AAs are developed (including no action alternative if appropriate) that indicate what action will be taken after each PSQ is answered. Data collected from this study will be incorporated into the larger Site dataset for decision making purposes. The PSQ is as follows:

Principal Study Question: Evaluate the vertical and horizontal extent of creosote and dissolved phase constituents of concern (COCs) in groundwater that may exceed cleanup levels set forth in the EPA ROD.

Based on this principal study question, the following alternative actions have been developed:

Alternative Action (1): Recommend that no additional borings and monitoring wells be completed and that the existing groundwater monitoring network be used to guage potential migration of creosote or dissolved phase constituents; or

Alternative Action (2): Recommend additional data collection efforts to better define the horizontal and vertical extent of the dissolved creosote constituents and zinc in groundwater and determine if the existing boundaries of the CGA and proposed TI area need to be expanded to remain protective of human health and the environment.

The principal study question and the alternative actions were combined to form the following decision statement:

Decision Statement: Determine whether or not existing data and data collected during the upcoming field investigation are sufficient to better define the horizontal and vertical extent of the dissolved constituents of concern and to determine if the existing boundaries of the proposed TI or CGA need to be revised to remain protective of human health and the environment.

1.1.3 Identify the Inputs to the Decision

The purpose of this step is to identify the information inputs needed to support the decision statement and to specify which inputs will require environmental measurements. Table 2.1 presents the data inputs needed and shows the relationship between the data inputs and evaluation criteria and performance goals.

1.1.4 Define the Study Boundaries

The purpose of this step is to clarify the site characteristics that the environmental measurements are intended to represent. This step includes the following activities (1) specifying the characteristics that define the media of interest, (2) defining the spatial boundary of the decision statement, (3) defining the temporal boundaries of the decision, (4) defining the scale of decision making, and (5) identifying any practical constraints on data collection. These activities are briefly discussed below.

Characteristics That Define the Media of Interest: The media of interest associated with the primary objective is creosote impacted soil or non-aqueous phase creosote that acts as a continuous source of the dissolved creosote constituent groundwater plume. This contaminated media, which is likely present beyond the CERCLA lagoon is the primary target of possible future response actions.

The media of interest associated with the secondary objective is zinc that may be associated with the galvanized steel casings installed in wells S-85-5B, S-85-6B and S-85-8A acting as a continuous source of the dissolved zinc that continues to be detected above ROD cleanup levels in samples collected from these wells.

The media of interest associated with the tertiary objective is groundwater that has decreased in elevation over time

Spatial Boundary of the Decision: The spatial boundary of the former land treatment unit (LTU) and upgradient monitoring well S-3R to the west, ponded and marshy areas byond monitoring well cluster S-85-5 to the north, monitori9ng wells S-84-15 and S-91-2 to the east and Flathead Lake to the south. These boundaries are further divided into investigative subsets about which independent decisions can be made. The spatial boundaries are dynamic and can be modified if field observations indicate a need to modify the boundaries of the study.

Temporal Boundaries of the Decision: The field investigations are anticipated to be completed by October 31, 2010. Additional monitoring of the proposed monitoring wells will occur for a minimum of one year following installation and may extend into perpetuity.

TABLE 1.1
SUMMARY OF DATA INPUT NEEDS

Evaluation Criteria	Performance Goals of In Situ Remedy	Proposed Performance Level	Data Needed to Estimate Performance	Source of Data
Long-Term Effectiveness and Permanence	Achieve conditions that are compatible with planned future use of the site.	For the media treated, achieve RAOs specified in the ROD and/or propose a technical impracticability waiver if these RAOs cannot be achieved.	Contaminant concentrations over time following monitoring well installation.	Environmental sampling
Reduction of Toxicity, Mobility, or Volume	Reduce effort needed to maintain long-term remedial operations at the site.	If GWTS is permanently discontinued, ensure impacted groundwater does not migrate outside of existing CGA and proposed TI boundary.	Contaminant concentrations over time. Additional lithologic information.	Environmental sampling Soil borings
Short-Term Effectiveness	Maintain subsurface conditions that are compatible with the operation of the existing groundwater collection and treatment system.	At the boundaries of the proposed technical impracticability boundary, maintain the RAOs specified in the ROD.	Contaminant concentrations in groundwater at sentinel and Point of Compliance wells to be determined.	Environmental sampling
Cost	Reduce long-term costs	Performance level to be determined by stakeholders.	Estimated cost of interim response actions and long-term monitoring	Cost estimate, rough (-30%, +50%).
Compliance with ARARs	Comply with ARARs identified in the ROD.	ARARs compliance	Contaminant concentrations over time.	Environmental sampling

Scale of Decision Making: The study area is divided into investigative subsets that represent different study areas. Independent decisions may be made for each of these areas. These areas are described as primary and secondary objectives as proposed:

Primary Objective: Evaluate the extent of dissolved creosote constituents in groundwater that may exceed cleanup levels set forth in the EPA ROD. The results of this investigation and additional quarterly monitoring will be used to determine if the boundaries of the existing Controlled Groundwater Area and the proposed technical impracticability area need to be revised to remain protective of human health and the environment

Secondary Objective: Better assess the source of zinc in groundwater that exceeds the cleanup level in the ROD by replacing galvanized steel constructed wells S-85-5B, S-85-6B, and S-85-5A with poly vinyl chloride constructed wells. The results of this investigation and additional quarterly monitoring will be used to determine long term monitoring requirements as well as to determine if the proposed technical impracticability area around nested wells S-85-5A and S-85-5B is necessary as well as determine if the existing controlled groundwater area that covers the former LTU Area can be lifted and still remain protective of human health and the environment

Tertiary Objective: Replace monitoring wells S-3R and S-6 with deeper screened wells to allow for better potentiometric maps to be developed and to provide analytical data representative of background conditions. Due to drought conditions in the region, the groundwater table has dropped 3 to 4 feet since the wells were constructed and have had insufficient volume to collect a sample during the interim monitoring period.

Practical Constraints of Data Collection: Practical constraints of data that will be collected include the physical and administrative access to the properties not owned by BNSF Railway Company as well as existing structure and buried utilities associated with the all the properties where borings and monitoring wells are planned to be completed. In addition, a sufficient volume of water may not be available for the collection of groundwater at each desired depth due to the geologic conditions at the site.

1.1.5 Develop a Decision Rule

The decision rule states what regulatory response action would be appropriate depending on whether a chosen parameter is greater or less than the action level. For this study, groundwater and soil analytical results will be compared with ROD based cleanup levels. Groundwater and soil analytical results and field chemistry measurements from this event as well as future groundwater analytical results will be used to support future site decisions.

Decision Rule Primary Objective: If data collected during this upcoming field investigation and future quarterly monitoring events indicate that the dissolved phase constituents above target cleanup goals extends, or has the potential to extend, beyond the existing CGA, then discussions with Flathead County Board of Health are appropriate to expand the original boundaries of the Controlled Groundwater Area pursuant to Section 85-2-506 and 508, MCA as amended.

If data collected during this upcoming investigation indicate that the dissolved phase constituents does not extend, or has the potential to extend, beyond the existing CGA, than site wide quarterly monitoring will continue to ensure the plume stability.

Decision Rule Secondary and Tertiary Objective: If the replacement wells are determined to be in compliance after four quarters, monitoring will continue as detailed in the Long-Term

Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).

If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, a monitoring plan will be developed in coordination with the Agencies.

1.1.6 Specify the Tolerable Limits on the Decision Errors

The purpose of this step is to specify the tolerable limits on decision errors, which are used to establish performance goals for the data collection design, and discuss how decision errors will be addressed. For this Work Plan, the boring and monitoring locations as well as the number of samples (which can impact the statistical power associated with the sample approach) were established based on previous investigations, discussions between the Agencies, BNSF and its representatives, and Agency direction. These are specified in Section 3.0.

In order to mitigate the potential for false positive and/or false negative errors associated with field sampling, sample collection processes will be consistent with established and relevant Project Operating Procedures (POPs) included as attachment A to this Work Plan. This includes collection of duplicate samples (and subsequent comparison to primary samples using relative percent difference (RPD) statistics), implementing a decontamination procedure (which may include the use of disposable sampling equipment), and the collection of field blanks.

For laboratory analysis of samples, quality assurance/quality control (QA/QC) steps (such as the use of laboratory controls, matrix spikes, matrix spike duplicates, blanks, etc.) will be consistent with previous QA/QC procedures used at this Site. In addition, split samples may be taken to evaluate laboratory analytical performance. This will be at the discretion of the Agencies and property owners provided a sufficient volume of groundwater can be collected from the boring.

1.1.7 Optimize the Design

The purpose of this step is to identify the most resource-effective data collection design for generating data expected to satisfy the DQOs specified in the preceding six steps. For this sampling event, the sample locations and the investigative approach were selected based on the results of previous sampling efforts at this site; discussions between the Agencies, BNSF and its representatives, and existing data needs.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Ref: 8MO

July 20, 2010

Mr. Dave Smith
Manager Environmental Remediation
Burlington Northern Santa Fe (BNSF) Railway Company
825 Great Northern Boulevard, Suite 105
Helena, MT 59601-3340

Re: *BNSF – Somers* Clarification of two changes to the revised work plan for additional work submitted to BNSF Railway on July 2, 2010

Dear Dave:

On the our July 19 conference call, BNSF Railway asked for clarification of two changes to the revised work plan for additional work submitted on July 2, 2010. Here are the issues and the Agencies responses:

Issue 1 - The first paragraph in Section 1 of the revised work plan requests that all written correspondence between the Agencies and BNSF pertaining to the development of this work plan be included as an appendix to the final work plan. You stated that this seemed to be a new requirement from the Agencies and asked for clarification on why this was included.

Andrew, Lisa and I have all inherited sites that have undergone response actions spanning decades and multiple project managers. At one time during our respective careers, we have gone through the administrative record of our respective Sites to try and determine how a Site decision was made in the past and have had to search the hundreds of documents that are on file for this information. We all feel that providing written correspondence between all the parties leading up to the final work plan as an appendix may be an unusual request but is not an undue burden to require in a work plan. We also feel that this request is specific to Somers because remediation has been going on for a long period of time and was overseen by federal and state project managers that no longer work on this Site. Furthermore, this appendix provides the necessary documentation that ultimately has lead up to the final decision and is in a location that can be easily referenced and accessed. Since the final work plan will be posted on DEQ's web page for the Somers Site, it also allows for more transparency and openness in government to ensure the public trust and establish a system of transparency, public participation, and collaboration which follows the intent of President Obama's January 21, 2010 memorandum issued to the Heads of Executive Departments and Agencies on Transparency and Openness in Government (Federal

Register Notice, Vol. 74, No. 15, January 26, 2010).

Issue 2 - Well S-86-1 was not one of the specific wells identified in the draft work plan that was required to be replaced. However, in this latest revision, the Agencies have requested this well be replaced.

Monitoring wells S-3R and S-4 were initially selected as the background wells for the Site in the FINAL Groundwater Treatment System Interim Monitoring Plan (Plan) submitted February 2008 (modified May 2008). Well S-3R is also designated as the background well for the LTU network. Because wells S-3R and S-4 have contained an insufficient volume of water to allow reliable sample collection, the Agencies requested a replacement well be installed as a background well. During the initial discussions on a replacement background well for this work plan, BNSF argued against replacing Well S-3R and proposed S-86-1 as the background well. The Agencies agreed to this request and the revised work plan submitted in October 2009 designated well S-86-1 as the background well. Well S-86-1 was first sampled in December 2009 following extensive well development. Analysis of samples collected from the well during the December 2009 event detected the presence of TPAHs and reported CPAH compounds above the ROD based cleanup levels of 0.30 ug/L. In addition, well S-86-1 contained zinc concentrations of 20.5 mg/L during the March 2010 groundwater sampling event above the ROD based cleanup levels of 5.0 mg/L. During the initial Agency development of DQOs for the revised work plan, concerns were raised by EPA and DEQ about concentrations detected in S-86-1. The Agencies do not disagree with BNSF suspicions that the zinc exceedances originate from the galvanized steel casings and would like to install replacement well S-86-1R with a PVC casing to test for this. Since replacement well S-86-1R will need to be sampled for at least 4 consecutive quarters, data can also be collected to determine if the CPAH exceedance detected in December 2009 was an anomaly or indicative of an increasing trend that will need to be monitored and/or addressed as part of a future response action (i.e., modify the Controlled Groundwater Area) since well S-86-1 is located outside of the Controlled Groundwater Area..

If you have any questions or concerns about the Agencies responses to the issues you raised on our conference call, please call me at (406) 457-5031.

Sincerely,

Roger Hoogerheide
USEPA Project Manager

cc: Lisa Dewitt, MDEQ (electronic copy)
Shelly Young, AECOM (electronic copy)
Ann Colpitts, AECOM (electronic copy)
Larry Scusa, MDEQ (electronic copy)
Joe Vranka, EPA (electronic copy)
Andrew Schmidt, EPA (electronic copy)
File

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Tuesday, July 20, 2010 11:58 AM
To: Hoogerheide.Roger@epamail.epa.gov
Cc: Schmidt.Andrew@epamail.epa.gov; Colpitts, Ann; Smith, David M; Vranka.Joe@epamail.epa.gov; lidewitt@mt.gov; lscusa@mt.gov; Young, Shelly
Subject: Re: Agency responses from July 19 conference call

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ROD cleanup level should be 0.030 ug/L not 0.30 ug/L as stated in this
letter


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  |Roger Hoogerheide/MO/R8/USEPA/US
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  |"Smith, David M" <David.Smith4@bnsf.com>
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  |"Colpitts, Ann" <Ann.Colpitts@aecom.com>, "Young, Shelly" <Shelly.Young@aecom.com>,
lidewitt@mt.gov, Andrew Schmidt/R8/USEPA/US@EPA,          |
  |lscusa@mt.gov, Joe Vranka/MO/R8/USEPA/US@EPA
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|Agency responses from July 19 conference call
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[attachment "img-720124431-0001.pdf" deleted by Roger Hoogerheide/MO/R8/USEPA/US]

Young, Shelly

From: Young, Shelly
Sent: Friday, July 30, 2010 3:12 PM
To: 'Hoogerheide.Roger@epamail.epa.gov'
Cc: lidewitt@mt.gov; Schmidt.Andrew@epamail.epa.gov; 'Smith, David M'; Colpitts, Ann; Gilliland, Nancy
Subject: BNSF Somers - Final Draft 2010 Work Plan
Attachments: 2010 Work Plan_Final Draft_e-mail.pdf; 2010 Work Plan_Final Draft_Redlines_e-mail.pdf; 2010 Work Plan_Final Draft.docx; Appendix C Data Quality Objectives.docx; Figure 1 _Additional Site Investigation Map.pdf

Hi Roger,

Attached to this e-mail are the Word and PDF files for revised Final Draft 2010 Work Plan. The PDF file shows the revisions BNSF and AECOM made to the June 30, 2010 work plan revised by the Agencies as redline/strikeouts. The Agency revisions were accepted in the document so only BNSF/AECOM changes are shown. For the purpose of keeping the TOC straight, the DQOs in Appendix C have been saved as a separate Word file. The Word documents have accepted all modifications and do not include tracked changes. The remaining appendices will be included in the final document anticipated for submittal in late August following Agency approval of this Final Draft Work Plan.

One hard copy of each document (changes accepted and redline/strikeout) have been sent to you (Roger and Lisa). A CD is included in the package and contains the Word and PDF files.

Please let me know if you have any questions.

Thanks!

Shelly Young
Project Manager/Environmental Engineer
Environment
Direct 406.896.4582
shelly.young@aecom.com

AECOM
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Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, Montana
60136257
~~May~~ July 2010

Final Draft Work Plan for Additional Data Collection
BNSF Former Tie Treatment Plant
Somers, Montana

Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, Montana
60136257
~~May~~ July 2010

Final Draft Work Plan for Additional Data Collection BNSF Former Tie Treatment Plant Somers, Montana

Prepared By
Shelly Young, Project Manager

Reviewed By
Ann Colpitts, Senior Program Manager

Contents

List of Appendices

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1.0 Introduction

~~This Work Plan~~ This work plan (2010 Work Plan) ~~for~~ outlines additional data collection at the BNSF Former Tie Treatment Plant in Somers, Montana (Site) and has been prepared by AECOM Environment on behalf of BNSF Railway Company (BNSF). ~~A~~ The 2010 Work Plan ~~for additional investigation~~ was requested by the Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (MDEQ), hereafter referred to as Agency or Agencies, in a July 15, 2009 letter to BNSF (EPA 2009). A draft work plan was submitted in January 2010 for Agency review and reflected correspondence BNSF received from the Agencies in July and October 2009 as well as verbal comments made during a series of conference calls in occurring in late 2009 and early 2010 between BNSF, the Agencies, and AECOM covering the approach for additional data collection. This revised 2010 Work Plan incorporates Agency comments dated April 19, 2010 to the draft work plan and also includes the revised draft prepared by the Agencies and submitted to BNSF on June 30, 2010. ~~All~~ Written correspondence between the Agencies and BNSF pertaining to this Work Plan and the June 2010 draft version of the Work Plan with Agency comments are included in **Appendix D** of this Work Plan.

EPA is the lead agency for implementation of work under this 2010 Work Plan pursuant to the 1991 Consent Decree (CV91-32-M-CCL) (USA 1991). The EPA Project Coordinator, in consultation with the MDEQ Project Officer, has the authority to halt, conduct or direct work approved in this Work Plan pursuant to the Consent Decree that is in the judgment of the EPA Project Coordinator to be inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the 1989 Record of Decision (ROD) for the Site, the Consent Decree, or this Work Plan.

At the BNSF Former Tie Treating Plant in Somers, Montana, the dissolved creosote constituent groundwater plume was treated using a groundwater recovery system (GWTS) located in the former CERCLA lagoon and treated at an onsite groundwater treatment system (**GWTS – Figure 1**). However, BNSF requested termination of the GWTS in the Groundwater Treatment System Interim Shut-Down Plan (ENSR 2007~~-~~) based on modeling results that indicated the GWTS provided only minimal ~~contaminant~~creosote consituents removal and the unlikelihood for creosote-impacted groundwater from the Site to migrate to either the town well or Flathead Lake given the ~~due to~~ geologic conditions of the aquifer and the low mobility of the dissolved creosote constituents of concern (COCs) present onsite.~~and the groundwater contamination was not likely to migrate, whether or not the GWTS was operating, due to geologic conditions that limit the movement of groundwater and creosote onsite.~~ Approval to shutdown GWTS operations for an interim period was granted in October 2007 (EPA 2007) (**Appendix D**). Since that time, BNSF has collected quarterly monitoring data in accordance with the Groundwater Treatment System Interim Monitoring Plan (IMP) (~~AECOM~~ ENSR 2008a) to evaluate the stability of the dissolved phase plume of ~~constituents of concern (COCs)~~COCs ~~-~~and to verify that the plume is naturally attenuating. Results have been reported annual interim monitoring reports (AECOM 2009,~~ and~~ 2010).

Review of groundwater data collected during the interim monitoring period ~~indicates a possible increasing trend in~~shows continuing phenol concentrations downgradient of the existing controlled groundwater area (CGA) and proposed technical impracticability (TI) ~~and controlled groundwater area (CGA)~~ boundaries. ~~, suggesting that the dissolved phase plume may be migrating laterally and vertically. The additional monitoring requirements outlined in Section 5.0 of the Groundwater Treatment System Interim Monitoring Plan (IMP) were invoked because phenol concentrations in well S-91-2 was greater than 50% of the cleanup level during the June 2009 and September 2009 quarterly sampling events. Well S-91-2 was resampled in July 2009 and October 2009 upon EPA notification in compliance with contingency plan outlined in the IMP.~~ Recent investigations on the neighboring properties adjacent to the BNSF Somers Site (Applied Water Consulting~~,~~ 2010) also indicate that creosote and/or dissolved phase constituents above the cleanup levels established in the ~~Record of Decision~~ROD ~~may have migrated~~are present in the subsurface beyond the existing proposed TI boundary.

In addition to the ~~discovery of elevated~~ phenol~~s~~ and other creosote related impacts off-Site, there are two issues related to the construction of ~~plume stability~~interim period monitoring wells: ~~have come to light;~~ (1) monitoring wells S-85-5B, S-85-6B, and S-85-8A exceed zinc cleanup levels but are constructed with galvanized steel casing, which may be causing the zinc exceedances through dissolution or loss of the zinc coating used for galvanization; and (2) upgradient and background well S-3R and downgradient well S-6 have been dry during the interim monitoring period, preventing adequate collection of groundwater monitoring data. Monitoring well S-86-1 was monitored as a replacement background well starting in December 2009 and elevated zinc concentrations have been reported. As a result of the aforementioned ~~discoveries and~~ issues, EPA ~~has~~ determined that additional work, as defined in Section ~~-~~III of the Consent Decree, is necessary and provided written notification of such additional work to BNSF's Project Coordinator on July 15, 2009~~-~~. This 2010 Work Plan details the investigation agreed upon by the Agencies and BNSF Railway.

The objectives of the work discussed in this 2010 Work Plan are the following.

1. Evaluate the extent of creosote and/or dissolved phase constituents in groundwater that may exceed cleanup levels set forth in the ~~EPA Record of Decision (ROD)~~ROD (EPA 1989) as amended through subsequent Explanation of Significant Differences (ESDs) (EPA 1992, ~~and EPA~~ 1998)~~), hereafter referred to as the ROD~~. This will be achieved through the installation of additional borings and wells~~,~~ and collection of samples between the former CERCLA lagoon and wells S-84-15 and S-91-2.
2. Better assess the source of zinc in groundwater that exceeds the cleanup level in the ROD by replacing galvanized steel constructed wells S-85-5B, S-85-6B, ~~and~~ S-85-8A, and S-86-1 with wells constructed of poly vinyl chloride (PVC).
3. Replace monitoring wells S-3R and S-6, which have been dry during recent years, with wells completed with a deeper screen interval ~~wells~~.

Data obtained ~~from~~ during implementation of this 2010 Work Plan ~~this investigation~~ will be used in accordance with the provisions outlined in the 1991 Consent Decree, the Data Quality Objectives (DQOs) outlined in **Appendix C** of this 2010 Work Plan and the Quality Assurance Project Plan included as **Appendix E** of this 2010 Work Plan. In the event of conflict between this 2010 Work Plan and Consent Decree, the Consent Decree shall ~~control~~preside.

The scope of work is presented in Section 2.0. Section 3.0 briefly discusses major components of the Quality Assurance Project Plan (QAPP). A Health and Safety Plan (HASP) that specifies employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 29 Code of Federal Regulations (CFR) 1910.120(l)(1) and (l)(2) is ~~included as **Appendix F** to this Work Plan and is briefly~~ discussed in Section 4.0. Section 5.0 includes the schedule for completing all activities associated with this 2010 Work Plan while Section 6.0 describes the reporting requirements for these activities. Section 7.0 contains the references consulted in the development of this 2010 Work Plan.

2.0 Scope of Work

This chapter presents the scope of work to meet the objectives of additional data collection specified in Section 1.0, including data collection locations, discussion of the borings and monitoring wells that will be installed, types of data that will be collected, field methods for collection, laboratory analytical methods, and data collection locations[1]. Data collection activities will be conducted in a manner consistent with the procedures set forth in the Project Operating Procedures (POPs) ~~and~~ included in **Appendix A** of this 2010 Work Plan. The text procedures described in this 2010 Work Plan ~~supercedes~~supersedes any POP text if the 2010 Work Plan and POP differ but are not intended to modify the Consent Decree. ~~-~~Field investigation activities will be conducted in a manner consistent with the procedures set forth in the Consent Decree, this 2010 Work Plan as well as the Site-Specific ~~Health and Safety Plan (~~HASP~~)~~ ~~(AECOM 2009)~~ as amended for the additional work outlined in this 2010 Work Plan. **Figure 1** presents the site layout and the locations and proposed borings and monitoring wells.

2.1 Extent of Creosote and/or Dissolved Phase Constituents and Proposed TI Boundary Location

Additional activities are proposed to determine the extent of the creosote and/or dissolved phase constituents downgradient of the source area originating from the former CERCLA lagoon toward monitoring well S-91-2 to fulfill the primary objective of this 2010 Work Plan. The data collected during ~~this investigation~~implementation of this work plan and in future quarterly monitoring events will also help evaluate the stability of the plume and to verify that natural processes are present to aid in breaking down these constituents. The data will also help determine if the proposed TI and the existing CGA boundaries should be revised ~~to remain protective of human health and the environment~~ (**Figure 1**).

2.1.1 Boring Locations

Soil borings will be installed between existing wells S-93-5S and S-88-2 within the source area and well S-91-2 downgradient from the source area and proposed TI boundary to initiate field investigations that fulfill the primary objective and principal study question discussed in the DQOs in **Appendix C** of this 2010 Work Plan. Borings will be located as follows (**Figure 1**).

- Soil boring IB-1 is proposed to be installed approximately midway between S-93-5S and S-91-2 and will be located near Somers Road.
- Soil boring IB-2 is proposed to be installed approximately midway between S-88-2 and S-91-2. The location for this boring has been adjusted per Agency request and is outside the existing ~~controlled groundwater area~~ CGA.
- Soil boring IB-3 is proposed to be installed between the CERCLA lagoon borings CB-10 and CB-11 installed in 1991 as requested by the Agencies in their comments to the approach for the Somers field effort dated December 2, 2009 (**Appendix D**).

Actual boring locations may vary due to existing structures, utility locations, and/or conditions set forth in access agreements discussed in Section 4.1 of this 2010 Work Plan. If the location varies more than 50 feet from the location proposed in this 2010 Work Plan, placement will be determined in consultation with the Agencies and will be documented in the ~~Investigative~~ 2010 Data Collection Results Report. Soil borings IB-1

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[1] BNSF ~~shall promptly~~will provide ~~any~~ data resulting from the field investigation, validated or unvalidated, to EPA upon request not withstanding the schedule as specified in Section 5.0 of this Work Plan.

and IB-3 will be installed first as observations during the installation of these borings may affect the placement of IB-2.

Proposed monitoring wells S-10-1, S-10-2 and S-10-3 will be installed based on the groundwater results obtained from IB-1, IB-2, and IB-3 (**Figure 1**). If groundwater analytical results from boring IB-1, IB-2, and IB-3 exceed the groundwater target cleanup goals for the COCs at the Site, two wells (S-10-1 and S-10-2) will be installed downgradient of all the borings,~~;~~ outside the existing ~~controlled groundwater area~~CGA,~~;~~ and upgradient of monitoring wells S-84-15 and S-91-2; while the third well (S-10-3) will be installed at the closest proximity to the existing ~~controlled groundwater area~~CGA. If results do not exceed the groundwater target cleanup goals, S-10-1 and S-10-2 will be installed between borings IB~~-~~-1/IB-3 within the ~~controlled groundwater area~~CGA and IB-2 at the closest proximity to the existing ~~controlled groundwater area~~CGA boundary. Precise well locations will be determined through consultation with the Agencies and will be documented in the ~~Investigative~~ 2010 Data Collection Results Report.

2.1.2 Installation and Sampling Methods

Borings will be installed and sampled per the following protocol.

- Borings will be developed using Sonic or hollow stem auger (HSA) drilling to approximately 65 to 70 feet below ground surface (bgs) or until evidence of contamination is no longer observed, whichever is greater **(POP 210)**.
  - Each HSA section or the continuous Sonic core will be logged by a field scientist/engineer and recorded in the field logbook **(POP 210)**.
  - Portions of the soil sample will be placed in plastic bags and the headspace will be screened using a photo ionization detector (PID) after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook **(POP 310).**
  - A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized (**POP 006**). Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of **(POP 006)**.~~—~~ Soils and liquid will be managed as indicated in Section 4.2.

- ~~A grab sample of soil~~Soil samples will be collected if evidence of ~~contamination~~ creosote impacts (i.e. dark staining, hydrocarbon odors, or PID readings greater than 10 parts per million [ppm]) is encountered above the groundwater table. The interval from which samples are collected will be recorded in the field logbook, ~~as well as photos~~and photos will be taken of the soil boring as appropriate (**POP 210).** ~~Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110.**~~
  - Samples will be collected from the continuous Sonic core or from split spoons, depending on the drilling method used, where PID readings or staining indicates the greatest area of impact. Samples will be collected in accordance with **POP 210**.
  - Samples will be sent to Pace Analytical Services, Inc. (Pace) in Minneapolis, Minnesota and will be analyzed for total and carcinogenic polycyclic aromatic hydrocarbons ~~TPAH and CPAH~~(TPAH and CPAH, respectively) by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020. Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110.**
  - Split samples will be made available to the Agencies and the property owner upon request; however, there is a finite amount of soil available during boring installation and there may be an insufficient volume to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners. The Agencies will follow proper methods established in **POP 110** and **POP 210** if split samples are taken.

- Discrete groundwater samples will be collected at 15-foot intervals from the start of the groundwater table to the end of the boring~~.~~ (**POP 210**, and **POP 230**). ~~Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110.**~~
  - Samples will be collected by either:
    1. P~~p~~ulling back the sonic casing and installing a packer assembly or power punch into the exposed borehole and collecting groundwater at the desired depth. Samples collected using a packer assembly would be collected from a stainless screen attached to a ~~two~~ 2 inch diameter black pipe; the packer is inflated to isolate the desired depth interval and a bailer or peristaltic pump is used to collect the sample. Samples collected using a power punch would be collected by driving the sampler to the desired depth, pulling back on the sampler to expose the screen, and withdrawing the tool after a sufficient collection time has elapsed. – or –
    2. ~~advancing~~ Advancing a power punch sampling tool past the drilling auger at the desired depth and collecting groundwater from a three-quarter inch screen exposed at the desired depth by using a small diameter bailer or a peristaltic pump or by the method described above in sub bullet 1.
  - Samples will be sent to Pace and will be analyzed for ~~TPAH and CPAH~~PAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020; results will be evaluated against the ~~to see if they are below~~ ROD cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc). Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110.**
  - A 24-hour turnaround will be requested on groundwater samples collected from IB-1, IB-2, and IB-3 as results collected from these borings will determine the location of additional borings or monitoring wells.
  - Groundwater sampling logs will be completed and/or notes will be added to the field logbook and presented in the ~~Investigative~~ 2010 Data Collection Results Report (**POP 230**). If a sufficient volume of water can be collected, field readings of temperature, pH, and conductivity will be collected and recorded in the field logbook or on the groundwater sampling log.
  - Split samples will be made available to the Agencies and property owners upon request provided a sufficient volume of water can be collected from the boring.

- Borings will be abandoned following sample collection. Boring abandonment activities will be conducted in accordance with Montana Administrative Code 36.21.670. The boring will be filled with sealing material (bentonite) to within three feet of the surface to prevent vertical movement of groundwater in the bore hole. Any remaining hole will be filled with unimpacted or clean naturally occurring soils.

As indicated in Section 2.1.1, additional borings or monitoring wells will be installed based on the results obtained from samples collected from borings IB-1, IB-2, and IB-3. Wells will be installed and sampled per the following protocol.

- Wells will be drilled using Sonic or ~~hollow stem auger~~HSA drilling to approximately 65 to 70 feet ~~below ground surface (~~bgs~~)~~ or until evidence of contamination is no longer observed, whichever is greater.
- Each HSA section or the continuous Sonic core will be logged by a field scientist/engineer and recorded in the field logbook **(POP 210)**.
- A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized (**POP 006**). Any drilling mud or well development/purge liquid collected must also be

properly contained and disposed of (**POP 006**). – Soils and liquids will be managed as indicated in Section 4.2.

- Portions of the soil sample will be placed in plastic bags and the headspace will be screened using a ~~photo ionization detector (~~PID~~)~~ after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook **(POP 310)**.
- Grab samples of soil will be collected if evidence of contamination is encountered above the water table (i.e., dark staining, hydrocarbon odors). Soil samples will be collected in accordance with **POP 210**.
- The interval from which samples are collected will be recorded in the field logbook and photos will be taken ~~, as well as photos~~ of the soil borings as appropriate.
  - Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020.
  - Split samples will be made available to the Agencies and the property owner upon request if sufficient volume is available to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners.
- As requested by the Agencies in the December 2, 2009, correspondence (**Appendix D**)**,** a cross-section between existing wells and the new borings will be sketched. Geological, PID, and analytical data will be used to determine the appropriate groundwater sampling and screen placement intervals. The PID readings at the well locations and the information from the sketched cross sections will be used to select the most likely intervals where creosote impacts may be encountered. The sketched cross sections will be included with the descriptions of the work performed in the ~~Investigative~~ 2010 Data Collection Results Report.
- The wells will be completed as follows (**POP 006**):
  - Two inch diameter schedule 40 PVC casing and 0.010 inch slotted screen.
  - The wells will be screened over a 10 foot interval across the water table where evidence of creosote impacts is noted. If multiple zones of impacts are observed, screen placement will be determined through consultation with the Agencies. If no impacts are observed, the screen will be placed from 25 to 35 feet bgs since wells S-91-2 and S-88-2 are screened over a similar interval.
  - Surface completion will be done in consultation with the property owners. Completion may consist of a two to three foot stickup casing with a locking lid; bollards may be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well or the well may be completed as a flush-mount well.
- Groundwater samples will be collected from impacted intervals based on the cross-sections described above, field observations, and PID readings. If no impacts are observed, the well will be completed and developed and groundwater samples will be collected from the screened interval following well development. The depth to water will be measured and recorded prior to sample collection. (**POP 110**, **POP 221**, **POP 230**, and **POP 231**).
  - Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020; results will be compared to the ~~to see if they are below~~ ROD cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc).
  - A normal turnaround time will be requested.
  - Split samples will be made available to the Agencies and/or property owners upon request provided a sufficient volume of water can be collected from the boring.

2.2 Galvanized Steel Constructed Well Replacement

Wells S-85-5B, S-85-6B, ~~S-86-1 and~~ S-85-8A, and S-86-1 will be replaced with wells constructed with PVC casing and screen material to fulfill the first secondary objective of this 2010 Work Plan. The replacement wells will be installed approximately 25 feet upgradient from the existing wells to ensure these wells are installed outside of the influence of zinc suspected to originate from the galvanized steel casing used to construct the original wells. The replacement wells will be installed at a similar depth as the original wells using ~~two~~2-inch schedule 40 ~~-~~PVC. A 0.010 or 0.020 inch slotted screen will be used depending on the screen in the existing well that is being replaced. The well completion logs from S-85-5B, S-85-6B, ~~S-86-1 and~~ S-85-8A, and S-86-1 are included in **Appendix B**. New well completion logs will be created for S-85-5B, S-85-6B, ~~and~~ S-85-8A, and S-86-1 and have been designated S-85-5BR, S-85-6BR, ~~S-86-1R and~~ S-85-8AR, and S-86-1R and will be provided in the ~~Investigative~~ 2010 Data Collection Results Report.

- The wells will be completed as follows (**POP 006**):
  - Two inch diameter schedule 40 PVC casing and 0.010 or 0.020 inch slotted screen depending on the screen in the existing well that is being replaced
  - The replacement wells will be installed at a similar depth as the original wells
  - A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized~~-~~**.** Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of. – Soils and liquids will be managed as indicated in Section 4.2.
  - Completion may consist of a ~~two~~ 2 to ~~three~~ 3 foot stickup casing with a locking lid; bollards may be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well.

The replacement wells will be sampled during the regularly scheduled sampling event following installation~~.~~. Sample results collected during four consecutive events will be evaluated to determine compliance with the target cleanup goals for site COCs. If the replacement wells are determined to be in compliance after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011). If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, a monitoring plan will be developed in coordination with the Agencies.

Wells S-85-5B, S-85-6B, ~~and~~ S-85-8A, and S-86-1 will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2. Where possible, the casing will be removed from the ground. In the event that the casing cannot be removed, it will be cut off ~~three~~ 3 feet bgs~~.~~. The well will then be filled with sealing material (bentonite) to within ~~three~~ 3 feet of the surface. Any remaining hole will be filled with ~~un~~non-impacted or clean naturally occurring soils.

2.3 Background Well Replacement

Monitoring wells S-3R and S-4 were initially selected as the background wells for the Site in the FINAL Groundwater Treatment System Interim Monitoring Plan (Plan) submitted February 2008 (modified May 2008) (ENSR 2008a). Well S-3R is also designated as the background well for the LTU network. Because wells S-3R and S-4 have contained an insufficient volume of water to allow reliable sample collection, the revised Plan submitted in October 2009 (ENSR 2009) designated well S-86-1 as the background well.

Well S-86-1 was sampled in December 2009 following extensive well development **(POP 221)**. Analysis of samples collected from the well during the December 2009 event detected the presence of TPAHs and reported CPAH compounds above the ROD based cleanup levels. In addition, well S-86-1 contained zinc concentrations of 20.5 mg/L during the March 2010 groundwater sampling event. As a result, the Agency deemed S-86-1 not acceptable as a background monitoring well (**Appendix D**).

A replacement well for S-3R will be installed similar to, but will be screened deeper than, S-3R (see **Appendix B** for the well completion log from S-3R) if the bedrock elevation allows~~is not encountered first~~ and will be constructed with two-inch schedule 40 PVC casing and 0.010 slotted screen **(Figure 1**). A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized (**POP 006**). Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of **(POP 006)**. Soils and liquids generated during well installation will be managed as indicated in Section 4.2. Completion may consist of a two to three foot stickup casing with a locking lid; bollards may be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well.

A new well completion log will be created for S-10-3R and will be provided in the ~~Investigative~~ 2010 Data Collection Results Report. As the newly installed well is a background well and is being installed upgradient of the source area, impacted intervals are not expected to be encountered. Wells S-3R and S-4 will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2.

~~The r~~Replacement well S-10-3R will be sampled during the regularly scheduled sampling events following installation. Groundwater sample results will continue to be collected and reported quarterly during the remainder of the interim monitoring period. The newly installed well S-10-3R ~~**(Figure 1)**~~ will also be used as the LTU network background well for the remainder of the post-closure monitoring period.

2.4 Well S-6 Replacement

Monitoring well S-6 is included in the interim monitoring period plume stability network and also sampled as part of the land treatment unit post-closure monitoring program. This well regularly has an insufficient volume of water in the well to collect samples; therefore, a deeper well will be installed to replace S-6 (S-6R). The boring for monitoring well S-6R will be installed and sampled in the same fashion as borings IB-1, IB-2, and IB-3.

If soil and groundwater samples from the boring do not indicate the presence of COCs above target cleanup levels, the well will be installed similar to but screened slightly deeper than S-6 (see **Appendix B** for the well completion log from S-6). Monitoring well S-6R will be constructed with ~~two~~2-inch schedule 40 PVC casing and 0.010 slotted screen. A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized and any drilling mud or well development/purge liquid collected ~~must~~ will be properly contained and disposed of **(POP 006)**. Soils and liquids generated during well installation will be managed as indicated in Section 4.2. Completion may consist of a ~~two~~ 2 to ~~three~~ 3 foot stickup casing with a locking lid; bollards may be placed around the completed wells if protection from vehicular traffic is needed to prevent damage to the well. A new well completion log will be created for S-6R and will be provided in the ~~Investigative~~ 2010 Data Collection Results Report. If impacted intervals are encountered, the screen may be placed at the impacted interval. Well S-6 will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2.

Samples will be collected from the replacement well if impacts are observed in the boring (i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm). A soil sample will be collected and analyzed as described in Section 2.1.2 if impacted soil is observed above the groundwater table. Groundwater samples will be collected as described in Section 2.1.2 if impacted intervals are observed below the water table. A normal turnaround time will be requested on all samples as no additional boring locations will be dependent on results obtained from boring S-6R.

The replacement well will be sampled during the regularly scheduled sampling events following installation.

2.5 Well Development

Monitoring wells installed in conjunction with this 2010 Work Plan will be developed following installation to remove silt and other fine-grained sediments that may accumulate within the monitoring well during installation. Development will be done by the drilling company through one or a combination of techniques including surging and pumping (**POP 221**).

- Pumping involves using a pump to evacuate water and silt from the well.
- With surging, a tool is used to scour the screened interval in an up and down repetitive motion, causing the groundwater to surge in and out through the screen and forcing fines out of the formation.

The monitoring wells will be developed until water is relatively free of sediment or until all of the groundwater has been removed. The ~~Investigative~~ 2010 Data Collection Results Report will indicate the development methods used. Water generated during well development activities will be collected, drummed, and analyzed as indicated in Section 4.2.

2.6 Well Survey

All wells and boring locations will be surveyed by a licensed surveyor as part of the upcoming Agency Five-~~-~~Year Review which is scheduled to be completed by September 2011. Surveying will be provided by Montana licensed professional land surveyor. Surveying will be based on the horizontal datum of NAD 83 Montana State Plane Feet and the vertical datum of NAVD 88. Positional accuracy of the survey will meet the Accuracy Standards for ALTA/ACSM Land Title Surveys, as adopted by the American Land Title Association and the National Society of Professional Surveyors. The well elevations obtained will be incorporated in all future routine sampling and well gauging events.

3.0 Quality Assurance and Project Plan

When sampling and analyzing samples, appropriate quality assurance/quality control and chain of custody procedures ~~shall~~ will be used ~~that are~~ in accordance with EPA's "Requirements for Quality Assurance Project Plans" and any other pertinent EPA guidance. These requirements are incorporated in the ~~Quality Assurance Project Plan (~~QAPP~~)~~ that ~~has~~ was prepared for the Site during the remedial investigation process in 1985~~been prepared, submitted and~~; an updated QAPP is~~ ~~ included as **Appendix E** pursuant to this 2010 Work Plan. Major components of the QAPP are discussed below.

3.1 Decontamination

All sampling equipment will be subject to appropriate decontamination protocol~~.~~ (**POP 110, POP 120**). To assess the adequacy of decontamination procedures, rinsate or equipment blanks should be collected and analyzed for the same parameters as the field samples. In general, ~~one~~ 1 rinsate blank will be collected per 20 ~~-~~samples.

3.2 Chain of Custody

All samples will be shipped overnight to the project laboratory. Sample collection, storage, and shipment will follow chain of custody protocol ~~-~~outlined in the QAPP and **POP 110**.

~~Sample language to consider as part of this Section~~

3.3 Laboratory Data Validation and Usability

Data validation is a process of review of the analytical results and documentation against established criteria. The Laboratory Quality Control Officer is responsible for performing the validation.

The precision and accuracy of all data will be computed and compared to the control limits as part fo the data validation process. The precision is determined from the analytical results of duplicate samples; accuracy is computed from spike recoveries.

The results of all other quality control checks will be reviewed in terms of the following criteria:

- Method blank values should be reasonably low, so that there is no evidence of contamination of reagents and glassware.
- Shipping or trip blank values should also be reasonably low, indicating that samples have been adequately protected from contamination.
- The daily calibration curves should be linear over their entire range, and all samples analyzed should be within that range.
- Surrogate recoveries (as applicable) should be within control limits.

If any of the above criteria are not met, the Laboratory Supervisor and Project Manager will be notified and will meet with the Laboratory Control Officer to discuss remedies and the status of the data.

For each batch of analyses, supporting documentation will be reviewed for completeness, correctness, and legibility.

~~Laboratory data validation and verification will begin at the sample log-in stage where a sample log-in technician or chemist will compare received samples against chain of custody forms and document sample condition (damage, temperature, etc.). Validation and verification of data will be performed by QA/QC personnel following USEPA National Functional Guidance (EPA 2002) in order to determine if the data quality objectives were met. Sample data deemed outside the expected range will be investigated, communicated to~~

~~the analytical chemistry staff, flagged (if needed) and potentially re-sampled to verify or discredit the data. Data that have proven to be incorrect may be flagged, further reviewed, or invalidated. The cause of incorrect data will be investigated and appropriate response actions will be taken, including communication of any issues to the user in the data report.~~

~~Uncertainty of validated data will be evaluated by the project manager to determine if the data quality objectives were met. In the event that the data quality objectives were not met, they will be reviewed to determine if they are achievable and may be revised if necessary, and the data may be further evaluated to determine the impact to the project. Data usability and limitations will be evaluated by the laboratory project manager.~~

~~Full Verification~~

~~Full verification will be conducted on data generated on analytical instrumentation that does not provide an electronic output. This will be performed to ensure that data were produced in accordance with procedures outlined in the QAPP. The following elements will be reviewed for compliance as part of the full data verification:~~

- ~~Methodology~~
- ~~Holding Times~~
- ~~Calibration~~
- ~~Blanks~~
- ~~Spikes~~
- ~~Duplicates~~
- ~~LCSs~~
- ~~Reporting Limits~~
- ~~Analyte Identification~~
- ~~Analyte Quantification~~
- ~~Comparison of hardcopy results to EDD~~

~~3.4 Abbreviated Data Verification~~

- ~~Abbreviated verification will be completed on 10% of the analytical results. This will be performed to ensure that data were produced in accordance with procedures outlined in the QAPP. The following elements will be reviewed for compliance as part of the abbreviated data validation:Holding Times~~
- ~~Calibration~~
- ~~Blanks~~
- ~~Spikes~~
- ~~Duplicates~~
- ~~LCSs~~
- ~~Reporting Limits~~
- ~~Analyte Quantification~~
- ~~Comparison of hardcopy results to EDD~~

~~3.5~~3.4 AECOM Data Validation

The analytical data will be validated ~~for 10% of the results~~ by a designated AECOM Quality Assurance officer. ~~The v~~Validation will include reviewing ~~10% of~~ the ~~samples~~ analytical results for ~~100% of~~ the ~~analytical~~ analysis performed and reported.

This will be performed to ensure that data were produced in accord with procedures outlined in this project plan. The following elements will be reviewed for compliance as part of the abbreviated data validation:

- Holding Times
- Instrument Calibration
- Method Blanks
- Matrix Spikes
- Laboratory Duplicates
- Laboratory Control Spikes
- ~~LCSs~~
- Reporting Limits
- Analyte Identification
- Analyte Quantification
- Comparison of hardcopy results to Electronic Data Deliverable (EDD)

~~3.6~~3.5 Data Quality Assessment

Information obtained through the implementation of this 2010 Work Plan ~~from the Field Investigation~~ will be evaluated through the Data Quality Assessment (DQA) process to determine if the data obtained are of adequate quality and quantity to support their intended use. The DQA process consists of five steps, as summarized below (~~US~~EPA ~~1998,~~ 2000~~b~~):

1. Review the DQOs (**Appendix C** of this 2010 Work Plan) and Sampling Design: DQO outputs will be reviewed to ensure that they are still applicable. The sampling analysis and data collection documentation will also be reviewed for completeness and consistency with DQOs.
2. Conduct a Preliminary Data Review: Data validation reports will be reviewed to identify any limitations associated with the analytical data. Basic statistics will be utilized by the laboratory where applicable and meaningful graphs of the data will be prepared. This information will be used to learn about the structure of the data and to identify patterns, relationships or potential anomalies/outliers.
3. Select the Statistical Method: Select the appropriate procedures for summarizing and analyzing the data, based on the review of the performance and acceptance criteria associated with the project objectives, the sampling design, and the preliminary data review. Identify the key underlying assumptions associated with the statistical tests.
4. Verify the Assumptions of the Statistical Method: Evaluate whether the underlying assumptions hold, or whether departures are acceptable, given the actual data and other information about the study.
5. Draw Conclusion from the Data: Perform the calculations necessary to draw reasonable conclusions from the data. If the design is to be used again, evaluate the performance of the sampling design.

Uncertainty of validated data will be identified in the report and evaluated by the Site team identified in **Appendix C** to determine if the ~~data quality objectives~~DQOs were met. In the event that the ~~data quality objectives~~DQOs were not met, they will be reviewed to determine if they are achievable and may be revised if necessary, and the data may be further evaluated to determine the impact to the project. Data usability and limitations will be evaluated by the Site team.

4.0 Health and Safety

A ~~site-specific health and safety plan (HASP)~~HASP has been developed for the Somers site. The HASP is reviewed annually and updated ~~annually~~as needed. The HASP contains emergency contact information and directions to the hospital, as well as information on hazards generally present on AECOM field sites. A copy of the HASP is included as **Appendix F** of this 2010 Work Plan and will remain on-site in the treatment building office throughout the data collection activities; all personnel working on site must read and sign the HASP. Task Hazard Analyses (THAs) have been prepared for tasks expected during the additional activities and are included in the HASP.

Safety equipment is available on site and personnel involved in the work activities need to be familiar with its proper use and location. Equipment includes the safety shower eyewash station and fire extinguishers. Minimum personal protective equipment (PPE) requirements include safety glasses with side shields, hard hats, and steel-toed boots. Gloves shall be worn when handling equipment and materials. Nitrile or other chemically impervious gloves shall be worn when working with contaminated liquids or sludges. Orange vests will also be worn when working around moving vehicles or near public roads.

Below is a list of general safety guidelines which will be followed during the additional data collection activities.

- All contractors will have completed the BNSF Contractor Orientation Training prior to conducting work on site. Annual certification is required.
- All manufacturers' recommended safety precautions for all chemicals will be followed. Refer to the Material Safety Data Sheets (MSDS) located in the HASP.
- A task or job hazard analysis will be conducted prior to performing interim monitoring tasks. If a THA already exists for the activity, it will be reviewed by all personnel involved in the task. New THAs will be filed in the HASP.
- All required PPE shall be worn while conducting work on site.
- Special precautions will be taken with moving liquids. This requires the use of protective clothing and maintaining a safe distance.
- When installing wells outside of the fenced Site, exclusion zones will be established around working areas to protect untrained and unqualified individuals.
- Utility locates will be conducted prior to installing borings and wells.
- All personnel are empowered to stop work activities if a deviation from planned activities occurs or if an unsafe condition is present.

4.1 Access Agreements

~~The borings and monitoring wells proposed to determine the extent of the dissolved plume are located off of BNSF owned property.~~ Owners of the property where borings and wells may be located will be contacted sufficiently in advance to allow time for obtaining access – ~~–~~no less than 30 days prior to commencing work. BNSF shall make best efforts to locate borings and wells away from structures and utilities. BNSF shall also use best efforts to obtain written access agreements to such property. Such agreements shall ensure access for the United States and it authorized representatives. If BNSF is unable to obtain access within that time frame, no later than 27 days prior to the time access is needed, BNSF shall notify EPA of the failure to obtain access, and the efforts made to obtain it.

If BNSF is unable to obtain access, where EPA has determined it to be necessary for carrying out the work under this 2010 Work Plan, EPA may then assist BNSF in gaining access, to the extent necessary to effectuate the investigations described in this Work Plan, using such means as EPA deems appropriate. EPA may at its discretion also consider alternate locations, including but not limited to existing County rights-of-way on the property, as appropriate. If EPA determines that placing the well/boring in a County right-of-way is acceptable (in the event a property owner refuses access), BNSF agrees it will make best efforts to obtain access for such placement from the County. Nothing in Section 4.1 is intended to modify the Consent Decree.

No personnel or individuals shall be allowed within the work area without prior approval. Property owners will be notified of the work activities and health and safety concerns. Access to the work area will be controlled with barricades, temporary fencing, or other means to limit entry. The AECOM field manager will be responsible for ensuring unauthorized access to the work area is prevented.

If a monitoring well is installed off of BNSF owned property, an access agreement will be drafted with which the property owner will grant BNSF and the Agencies access to the well for future monitoring and operation and maintenance.

4.2 Data Collection-Derived Waste Management

Waste material including but not limited to soils and liquids generated during the field work will be containerized and stored within the fenced area of the Somers Site until appropriate disposal can be arranged. “Waste Material” shall mean 1) any “hazardous substance” under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); 2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); 3) any “solid waste” under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and 4) any “hazardous waste” under State law.

4.2.1 Soils

A composite sample will be collected from the containerized soil and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, zinc by EPA Method 6020 and potentially other methods required to appropriately profile the waste. Soil cuttings that are non-hazardous will be spread on the ground surface within the fenced area of the Site. If soil cuttings are determined to be hazardous waste (F034), they will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

4.2.2 Liquids

Liquid produced during sampling and decontamination activities will be collected, drummed, and analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020. Liquid that does not exceed the ROD target cleanup levels (40 μg/L for TPAH, 0.030 μg/L for CPAH, and 5 mg/L for zinc) will be poured onto the ground surface within the fenced area of the Site. If collected liquid exceeds the ROD target cleanup level, the drums will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

5.0 Schedule

The schedule for the scope of work included in his Work Plan is as follows:

- Final Draft Work Plan for Additional Data Collection submittal – July ~~16~~30, 2010 (submittal of Attachments by August 31, 2010)
- Receive Agency approval of Work Plan – ~~July 31~~August 17, 2010
- Access Agreements in Place – No later than September 30, 2010
- Complete Field ~~Investigation~~ Activities – October 31, 2010
- Submit Draft ~~Investigative~~ 2010 Data Collection Results Report – December 31, 2010
- Submit Final 2010 Data Collection ~~Investigative~~ Results Report – 30 days after receipt of Agency comments

6.0 Reporting

Upon completion of field activities and receipt of analytical results, ~~an investigative results report~~2010 Data Collection Results Report shall be prepared and submitted to the Agencies for review and approval. The draft report, due on December 31, 2010, will include but not be limited to the following information:

- Description of all activities conducted under this 2010 Work Plan
- Deviations to the p~~P~~lanned work
- Access agreements
- Evaluation of data quality
- Boring and/or well logs
- Analytical results for both soils and groundwater, in summary table format, including comparison to the cleanup levels in the ROD
- Water levels measured
- Cross sections and lithology diagrams
- Copies of field logbooks and photos taken
- Field data
- ~~Contaminant~~ COC concentration contour diagrams

The final ~~investigative results report~~2010 Data Collection Results Report shall be submitted 30 days after receipt of Agency comments, and shall include a formal response to Agency comments.

7.0 References

AECOM. 2010. Second Annual Interim Monitoring Report. BNSF Former Tie Treatment Plant. Somers, MT. May 2010.

______. 2009. First Annual Interim Monitoring Report. BNSF Former Tie Treatment Plant. Somers, MT. April 2010.

Applied Water Consulting. 2010. Preliminary Subsurface Investigation Report for the Ortiz and Able Properties in Somers, Montana. January 2010.

ENSR. 2009. Revised Groundwater Treatment System Interim Monitoring Plan, BNSF Former Tie Treatment Plant, Somers, MT. October 2009.

______.~~ENSR.~~ 2008. Final Groundwater Treatment System Interim Monitoring Plan, BNSF Former Tie Treatment Plant, Somers, MT. February 2008, revised May 2008.

~~.~~______.~~,~~ 2007. Groundwater Treatment System Interim Shut-Down Plan. October 2007.

EPA.~~,~~ 2009. Letter to David M. Smith, BNSF. RE: Agency Comments on the Revisions to the Interim Monitoring Plan Resulting from Comments on the Annual Report, BNSF Former Tie Treatment Plant, Somers, Montana. July 15, 2009.

______.~~,~~ 2007. Letter to David M. Smith, BNSF. RE: Agency Comments on the Revised Draft Groundwater Treatment System Interim Shut-Down Plan. October 5, 2007.

______.~~,~~ 2000. Guidance for Data Quality Assessment, Practical Methods for Data Analysis, EPA QA/G-9, QA00 UPDATE. July 2000.

______.~~,~~ 1998. Explanation of Significant Differences, Burlington Northern (Somers Plant) Site, Flathead County, Montana. July 1998.

______.~~,~~ 1992. Explanation of Significant Differences, Burlington Northern (Somers Plant) Site, Flathead County, Montana. June 1992.

______.~~,~~ 1989. Record of Decision Burlington Northern (Somers Plant) Superfund Site Flathead County, Montana. September 1989.

~~.~~USA.~~,~~ 1991. Consent Decree for Remedial Design/Remedial Action (Civil Action No. CV-91-32-M-CCL). United States of America District Court Missoula Division. February 1991.

~~AECOM. 2009.~~

~~AECOM. 2008.~~

~~USEPA. 2000b.~~

~~USEPA. 1998.~~

AECOM

BNSF RAILWAY COMPANY SOMERS, MONTANA (60147072-510)	ADDITIONAL SITE INVESTIGATION SITE MAP
DATE: 5/3/10 DRWN: LP/FTC	FIGURE 1

File: S:\CADD\CADD FORT COLLINS\BNSF Somers\60136257\Additional Site Investigation Map.dwg Layout: Layout1 User: paull Plotted: May 03, 2010 – 1:18pm Xref's:

Appendix A

Project Operating Procedures (POPs)

~~Agency comments on POPs~~

1. ~~POP 006 does not contain Sections 1-4 (pages 1& 2 of the POP~~
2. ~~POP 006, Section 8.2 appears to have residual language discussing the Iowa DNR.~~
2. ~~POP 210, Section 5.3 discusses the notation of contamination using high, medium, and low, and corresponding to a percentage of oil contamination. Is this classification conducted in the field, and is it solely at the discretion of the field geologist?~~
3. ~~POP 210 provides a boring log form for logging lithology and samples. The form provided is not familiar to Andrew. Does AECOM use a traditional boring log form, or is the attached form used to create a more typical boring log? Presumably PID observations would be recorded in the "sample description" section? Andrew would like to talk to AECOM about this form.~~
4. ~~POP 230, Section 5.2 is not terribly clear in differentiating low flow sampling methodology versus sampling after three casing volumes are removed.~~
5. ~~POP 231 provides a Fluid-Level Monitoring Log, however, the log does not have a column for depth to product and thickness of product, if present.~~

Appendix B

Boring and Well Logs

Appendix C

Data Quality Objectives

1.0 Data Quality Objectives

The Data Quality Objective (DQO) process is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. These DQOs shall also be the determinative factor for assessing the success or failure of the sampling. EPA has issued guidelines to help data users develop site-specific DQOs (EPA, 2000). The DQO process is intended to:

- Clarify the study objective;
- Define the most appropriate type of data to collect;
- Determine the most appropriate conditions from which to collect the data; and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the design

1.1 Data Quality Objective Process

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate data are justified. The DQO process consists of seven steps; the output from each step influences the choices that will be made later in the process. These steps are as follows:

Step 1: State the problem

Step 2: Identify the decision

Step 3: Identify the inputs to the decision

Step 4: Define the study boundaries

Step 5: Develop a decision rule

Step 6: Specify tolerable limits on decision errors

Step 7: Optimize the design

During the first six steps of the process, the planning team[1] develops decision performance criteria that will be used to develop the data collection design. The final step of the process involves developing the data collection design based on the DQOs. A brief discussion of these steps and their application to this Work Plan is provided below.

1.1.1 State the Problem

The problem at the ~~At the~~ BNSF Railway Co. (BNSF) Former Tie Treating Plant in Somers, Montana (Site) is threefold.~~, a~~

1. A dissolved creosote constituent groundwater plume had been contained by a groundwater recovery system (GWTS) located in the former CERCLA lagoon and treated at an onsite water

[1] Includes EPA, MDEQ and BNSF Railway representatives

treatment plant ~~(GWTS)~~. However, BNSF requested termination of the GWTS in 2007 based on modeling results that indicated creosote-impacted groundwater from the Site is not likely to migrate to either the town well or Flathead Lake given the due to geologic conditions of the aquifer and the low mobility of the dissolved creosote constituents of concern (COCs) present onsite~~the groundwater contamination is not likely to migrate~~, whether or not the GWTS is operating~~, due to geologic conditions that the movement of groundwater and creosote onsite~~. Approval to shutdown GWTS operations for an interim period was granted in October 2007. Since that time, BNSF has collected quarterly monitoring data to evaluate the stability of the dissolved creosote constituent plume and to verify that natural processes are present to aid in breaking down creosote constituents.

~~Review of groundwater data collected during the interim monitoring period indicates a possible increasing trend in phenol concentrations (particularly 2,4-Dimethylphenol) in S-91-2 suggesting that the dissolved phase plume may be migrating laterally and vertically beyond the proposed technical impracticability (TI) and controlled groundwater area (CGA) boundaries.~~

Recent investigations on ~~the~~ neighboring ~~Ortiz and Abel~~ property (Applied Water Consulting, 2010 – Figure 1) have ~~also~~ indicated that creosote and/or dissolved phase constituents above the ROD cleanup levels ~~have migrated~~are present in the subsurface beyond the proposed TI boundary.

2. ~~In addition to the potential migration of the dissolved phase creosote plume, s~~Several monitoring wells have concentrations of zinc above ROD cleanup levels. The wells with concentrations of zinc above ROD cleanup levels were constructed of galvanized steel casings and it is hypothesized that the exceedances are a result of these casings.

~~2.~~3. Monitoring wells installed upgradient from the site for the purpose of monitoring background conditions have contained an insufficient amount of water to collect samples.

Based on the above observations, additional site investigations and monitoring are proposed. The ability to determine whether the proposed technical impracticability boundaries and the existing controlled groundwater area need revision in order to be protective of human health and the environment depends on the results of this field investigation and future monitoring.

1.1.2 Identify the Decision

The purpose of this step is to define the decision statements this study will attempt to resolve. Decision statements are developed by combining principal study questions (PSQs) and alternative actions (AAs). PSQs are derived from the problem statement presented in Section 2.1.1. For each PSQ, AAs are developed (including no action alternative if appropriate) that indicate what action will be taken after each PSQ is answered. Data collected from this study will be incorporated into the larger Site dataset for decision making purposes. The PSQ is as follows:

Principal Study Question: Evaluate the vertical and horizontal extent of creosote and dissolved phase constituents of concern (COCs) in groundwater in the area between the former CERCLA lagoon and well S-91-2 that may exceed cleanup levels set forth in the EPA ROD.

Based on this principal study question, the following alternative actions have been developed:

Alternative Action (1): Recommend that no additional borings and monitoring wells be completed and that the existing groundwater monitoring network be used to guage potential migration of creosote or dissolved phase constituents; or

Alternative Action (2): Recommend additional data collection efforts to better define the horizontal and vertical extent of the dissolved creosote constituents and zinc in groundwater and determine if the existing boundaries of the CGA and proposed TI area need to be expanded to remain protective of human health and the environment.

The principal study question and the alternative actions were combined to form the following decision statement:

Decision Statement: Determine whether or not existing data and data collected during ~~the upcoming field investigation~~implementation of the Work Plan for Additional Data Collection (2010 Work Plan) are sufficient to better define the horizontal and vertical extent of the dissolved constituents of concern and to determine if the existing boundaries of the proposed TI or CGA need to be revised~~ to remain protective of human health and the environment~~. Determine if observed zinc exceedances are associated with galvanized steel casings. Determine if a deeper well can be installed to monitor background conditions for the Site.

1.1.3 Identify the Inputs to the Decision

The purpose of this step is to identify the information inputs needed to support the decision statement and to specify which inputs will require environmental measurements. Table 2.1 presents the data inputs needed and shows the relationship between the data inputs and evaluation criteria and performance goals.

1.1.4 Define the Study Boundaries

The purpose of this step is to clarify the site characteristics that the environmental measurements are intended to represent. This step includes the following activities (1) specifying the characteristics that define the media of interest, (2) defining the spatial boundary of the decision statement, (3) defining the temporal boundaries of the decision, (4) defining the scale of decision making, and (5) identifying any practical constraints on data collection. These activities are briefly discussed below.

Characteristics That Define the Media of Interest: The media of interest associated with the primary objective is creosote impacted soil or non-aqueous phase creosote that acts as a continuous source of the dissolved creosote constituent groundwater plume. This ~~contaminated~~ impacted media, which is likely present beyond the CERCLA lagoon is the primary target of possible future response actions (e.g. revision to the TI or CGA)..

The media of interest associated with the secondary objective is zinc that may be associated with the galvanized steel casings installed in wells S-85-5B, S-85-6B, ~~and~~ S-85-8A, and S-86-1 acting as a continuous source of the dissolved zinc that continues to be detected above ROD cleanup levels in samples collected from these wells.

The media of interest associated with the tertiary objective is groundwater that has decreased in elevation over time

Spatial Boundary of the Decision: The spatial boundary of the former land treatment unit (LTU) and upgradient monitoring well S-3R to the west, ponded and marshy areas beyond monitoring well cluster S-85-5 to the north, monitori~~9~~ng wells S-84-15 and S-91-2 to the east and Flathead Lake to the south. These boundaries are further divided into investigative subsets about which independent decisions can be made. The spatial boundaries are dynamic and can be modified if field observations indicate a need to modify the boundaries of the study.

Temporal Boundaries of the Decision: The field investigations are anticipated to be completed by October 31, 2010. Monitoring of the proposed monitoring wells will occur quarterly for a minimum of one year following installation. If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, a monitoring plan will be developed in coordination with the Agencies. ~~Additional monitoring of the proposed monitoring wells will occur for a minimum of one year following installation and may extend into perpetuity~~.

TABLE 1.1
SUMMARY OF DATA INPUT NEEDS

Evaluation Criteria	Performance Goals of In Situ Remedy	Proposed Performance Level	Data Needed to Estimate Performance	Source of Data
Long-Term Effectiveness and Permanence	Achieve conditions that are compatible with planned future use of the site.	For the media treated, achieve RAOs specified in the ROD and/or ~~propose a~~finalize the proposed technical impracticability waiver if these RAOs cannot be achieved.	Contaminant concentrations over time following monitoring well installation.	Environmental sampling
Reduction of Toxicity, Mobility, or Volume	Reduce effort needed to maintain long-term remedial operations at the site.	If GWTS is permanently discontinued, ensure impacted groundwater that does ~~not~~ exceed the ROD cleanup levels does not migrate outside of existing CGA and proposed TI boundary.	Contaminant concentrations over time. Additional lithologic information.	Environmental sampling Soil borings
Short-Term Effectiveness	Maintain subsurface conditions that are compatible with the operation of the existing groundwater collection and treatment system.	At the boundaries of the proposed technical impracticability boundary, maintain the RAOs specified in the ROD.	Contaminant concentrations in groundwater at sentinel and Point of Compliance wells to be determined.	Environmental sampling
Cost	Reduce long-term costs	Performance level to be determined by stakeholders.	Estimated cost of interim response actions and long-term monitoring	Cost estimate, rough (-30%, +50%).
Compliance with ARARs	Comply with ARARs identified in the ROD.	ARARs compliance	Contaminant concentrations over time.	Environmental sampling

Scale of Decision Making: The study area is divided into investigative subsets that represent different study areas. Independent decisions may be made for each of these areas. These areas are described as primary and secondary objectives as proposed:

Primary Objective: Evaluate the extent of dissolved creosote constituents in groundwater that may exceed cleanup levels set forth in the EPA ROD. The results of this investigation and additional quarterly monitoring will be used to determine if the boundaries of the existing Controlled Groundwater Area and the proposed technical impracticability area need to be revised ~~to remain protective of human health and the environment~~.

Secondary Objective: Better assess the source of zinc in groundwater that exceeds the cleanup level in the ROD by replacing galvanized steel constructed wells S-85-5B, S-85-6B, and S-85-5A with poly vinyl chloride constructed wells. The results of this investigation and additional quarterly monitoring will be used to determine long term monitoring requirements as well as to determine if the proposed technical impracticability area around nested wells S-85-5A and S-85-5B is necessary as well as determine if the existing controlled groundwater area that covers the former LTU Area can be lifted and still remain protective of human health and the environment.

Tertiary Objective: Replace monitoring wells S-3R and S-6 with deeper screened wells to allow for better potentiometric maps to be developed and to provide analytical data representative of background conditions. Due to drought conditions in the region, the groundwater table has dropped 3 to 4 feet since the wells were constructed and have had insufficient volume to collect a sample during the interim monitoring period.

Practical Constraints of Data Collection: Practical constraints of data that will be collected include the physical and administrative access to the properties not owned by BNSF ~~Railway Company~~ as well as existing structure and buried utilities associated with the all the properties where borings and monitoring wells are planned to be completed. In addition, a sufficient volume of water may not be available for the collection of groundwater at each desired depth due to the geologic conditions at the site.

1.1.5 Develop a Decision Rule

The decision rule states what regulatory response action would be appropriate depending on whether a chosen parameter is greater or less than the action level. For this study, groundwater and soil analytical results will be compared with ROD based cleanup levels. Groundwater and soil analytical results and field chemistry measurements from this event as well as future groundwater analytical results will be used to support future site decisions.

Decision Rule Primary Objective: If data collected during this upcoming field investigation and future quarterly monitoring events indicate that the dissolved phase constituents above target cleanup goals extends, or has the potential to extend, beyond the existing Controlled Groundwater Area (CGA)~~CGA~~, ~~then discussions with Flathead County Board of Health are appropriate to~~to the need to expand the original boundaries of the CGA ~~Controlled Groundwater Area~~ pursuant to Section 85-2-506 and 508, MCA as amended will be evaluated.

If data collected during this upcoming investigation indicate that the dissolved phase constituents ~~does~~ do not extend, or has the potential to extend, beyond the existing CGA, ~~than~~ then site wide quarterly monitoring will continue to ensure the plume stability.

Decision Rule Secondary and Tertiary Objective: If the replacement wells are determined to be in compliance after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year

Review in 2011).

If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, a monitoring plan will be developed in coordination with the Agencies.

1.1.6 Specify the Tolerable Limits on the Decision Errors

The purpose of this step is to specify the tolerable limits on decision errors, which are used to establish performance goals for the data collection design, and discuss how decision errors will be addressed. For ~~this~~ the 2010 Work Plan, the boring and monitoring locations as well as the number of samples (which can impact the statistical power associated with the sample approach) were established based on previous investigations, discussions between the Agencies, BNSF and its representatives, and Agency direction. These are specified in Section 3.0.

In order to mitigate the potential for false positive and/or false negative errors associated with field sampling, sample collection processes will be consistent with established and relevant Project Operating Procedures (POPs) included as attachment A to ~~this~~ the 2010 Work Plan. This includes collection of duplicate samples (and subsequent comparison to primary samples using relative percent difference (RPD) statistics), implementing a decontamination procedure (which may include the use of disposable sampling equipment), and the collection of field blanks.

For laboratory analysis of samples, quality assurance/quality control (QA/QC) steps (such as the use of laboratory controls, matrix spikes, matrix spike duplicates, blanks, etc.) will be consistent with previous QA/QC procedures used at this Site. In addition, split samples may be taken to evaluate laboratory analytical performance. This will be at the discretion of the Agencies and property owners provided a sufficient volume of groundwater can be collected from the boring.

1.1.7 Optimize the Design

The purpose of this step is to identify the most resource-effective data collection design for generating data expected to satisfy the DQOs specified in the preceding six steps. For this sampling event, the sample locations and the investigative approach were selected based on the results of previous sampling efforts at this site; discussions between the Agencies, BNSF and its representatives, and existing data needs.

Appendix D

Correspondence Pertaining to Work Plan

Appendix E

Quality Assurance Project Plan

Appendix F

Health and Safety Plan

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Friday, July 30, 2010 3:45 PM
To: Young, Shelly
Cc: lidewitt@mt.gov
Subject: Re: BNSF Somers - Final Draft 2010 Work Plan

Figure 1 doesn't contain a proposed location for replacement well S-86-1R nor the contingency well S-10-3 (as close to edge of CGA). As long as a revised Figure is provided by August 31 (per Section 5.0) there is no need to submit this figure prior to then.

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| From: |
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 |"Young, Shelly" <Shelly.Young@aecom.com>
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| To: |
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 |Roger Hoogerheide/MO/R8/USEPA/US@EPA
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 |<lidewitt@mt.gov>, Andrew Schmidt/R8/USEPA/US@EPA, "Smith, David M"
<David.Smith4@bnsf.com>, "Colpitts, Ann" <Ann.Colpitts@aecom.com>, |
 |"Gilliland, Nancy" <Nancy.Gilliland@aecom.com>
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|BNSF Somers - Final Draft 2010 Work Plan |
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Hi Roger,

Attached to this e-mail are the Word and PDF files for revised Final Draft 2010 Work Plan. The PDF file shows the revisions BNSF and AECOM made to the June 30, 2010 work plan revised by the Agencies as redline/strikeouts. The Agency revisions were accepted in the document so only BNSF/AECOM changes are shown. For the purpose of keeping the TOC straight, the DQOs in Appendix C have been saved as a separate Word file. The Word documents have accepted all modifications and do not include tracked changes. The remaining appendices will be included in the final document anticipated for submittal in late August following Agency approval of this Final Draft Work Plan.

One hard copy of each document (changes accepted and redline/strikeout) have been sent to you (Roger and Lisa). A CD is included in the package and contains the Word and PDF files.

Please let me know if you have any questions.

Thanks!

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[attachment "2010 Work Plan_Final Draft_e-mail.pdf" deleted by Roger Hoogerheide/MO/R8/USEPA/US] [attachment "2010 Work Plan_Final Draft_Redlines_e-mail.pdf" deleted by Roger Hoogerheide/MO/R8/USEPA/US] [attachment "2010 Work Plan_Final Draft.docx" deleted by Roger Hoogerheide/MO/R8/USEPA/US] [attachment "Appendix C Data Quality Objectives.docx" deleted by Roger Hoogerheide/MO/R8/USEPA/US] [attachment "Figure 1_Additional Site Investigation Map.pdf" deleted by Roger Hoogerheide/MO/R8/USEPA/US]

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Tuesday, August 17, 2010 2:00 PM
To: Young, Shelly; Colpitts, Ann; Smith, David M
Cc: lidewitt@mt.gov; Schmidt.Andrew@epamail.epa.gov
Subject: Comments on the Final Draft Work Plan for Additional Data Collection
Attachments: 2010 Work Plan - Appx C - APS comment v2.docx; 2010 Work Plan_Final Draft.docx

(See attached file: 2010 Work Plan - Appx C - APS comment v2.docx)

(See attached file: 2010 Work Plan_Final Draft.docx)

The Schedule in Section 5.0 of the Final Draft Work Plan specifies that Agency approval will be received today. However, we have revised that schedule to Friday August 20 to allow you time to look over the changes. Appendix C may look like major modifications but it is more cut and paste various Sections that had already been reviewed to make it flow better. Please let us know by 12:00 pm Friday about these changes and we will provide a signed approval letter for the record. If you wish to discuss these changes please let us know ASAP when you are available to discuss. I will be out Weds through Friday next week and Andrew is out after this Thursday for two weeks so we have a limited window to discuss.

Please note that the following sentence has been inserted in several places throughout the document:

"Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011)."

As a point of clarification, HQ policy on 5 years reviews where waste has been left in place above levels that allow for unlimited use and unrestricted exposure recommends that all monitoring wells be sampled every five years in order to make a long-term groundwater protectiveness statement Given the need to begin collecting data for the five year review, I propose that we discuss the Agencies' data needs for the five year review soon so that the appropriate data can be collected in time to be available for the review.

AECOM

Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, Montana
60136257
July 2010

Final Draft Work Plan for Additional Data Collection

BNSF Former Tie Treatment Plant
Somers, Montana

Environment

Submitted to:
BNSF Railway Company
Helena, Montana

Submitted by:
AECOM
Billings, Montana
60136257
July 2010

Final Draft Work Plan for Additional Data Collection

BNSF Former Tie Treatment Plant Somers, Montana

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Prepared By
Shelly Young, Project Manager

____
Reviewed By
Ann Colpitts, Senior Program Manager

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~~1.~~1.0 Introduction

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This work plan (2010 Work Plan) outlines additional data collection at the BNSF Former Tie Treatment Plant in Somers, Montana (Site) and has been prepared by AECOM Environment on behalf of BNSF Railway Company (BNSF). The 2010 Work Plan was requested by the Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (MDEQ), hereafter referred to as Agency or Agencies, in a July 15, 2009 letter to BNSF (EPA 2009). A draft work plan was submitted in January 2010 for Agency review and reflected correspondence BNSF received from the Agencies in July and October 2009 as well as verbal comments made during a series of conference calls ~~in~~ occurring in late 2009 and early 2010 between BNSF, the Agencies, and AECOM covering the approach for additional data collection. This revised 2010 Work Plan incorporates Agency comments dated April 19, 2010 to the draft work plan and also includes the revised draft prepared by the Agencies and submitted to BNSF on June 30, 2010. Written correspondence between the Agencies and BNSF pertaining to this Work Plan and the June 2010 draft version of the Work Plan with Agency comments are included in **Appendix D** of this Work Plan.

EPA is the lead agency for implementation of work under this 2010 Work Plan pursuant to the 1991 Consent Decree (CV91-32-M-CCL) (USA 1991). The EPA Project Coordinator, in consultation with the MDEQ Project Officer, has the authority to halt, conduct or direct work approved in this Work Plan pursuant to the Consent Decree that is in the judgment of the EPA Project Coordinator to be inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the 1989 Record of Decision (ROD) for the Site, the Consent Decree, or this Work Plan.

At the BNSF Former Tie Treating Plant in Somers, Montana, a ~~the~~ dissolved creosote constituent groundwater plume was treated using a groundwater recovery system (GWTS) located in the former CERCLA lagoon and treated at an onsite groundwater treatment system (**GWTS – Figure 1**). However, BNSF requested termination of the GWTS in the Groundwater Treatment System Interim Shut-Down Plan (ENSR 2007) based on modeling results that indicated the GWTS provided only minimal creosote cons~~i~~tituents removal and the unlikelihood for creosote-impacted groundwater from the Site to migrate to either the town well or Flathead Lake given the geologic conditions of the aquifer and the low mobility of the dissolved creosote constituents of concern (COCs) present onsite. Approval to shutdown GWTS operations for an interim period was granted in October 2007 (EPA 2007) (**Appendix D**). Since that time, BNSF has collected quarterly monitoring data in accordance with the Groundwater Treatment System Interim Monitoring Plan (IMP) (ENSR 2008) to evaluate the stability of the dissolved phase plume of COCs and to verify that the plume is naturally attenuating. Results have been reported in quarterly and annual interim monitoring reports (AECOM 2008, 2009, 2010).

Review of groundwater data collected during the interim monitoring period shows continuing phenol concentrations downgradient of the existing controlled groundwater area (CGA) and proposed technical impracticability (TI) boundaries. Recent investigations on the neighboring properties adjacent to the BNSF Somers Site (Applied Water Consulting 2010) also indicate that creosote and/or dissolved phase constituents above the cleanup levels established in the ROD are present in the subsurface beyond the ~~existing~~ proposed TI boundary.

In addition to the phenol and other creosote related impacts off-Site, there are two issues related to the construction of interim period monitoring wells: (1) monitoring wells S-85-5B, S-85-6B, and S-85-8A exceed zinc cleanup levels but are constructed with galvanized steel casing, which may be causing the zinc exceedances through dissolution or loss of the zinc coating used for galvanization; and (2) upgradient and background well S-3R and downgradient well S-6 have been dry during the interim monitoring period, preventing adequate collection of groundwater monitoring data. Monitoring well S-86-1 was monitored as a replacement background well starting in December 2009 and elevated zinc concentrations have been reported, As a result of the aforementioned issues, EPA determined that additional work, as defined in Section III of the Consent Decree, is necessary and provided written notification of such additional work to BNSF's Project Coordinator on July 15, 2009. This 2010 Work Plan details the investigation agreed upon by the Agencies and BNSF Railway.

The objectives of the work discussed in this 2010 Work Plan are as~~the~~ follows~~ing~~.

1. Evaluate the extent of creosote and/or dissolved phase constituents in groundwater that may exceed cleanup levels set forth in the ROD (EPA 1989) as amended through subsequent Explanation of Significant Differences (ESDs) (EPA 1992, 1998). This will be achieved through the installation of additional borings and wells and collection of samples between the former CERCLA lagoon and wells S-84-15 and S-91-2.
2. Better assess the source of zinc in groundwater that exceeds the cleanup level in the ROD by replacing galvanized steel constructed wells S-85-5B, S-85-6B, S-85-8A, and S-86-1 with wells constructed of poly vinyl chloride (PVC).
3. Replace monitoring wells S-3R and S-6, which have been dry during recent years, with wells completed with a deeper screen interval.

Data obtained during implementation of this 2010 Work Plan will be used in accordance with the provisions outlined in the 1991 Consent Decree, the Data Quality Objectives (DQOs) outlined in **Appendix C** of this 2010 Work Plan and the Quality Assurance Project Plan included as **Appendix E** of this 2010 Work Plan. In the event of conflict between this 2010 Work Plan and Consent Decree, the Consent Decree shall preside.

The scope of work is presented in Section 2.0. Section 3.0 briefly discusses major components of the Quality Assurance Project Plan (QAPP). A Health and Safety Plan (HASP) that specifies employee training, protective equipment, medical surveillance requirements, standard operating procedures, and a contingency plan in accordance with 29 Code of Federal Regulations (CFR) 1910.120(l)(1) and (l)(2) is discussed in Section 4.0. Section 5.0 includes the schedule for completing all activities associated with this 2010 Work Plan while Section 6.0 describes the reporting requirements for these activities. Section 7.0 contains the references consulted in the development of this 2010 Work Plan.

~~2.~~2.0 Scope of Work

This Section~~chapter~~ presents the scope of work needed to meet the objectives of additional data collection specified in Section 1.0, including data collection locations, discussion of the borings and monitoring wells that will be installed, types of data that will be collected, field methods for collection, laboratory analytical methods, and data collection locations[1]. Data collection activities will be conducted in a manner consistent with the procedures set forth in the Project Operating Procedures (POPs) included in **Appendix A** of this 2010 Work Plan. The text procedures described in this 2010 Work Plan supersedes any POP text if the 2010 Work Plan and POP differ but are not intended to modify the Consent Decree. Field investigation activities will be conducted in a manner consistent with the procedures set forth in the Consent Decree, this 2010 Work Plan, as well as the Site-Specific HASP and QAPP as amended for the additional work outlined in this 2010 Work Plan. **Figure 1** presents the site layout and the locations and proposed borings and monitoring wells.

~~1.1~~2.1 Extent of Creosote and/or Dissolved Phase Constituents and Proposed TI Boundary Location

Additional activities are proposed to determine the extent of the creosote and/or dissolved phase constituents downgradient of the source area originating from the former CERCLA lagoon toward monitoring wells S-84-15 and ~~-~~S-91-2 to fulfill the primary objective of this 2010 Work Plan. The data collected during implementation of this work plan and in future quarterly monitoring events will also help evaluate the stability of the plume and to verify that natural processes are present to aid in breaking down these constituents. The data will also help determine if the proposed TI and the existing CGA boundaries should be revised (**Figure 1**).

~~1.1.1~~2.1.1 Boring Locations

Soil borings will be installed between existing wells S-93-5S ~~-~~and S-88-2 within the source area and well S-91-2 downgradient from the source area and proposed TI boundary to initiate field investigations that fulfill the primary objective and the first principal study question discussed in the DQOs in **Appendix C** of this 2010 Work Plan. Borings will be located as follows (**Figure 1**).

- Soil boring IB-1 is proposed to be installed approximately midway between S-93-5S and S-91-2 and will be located near Somers Road.
- Soil boring IB-2 is proposed to be installed approximately midway between S-88-2 and S-91-2. The location for this boring has been adjusted per Agency request and is outside the existing CGA.
- Soil boring IB-3 is proposed to be installed between the CERCLA lagoon borings CB-10 and CB-11 installed in 1991 as requested by the Agencies in their comments to the approach for the Somers field effort dated December 2, 2009 (EPA 2009)~~**Appendix D**~~).

Actual boring locations may vary due to existing structures, utility locations, and/or conditions set forth in access agreements discussed in Section 4.1 of this 2010 Work Plan. If the location varies more than 50 feet from the location proposed in this 2010 Work Plan, placement will be determined in consultation with the Agencies and will be documented in the 2010 Data Collection Results Report. Soil borings IB-1 and IB-3 will be installed first as observations during the installation of these borings may affect the placement of IB-2.

Proposed monitoring wells S-10-1, S-10-2 and S-10-3 will be installed based on the groundwater results obtained from IB-1, IB-2, and IB-3 (**Figure 1**). If any groundwater analytical result~~s~~ from boring IB-1, IB-2, and

[1] BNSF will provide data resulting from the field investigation, validated or unvalidated, to EPA upon request not withstanding the schedule as specified in Section 5.0 of this Work Plan.

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IB-3 exceed the groundwater target cleanup goals established in the ROD for the COCs at the Site, two wells (S-10-1 and S-10-2) will be installed downgradient of all the borings, outside the existing CGA, and upgradient of monitoring wells S-84-15 and S-91-2; while the third well (S-10-3) will be installed at the closest proximity to the existing CGA~~the closest proximity to the existing CGA~~. If all results do not exceed the groundwater target cleanup goals established in the ROD, S-10-1A ~~and S-10-2~~ will be installed between borings IB-1/IB-3 and S-93-5S ~~within the CGA~~ and S-10-2A will be installed between boring IB-2 and S-88-2 at the closest proximity to the existing CGA boundary. Precise well locations will be determined through consultation with the Agencies and will be documented in the 2010 Data Collection Results Report.

~~1.1.2~~2.1.2 Installation and Sampling Methods

Borings will be installed and sampled per the following protocol.

- Borings will be developed using Sonic or hollow stem auger (HSA) drilling to approximately 65 to 70 feet below ground surface (bgs) or until evidence of contamination is no longer observed, whichever is greater **(POP 210)**.

Each HSA section or the continuous Sonic core will be logged by a field scientist/engineer and recorded in the field logbook **(POP 210)**.

Portions of the soil sample from each section or core will be placed in plastic bags and the headspace will be screened using a photo ionization detector (PID) after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook **(POP 310).**

  – A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized (**POP 006**)**.** Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of **(POP 006)**. Soils and liquid will be managed as indicated in Section 4.2.

- Soil samples will be collected if evidence of creosote impacts (i.e. dark staining, hydrocarbon odors, or PID readings greater than 10 parts per million [ppm]) is encountered above the groundwater table. The interval from which samples are collected will be recorded in the field logbook, and photos will be taken of the soil boring as appropriate (**POP 210).**

Samples will be collected from the continuous Sonic core or from split spoons, depending on the drilling method used, where PID readings or staining indicates the greatest area of impact. Samples will be collected in accordance with **POP 210**.

Samples will be sent to Pace Analytical Services, Inc. (Pace) in Minneapolis, Minnesota and will be analyzed for total and carcinogenic polycyclic aromatic hydrocarbons (TPAH and CPAH, respectively) by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020. Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110.**

  – Split samples will be made available to the Agencies and the property owner upon request; however, there is a finite amount of soil available during boring installation and there may be an insufficient volume to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners. The Agencies will follow proper methods established in **POP 110** and **POP 210** if split samples are taken.

- Discrete groundwater samples will be collected at 15-foot intervals from the start of the groundwater table to the end of the boring (**POP 210**, and **POP 230**).

Samples will be collected by either:

1. Pulling back the sonic casing and installing a packer assembly or power punch into the exposed borehole and collecting groundwater at the desired depth. Samples collected using a packer assembly would be collected from a stainless steel screen attached to a 2 inch diameter black pipe; the packer is inflated to isolate the desired depth interval and a bailer or

peristaltic pump is used to collect the sample. Samples collected using a power punch would be collected by driving the sampler to the desired depth, pulling back on the sampler to expose the screen, and withdrawing the tool after a sufficient collection time has elapsed. – or –

2. Advancing a power punch sampling tool past the drilling auger at the desired depth and collecting groundwater from a three-quarter inch screen exposed at the desired depth by using a small diameter bailer or a peristaltic pump or by the method described above in sub bullet 1.

Samples will be sent to Pace and will be analyzed for PAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020; results will be evaluated against the ROD cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc). Proper packaging methods and shipment of samples to minimize the potential for sample breakage, leakage, or cross-contamination and to provide a clear record of sample custody from collection to analysis is provided in **POP 110.**

A 24-hour turnaround will be requested on groundwater samples collected from IB-1, IB-2, and IB-3 as results collected from these borings will determine the location of additional borings or monitoring wells.

Groundwater sampling logs will be completed and/or notes will be added to the field logbook and presented in the 2010 Data Collection Results Report (**POP 230**). If a sufficient volume of water can be collected, field readings of temperature, pH, and conductivity will be collected and recorded in the field logbook or on the groundwater sampling log.

– Split samples will be made available to the Agencies and property owners upon request provided a sufficient volume of water can be collected from the boring.

- Borings will be abandoned following sample collection. Boring abandonment activities will be conducted in accordance with Montana Administrative Code 36.21.670. The boring will be filled with sealing material (bentonite) to within three feet of the surface to prevent vertical movement of groundwater in the bore hole. Any remaining hole will be filled with unimpacted or clean naturally occurring soils.

As indicated in Section 2.1.1, additional borings or monitoring wells will be installed based on the results obtained from samples collected from borings IB-1, IB-2, and IB-3. Wells will be installed and sampled per the following protocol.

- Wells will be drilled using Sonic or HSA drilling to approximately 65 to 70 feet bgs or until evidence of contamination is no longer observed, whichever is greater.
- Each HSA section or the continuous Sonic core will be logged by a field scientist/engineer and recorded in the field logbook **(POP 210)**.
- A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized (**POP 006**). Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of (**POP 006**). Soils and liquids will be managed as indicated in Section 4.2.
- Portions of the soil sample will be placed in plastic bags and the headspace will be screened using a PID after letting the soil rest approximately 10 minutes. PID readings will be recorded in the field logbook **(POP 310)**.
- Grab samples of soil will be collected if evidence of contamination is encountered above the water table (i.e., dark staining, hydrocarbon odors). Soil samples will be collected in accordance with **POP 210**.

- The interval from which samples are collected will be recorded in the field logbook and photos will be taken of the soil borings as appropriate.

Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020.

  – Split samples will be made available to the Agencies and the property owner upon request if sufficient volume is available to collect soil for PID readings, BNSF laboratory samples, and split samples for both the Agency and the private property owners.

- As requested by the Agencies in the December 2, 2009, correspondence (**Appendix D**), a cross-section between existing wells and the new borings will be sketched. Geological, PID, and analytical data will be used to determine the appropriate groundwater sampling and screen placement intervals. The PID readings at the well locations and the information from the sketched cross sections will be used to select the most likely intervals where creosote impacts may be encountered. The sketched cross sections will be included with the descriptions of the work performed in the 2010 Data Collection Results Report.
- The wells will be completed as follows (**POP 006**):

Two inch diameter schedule 40 PVC casing and 0.010 inch slotted screen.

The wells will be screened over a 10 foot interval across the water table where evidence of creosote impacts is noted. If multiple zones of impacts are observed, screen placement will be determined through consultation with the Agencies. If no impacts are observed, the screen will be placed from 25 to 35 feet bgs since wells S-91-2 and S-88-2 are screened over a similar interval.

  – Surface completion will be done in consultation with the property owners. Completion may consist of a two to three foot stickup casing with a locking lid; bollards may be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well or the well may be completed as a flush-mount well.

- Groundwater samples will be collected from impacted intervals based on the cross-sections described above, field observations, and PID readings. If no impacts are observed, the well will be completed and developed and groundwater samples will be collected from the screened interval following well development. The depth to water will be measured and recorded prior to sample collection (**POP 110**, **POP 221**, **POP 230**, and **POP 231**).

  ~~2~~– Samples will be sent to Pace and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020; results will be compared to the ROD cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc).

  ~~3~~– A normal turnaround time will be requested.

  – Split samples will be made available to the Agencies and/or property owners upon request provided a sufficient volume of water can be collected from the boring.

- The new wells will be sampled during the regularly scheduled sampling events as part of the natural attenuation monitoring well network. Groundwater sample results will continue to be collected and reported quarterly during the remainder of the interim monitoring period. Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).

~~1.2~~2.2 Galvanized Steel Constructed Well Replacement

Wells S-85-5B, S-85-6B, S-85-8A, and S-86-1 will be replaced with wells constructed with PVC casing and screen material to fulfill the ~~first~~ secondary objective of this 2010 Work Plan. The replacement wells will be installed approximately 25 feet upgradient from the existing wells to ensure these wells are installed outside of the influence of zinc suspected to originate from the galvanized steel casing used to construct the original

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- The wells will be completed as follows (**POP 006**):

Two inch diameter schedule 40 PVC casing and 0.010 or 0.020 inch slotted screen depending on the screen in the existing well that is being replaced.

  – The replacement wells will be installed at a similar depth as the original wells

A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized**.** Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of. Soils and liquids will be managed as indicated in Section 4.2.

  – Completion may consist of a 2 to 3 foot stickup casing with a locking lid; bollards may also be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well.

The replacement wells will be sampled during the regularly scheduled sampling event following installation. Sample results collected during four consecutive events will be evaluated to determine compliance with the target cleanup goals for site COCs. If the replacement well S-85-5BR is determined to be in compliance with the target cleanup goals for zinc after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011). The Agencies in consultation with BNSF will also determine if the proposed technical impracticability area around nested wells S-85-5A and S-85-5B is necessary. If the replacement well S-86-1R is determined to be in compliance with the target cleanup goals for Site COCs after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011). If the replacement wells S-85-5BR and S-86-1R are not in compliance or if compliance cannot be established following four quarters of monitoring, the interim monitoring plan will be revised and the need to establish a TI area around nested wells S-85-5A and S-85-5B will be evaluated in coordination with BNSF. Groundwater sample results will continue to be collected during the regularly scheduled sampling events for the remainder of the interim monitoring period at S-85-8AR and S-85-6BR. Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).

~~If the replacement wells are determined to be in compliance after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011). If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, a monitoring plan will be developed in coordination with the Agencies.~~

Wells S-85-5B, S-85-6B, S-85-8A, and S-86-1 will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2. Where possible, the casing will be removed from the ground. In the event that the casing cannot be removed, it will be cut off 3 feet bgs. The well will then be filled with sealing material (bentonite) to within 3 feet of the surface. Any remaining hole will be filled with non-impacted or clean naturally occurring soils.

~~1.3~~2.3 Background Well Replacement

Monitoring wells S-3R and S-4 were initially selected as the background wells for the Site in the FINAL Groundwater Treatment System Interim Monitoring Plan (Plan) submitted February 2008 (modified May 2008) (ENSR 2008). Well S-3R is also designated as the background well for the LTU network. Because wells S-3R and S-4 have contained an insufficient volume of water to allow reliable sample collection, the revised Work Plan submitted in October 2009 (ENSR 2009) designated well S-86-1 as the background well.

Well S-86-1 was sampled in December 2009 following extensive well development **(POP 221)**. Analysis of samples collected from the well during the December 2009 event detected the presence of TPAHs and reported CPAH compounds above the ROD based target cleanup levels. In addition, well S-86-1 contained zinc concentrations of 20.5 mg/L during the March 2010 groundwater sampling event. As a result, the Agency deemed S-86-1 not acceptable as a background monitoring well since the objective of a background well is to monitor the quality of groundwater that is unimpacted by Site COCs. ~~(**Appendix D**)~~.

A replacement well for S-3R will be installed similar to, but will be screened deeper than, S-3R (see **Appendix B** for the well completion log from S-3R) if the bedrock elevation allows and will be constructed with two-inch schedule 40 PVC casing and 0.010 slotted screen (**Figure 1**). A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized (**POP 006**). Any drilling mud or well development/purge liquid collected must also be properly contained and disposed of **(POP 006)**. Soils and liquids generated during well installation will be managed as indicated in Section 4.2. Completion may consist of a two to three foot stickup casing with a locking lid; bollards may be placed around the competed wells if protection from vehicular traffic is needed to prevent damage to the well.

A new well completion log will be created for S-10-3R and will be provided in the 2010 Data Collection Results Report. As the newly installed well is a background well and is being installed upgradient of the source area, impacted intervals are not expected to be encountered. Well~~s~~ S-3R ~~and S-4~~ will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2.

Replacement well S-10-3R will be sampled during the regularly scheduled sampling events following installation as part of the plume stability network. Groundwater sample results will continue to be collected and reported quarterly during the remainder of the interim monitoring period. Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011). The newly installed well S-10-3R will also be used as the LTU network background well for the remainder of the post-closure monitoring period.

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~~1.4~~2.4 Well S-6 Replacement

Monitoring well S-6 is included in the interim monitoring period plume stability network and also sampled as part of the land treatment unit post-closure monitoring program. This well regularly has an insufficient volume of water in the well to collect samples; therefore, a deeper well will be installed to replace S-6 (S-6R). The boring for monitoring well S-6R will be installed and sampled in the same fashion as borings IB-1, IB-2, and IB-3.

If soil and groundwater samples from the boring do not indicate the presence of COCs above target cleanup levels, the well will be installed similar to but screened slightly deeper than S-6 (see **Appendix B** for the well completion log from S-6). Monitoring well S-6R will be constructed with 2-inch schedule 40 PVC casing and 0.010 slotted screen. A plastic tarp or similar barrier will be placed on the ground around the borehole and soil cuttings will be containerized and any drilling mud or well development/purge liquid collected will be properly contained and disposed of **(POP 006)**. Soils and liquids generated during well installation will be managed as indicated in Section 4.2. Completion may consist of a 2 to 3 foot stickup casing with a locking lid; bollards may be placed around the completed wells if protection from vehicular traffic is needed to prevent damage to the well. A new well completion log will be created for S-6R and will be provided in the 2010 Data Collection Results Report. If impacted intervals are encountered, the screen may be placed at the impacted interval. Well S-6 will be abandoned according to the Montana well abandonment requirements described in Section 2.1.2.

Samples will be collected from the replacement well if impacts are observed in the boring (i.e., dark staining, hydrocarbon odors, or PID readings greater than 10 ppm). A soil sample will be collected and analyzed as described in Section 2.1.2 if impacted soil is observed above the groundwater table. Groundwater samples will be collected as described in Section 2.1.2 if impacted intervals are observed below the water table. A normal turnaround time will be requested on all samples as no additional boring locations will be dependent on results obtained from boring S-6R.

R~~The r~~eplacement well S-6R will be sampled during the regularly scheduled sampling events as part of the plume stability network following installation. Groundwater sample results will continue to be collected and reported quarterly during the remainder of the interim monitoring period. Following the interim monitoring period, g~~G~~roundwater monitoring ~~may also~~will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).

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~~1.5~~2.5 Well Development

Monitoring wells installed in conjunction with this 2010 Work Plan will be developed following installation to remove silt and other fine-grained sediments that may accumulate within the monitoring well during installation. Development will be done by the drilling company through one or a combination of techniques including surging and pumping (**POP 221**).

- Pumping involves using a pump to evacuate water and silt from the well.
- With surging, a tool is used to scour the screened interval in an up and down repetitive motion, causing the groundwater to surge in and out through the screen and forcing fines out of the formation.

The monitoring wells will be developed until water is relatively free of sediment or until all of the groundwater has been removed. The 2010 Data Collection Results Report will indicate the development methods used. Water generated during well development activities will be collected, drummed, and analyzed as indicated in Section 4.2.

~~1.6~~2.6 Well Survey

All wells and boring locations will be surveyed by a licensed surveyor as part of the upcoming Agency Five-Year Review which is scheduled to be completed by September 2011. Surveying will be provided by Montana licensed professional land surveyor. Surveying will be based on the horizontal datum of NAD 83 Montana State Plane Feet and the vertical datum of NAVD 88. Positional accuracy of the survey will meet the Accuracy Standards for ALTA/ACSM Land Title Surveys, as adopted by the American Land Title Association and the National Society of Professional Surveyors. The well elevations obtained will be incorporated in all future routine sampling and well gauging events.

~~3.~~3.0 Quality Assurance and Project Plan

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When sampling and analyzing samples, appropriate quality assurance/quality control and chain of custody procedures will be used in accordance with EPA's "Requirements for Quality Assurance Project Plans" and any other pertinent EPA guidance. These requirements are incorporated in the QAPP that was prepared for the Site during the remedial investigation process in 1985; an updated QAPP is included as **Appendix E** pursuant to this 2010 Work Plan. Major components of the QAPP are discussed below.

~~1.7~~3.1 Decontamination

All sampling equipment will be subject to appropriate decontamination protocol (**POP 110, POP 120**). To assess the adequacy of decontamination procedures, rinsate or equipment blanks should be collected and analyzed for the same parameters as the field samples. In general, 1 rinsate blank will be collected per 20 samples.

~~1.8~~3.2 Chain of Custody

All samples will be shipped overnight to the project laboratory. Sample collection, storage, and shipment will follow chain of custody protocol outlined in the QAPP and **POP 110**.

~~1.9~~3.3 Laboratory Data Validation and Usability

Data validation is a process of review of the analytical results and documentation against established criteria. The Laboratory Quality Control Officer is responsible for performing the validation.

The precision and accuracy of all data will be computed and compared to the control limits as part of~~fo~~ the data validation process. The precision is determined from the analytical results of duplicate samples; accuracy is computed from spike recoveries.

The results of all other quality control checks will be reviewed in terms of the following criteria:

- Method blank values should be reasonably low, so that there is no evidence of contamination of reagents and glassware.
- Shipping or trip blank values should also be reasonably low, indicating that samples have been adequately protected from contamination.
- The daily calibration curves should be linear over their entire range, and all samples analyzed should be within that range.
- Surrogate recoveries (as applicable) should be within control limits.

If any of the above criteria are not met, the Laboratory Supervisor and Project Manager will be notified and will meet with the Laboratory Control Officer to discuss remedies and the status of the data.

For each batch of analyses, supporting documentation will be reviewed for completeness, correctness, and legibility.

~~1.10~~3.4 AECOM Data Validation

The analytical data will be validated by a designated AECOM Quality Assurance officer. Validation will include reviewing the analytical results for the analysis performed and reported.

This will be performed to ensure that data were produced in accord with procedures outlined in this project plan. The following elements will be reviewed for compliance as part of the abbreviated data validation:

- Holding Times
- Instrument Calibration
- Method Blanks
- Matrix Spikes
- Laboratory Duplicates
- Laboratory Control Spikes
- Reporting Limits
- Analyte Identification
- Analyte Quantification
- Comparison of hardcopy results to Electronic Data Deliverable (EDD)

~~1.11~~3.5 Data Quality Assessment

Information obtained through the implementation of this 2010 Work Plan will be evaluated through the Data Quality Assessment (DQA) process to determine if the data obtained are of adequate quality and quantity to support their intended use. The DQA process consists of five steps, as summarized below (EPA 2000):

1. Review the DQOs (**Appendix C** of this 2010 Work Plan) and Sampling Design: DQO outputs will be reviewed to ensure that they are still applicable. The sampling analysis and data collection documentation will also be reviewed for completeness and consistency with DQOs.
2. Conduct a Preliminary Data Review: Data validation reports will be reviewed to identify any limitations associated with the analytical data. Basic statistics will be utilized by the laboratory where applicable and meaningful graphs of the data will be prepared. This information will be used to learn about the structure of the data and to identify patterns, relationships or potential anomalies/outliers.
3. Select the Statistical Method: Select the appropriate procedures for summarizing and analyzing the data, based on the review of the performance and acceptance criteria associated with the project objectives, the sampling design, and the preliminary data review. Identify the key underlying assumptions associated with the statistical tests.
4. Verify the Assumptions of the Statistical Method: Evaluate whether the underlying assumptions hold, or whether departures are acceptable, given the actual data and other information about the study.
5. Draw Conclusion from the Data: Perform the calculations necessary to draw reasonable conclusions from the data. If the design is to be used again, evaluate the performance of the sampling design.

Uncertainty of validated data will be identified in the report and evaluated by the Site team identified in **Appendix C** to determine if the DQOs were met. In the event that the DQOs were not met, they will be reviewed to determine if they are achievable and may be revised if necessary, and the data may be further evaluated to determine the impact to the project. Data usability and limitations will be evaluated by the Site team.

~~4.~~4.0 Health and Safety

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A HASP has been developed for the Somers site. The HASP is reviewed annually and updated as needed. The HASP contains emergency contact information and directions to the hospital, as well as information on hazards generally present on AECOM field sites. A copy of the HASP is included as **Appendix F** of this 2010 Work Plan and will remain on-site in the treatment building office throughout the data collection activities; all personnel working on site must read and sign the HASP. Task Hazard Analyses (THAs) have been prepared for tasks expected during the additional activities and are included in the HASP.

Safety equipment is available on site and personnel involved in the work activities need to be familiar with its proper use and location. Equipment includes the safety shower eyewash station and fire extinguishers. Minimum personal protective equipment (PPE) requirements include safety glasses with side shields, hard hats, and steel-toed boots. Gloves shall be worn when handling equipment and materials. Nitrile or other chemically impervious gloves shall be worn when working with contaminated liquids or sludges. Orange vests will also be worn when working around moving vehicles or near public roads.

Below is a list of general safety guidelines which will be followed during the additional data collection activities.

- All contractors will have completed the BNSF Contractor Orientation Training prior to conducting work on site. Annual certification is required.
- All manufacturers' recommended safety precautions for all chemicals will be followed. Refer to the Material Safety Data Sheets (MSDS) located in the HASP.
- A task or job hazard analysis will be conducted prior to performing interim monitoring tasks. If a THA already exists for the activity, it will be reviewed by all personnel involved in the task. New THAs will be filed in the HASP.
- All required PPE shall be worn while conducting work on site.
- Special precautions will be taken with moving liquids. This requires the use of protective clothing and maintaining a safe distance.
- When installing wells outside of the fenced Site, exclusion zones will be established around working areas to protect untrained and unqualified individuals.
- Utility locates will be conducted prior to installing borings and wells.
- All personnel are empowered to stop work activities if a deviation from planned activities occurs or if an unsafe condition is present.

~~1.12~~4.1 Access Agreements

Owners of the property where borings and wells may be located will be contacted sufficiently in advance to allow time for obtaining access – no less than 30 days prior to commencing work. BNSF shall make best efforts to locate borings and wells away from structures and utilities. BNSF shall also use best efforts to obtain written access agreements to such property. Such agreements shall ensure access for the United States and it authorized representatives. If BNSF is unable to obtain access within that time frame, no later than 27 days prior to the time access is needed, BNSF shall notify EPA of the failure to obtain access, and the efforts made to obtain it.

If BNSF is unable to obtain access, where EPA has determined it to be necessary for carrying out the work under this 2010 Work Plan, EPA may then assist BNSF in gaining access, to the extent necessary to effectuate the investigations described in this Work Plan, using such means as EPA deems appropriate. EPA may at its discretion also consider alternate locations, including but not limited to existing County rights-of-way on the property, as appropriate. If EPA determines that placing the well/boring in a County right-of-way is acceptable (in the event a property owner refuses access), BNSF agrees it will make best efforts to obtain access for such placement from the County. Nothing in Section 4.1 is intended to modify the Consent Decree.

No personnel or individuals shall be allowed within the work area without prior approval. Property owners will be notified of the work activities and health and safety concerns. Access to the work area will be controlled with barricades, temporary fencing, or other means to limit entry. The AECOM field manager will be responsible for ensuring unauthorized access to the work area is prevented.

If a monitoring well is installed off of BNSF owned property, an access agreement will be drafted with which the property owner will grant BNSF and the Agencies access to the well for future monitoring and operation and maintenance.

~~1.13~~4.2 Data Collection-Derived Waste Management

Waste material including but not limited to soils and liquids generated during the field work will be containerized and stored within the fenced area of the Somers Site until appropriate disposal can be arranged. "Waste Material" shall mean 1) any "hazardous substance" under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); 2) any pollutant or contaminant under Section 101(33) of CERCLA, 42 U.S.C. § 9601(33); 3) any "solid waste" under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); and 4) any "hazardous waste" under State law.

~~1.13.1~~4.2.1 Soils

A composite sample will be collected from the containerized soil and will be analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, zinc by EPA Method 6020 and potentially other methods required to appropriately profile the waste. Soil cuttings that are non-hazardous will be spread on the ground surface within the fenced area of the Site. If soil cuttings are determined to be hazardous waste (F034), they will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

~~1.13.2~~4.2.2 Liquids

Liquid produced during sampling and decontamination activities will be collected, drummed, and analyzed for TPAH and CPAH by EPA Method 8270-SIM, phenols by EPA Method 8270, and zinc by EPA Method 6020. Liquid that does not exceed the ROD target cleanup levels (40 µg/L for TPAH, 0.030 µg/L for CPAH, and 5 mg/L for zinc) will be poured onto the ground surface within the fenced area of the Site. If collected liquid exceeds the ROD target cleanup level, the drums will be sent off-site for disposal at an appropriate hazardous waste disposal facility.

~~5.~~5.0 Schedule

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The schedule for the scope of work included in his Work Plan is as follows:

- Final Draft Work Plan for Additional Data Collection submittal – July 30, 2010 (submittal of Attachments by August 31, 2010)
- Receive Agency approval of Work Plan – August 20~~17~~, 2010
- Access Agreements in Place – No later than September 30, 2010
- Complete Field Activities – October 31, 2010
- Submit Draft 2010 Data Collection Results Report – December 31, 2010
- Submit Final 2010 Data Collection Results Report – 30 days after receipt of Agency comments

~~6.~~6.0 Reporting

Upon completion of field activities and receipt of analytical results, 2010 Data Collection Results Report shall be prepared and submitted to the Agencies for review and approval. The draft report, due on December 31, 2010, will include but not be limited to the following information:

- Description of all activities conducted under this 2010 Work Plan
- Deviations to the planned work
- Access agreements
- Evaluation of data quality
- Boring and/or well logs
- Analytical results for both soils and groundwater, in summary table format, including comparison to the cleanup levels in the ROD
- Water levels measured
- Cross sections and lithology diagrams
- Copies of field logbooks and photos taken
- Field data
- COC concentration contour diagrams

The final 2010 Data Collection Results Report shall be submitted 30 days after receipt of Agency comments, and shall include a formal response to Agency comments.

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~~7.~~7.0 References

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Appendix A

Project Operating Procedures (POPs)

Appendix B

Boring and Well Logs

Appendix C

Data Quality Objectives

1.0 Data Quality Objectives

The Data Quality Objective (DQO) process is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. These DQOs shall also be the determinative factor for assessing the success or failure of the sampling. EPA has issued guidelines to help data users develop site-specific DQOs (EPA, 2000). The DQO process is intended to:

- Clarify the study objective;
- Define the most appropriate type of data to collect;
- Determine the most appropriate conditions from which to collect the data; and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the design

1.1 Data Quality Objective Process

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate data are justified. The DQO process consists of seven steps; the output from each step influences the choices that will be made later in the process. These steps are as follows:

Step 1: State the problem

Step 2: Identify the decision

Step 3: Identify the inputs to the decision

Step 4: Define the study boundaries

Step 5: Develop a decision rule

Step 6: Specify tolerable limits on decision errors

Step 7: Optimize the design

During the first six steps of the process, the Site~~planning~~ team[1] develops decision performance criteria that will be used to develop the data collection design. The final step of the process involves developing the data collection design based on the DQOs. A brief discussion of these steps and their application to this Work Plan is provided below.

1.1.1 State the Problem

The problem at the BNSF Railway Co. (BNSF) Former Tie Treating Plant in Somers, Montana (Site) is threefold.

1. A dissolved creosote constituent groundwater plume had been contained by a groundwater recovery system (GWTS) located in the former CERCLA lagoon and treated at an onsite water

[1] Includes EPA, MDEQ and BNSF Railway representatives

treatment plant. However, BNSF requested termination of the GWTS in 2007 based on modeling results that indicated creosote-impacted groundwater from the Site is not likely to migrate to either the town well or Flathead Lake~~ given the~~ due to geologic conditions of the aquifer and the low mobility of the dissolved creosote constituents of concern (COCs) present onsite, whether or not the GWTS is operating. Approval to shutdown GWTS operations for an interim period was granted in October 2007. Since that time, BNSF has collected quarterly monitoring data to evaluate the stability of the dissolved creosote constituent plume and to verify that natural processes are present to aid in breaking down creosote constituents.

Recent investigations on neighboring property (Applied Water Consulting, 2010 – Figure 1) have indicated that creosote and/or dissolved phase constituents above the ROD cleanup levels are present in the subsurface beyond the proposed TI boundary.

2. Several monitoring wells have concentrations of zinc above ROD cleanup levels. The wells with concentrations of zinc above ROD cleanup levels were constructed of galvanized steel casings and it is hypothesized that the exceedances are are caused through the dissolution or loss of the zinc coating used for galvanization. ~~a result of these casings.~~

3. Two m~~M~~onitoring wells installed ~~upgradient from~~at the site for the purpose of monitoring ~~background~~ site conditions have contained an insufficient amount of water to collect samples.

Based on the above observations, additional site investigations and monitoring are proposed. The ability to determine whether the proposed technical impracticability boundaries and the existing controlled groundwater area need revision ~~in order to be protective of human health and the environment~~ depends on the results of these~~is~~ field activities~~investigation~~ and future monitoring.

1.1.2 Identify the Decision

The purpose of this step is to define the decision statements this study will attempt to resolve. Decision statements are developed by combining principal study questions (PSQs) and alternative actions (AAs). PSQs are derived from the problem statements presented in Section 1~~2~~.1.1 above. For each PSQ, AAs are developed (including no action alternative if appropriate) that indicate what action will be taken after each PSQ is answered. Data collected from this study will be incorporated into the larger Site dataset for decision making purposes. The PSQs are~~is~~ as follows:

Principal Study Questions: Evaluate the vertical and horizontal extent of creosote and dissolved phase constituents of concern (COCs) in groundwater in the area between the former CERCLA lagoon and well S-91-2 that may exceed target cleanup levels set forth in the ~~EPA~~ Record ~~O~~of Decision (ROD). Better assess the source of zinc in groundwater that exceeds the target cleanup level in the ROD by replacing galvanized steel constructed wells with wells constructed of poly vinyl chloride (PVC). Replace monitoring wells S-3R and S-6, which have been dry during recent years, with wells completed with a deeper screen interval.

Based on these~~is~~ principal study questions, the following alternative actions have been developed:

Alternative Action (1): Recommend that no additional borings and monitoring wells be completed and that the existing groundwater monitoring network be used to g~~u~~auge potential migration of ~~creosote or~~ dissolved creosote~~phase~~ COCs and zinc~~constituents~~; or

Alternative Action (2): Recommend additional data collection efforts to better define the horizontal and vertical extent of the dissolved creosote COC~~constituent~~s and zinc in groundwater and determine if the existing boundaries of the CGA and proposed TI area need to be revis~~expand~~ed~~ to remain protective of human health and the environment~~.

The principal study questions and the alternative actions were combined to form the following decision statements:

Decision Statement: Determine whether or not existing data and data collected during implementation of the

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Work Plan for Additional Data Collection (2010 Work Plan) are sufficient to better define the horizontal and vertical extent of the dissolved constituents of concern and to determine if the existing boundaries of the proposed TI or CGA need to be revised. Determine if observed zinc exceedances are associated with galvanized steel casings. Determine if ~~a~~ deeper wells can be installed to provide additional monitoring locations ~~background conditions~~ for the Site.

1.1.3 Identify the Inputs to the Decision

The purpose of this step is to identify the information inputs needed to support the decision statement and to specify which inputs will require environmental measurements. Table 1~~2~~.1 presents the data inputs needed and shows the relationship between the data inputs and evaluation criteria and performance goals.

1.1.4 Define the Study Boundaries

The purpose of this step is to clarify the site characteristics that the environmental measurements are intended to represent. This step includes the following activities (1) defining the scale of decision making~~specifying the characteristics that define the media of interest~~, (2) specifying the characteristics that define the media of interest~~defining the spatial boundary of the decision statement~~, (3) defining the spatial boundary of the decision statement defining the spatial boundary of the decision statement~~defining the temporal boundaries of the decision~~, (4) defining the spatial boundary of the decision statement ~~defining the scale of decision making~~, and (5) identifying any practical constraints on data collection. These activities are briefly discussed below.

Scale of Decision Making: The study area is divided into investigative subsets that represent different study areas. Independent decisions may be made for each of these areas. These areas are described as primary, secondary and tertiary objectives:

Primary Objective: Evaluate the extent of dissolved creosote constituents of concern in groundwater that may exceed target cleanup levels set forth in the ROD. The results of this investigation and additional quarterly monitoring will be used to determine if the boundaries of the existing Controlled Groundwater Area and the proposed technical impracticability area need to be revised.

Secondary Objective: Better assess the source of zinc in groundwater that exceeds the target cleanup level in the ROD by replacing galvanized steel casing constructed wells S-85-5B, S-85-6B, S-85-5A, and S-86-1 with poly vinyl chloride constructed wells. The results of this investigation and additional quarterly monitoring will be used to determine long term monitoring requirements as well as to determine if the proposed technical impracticability area around nested wells S-85-5A and S-85-5B is necessary. It can also determine if the existing controlled groundwater area that covers the former LTU Area can be lifted and still remain protective of human health and the environment.

Tertiary Objective: Replace monitoring wells S-3R and S-6 with deeper screened wells to allow for better potentiometric maps to be developed and to provide analytical data representative of background conditions. Due to drought conditions in the region, the groundwater table has dropped 3 to 4 feet since the wells were constructed and wells have had insufficient volume to collect a sample during the interim monitoring period.

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Characteristics That Define the Media of Interest: The media of interest associated with the primary objective is creosote impacted soil and~~or~~ non-aqueous phase creosote that acts as a continuous source of the dissolved creosote constituent groundwater plume. This impacted media, which is likely present beyond the CERCLA lagoon, is the primary target of possible future response actions (e.g. revision to the CGA or proposed TI ~~or CGA~~boundaries).

The media of interest associated with the secondary objective is zinc that may be associated with the galvanized steel casings installed in wells S-85-5B, S-85-6B, S-85-8A, and S-86-1 that may be acting as a continuous source of the dissolved zinc that continues to be detected above ROD target cleanup levels in samples collected from these wells.

The media of interest associated with the tertiary objective is groundwater that has decreased in elevation over time.

Spatial Boundary of the Decision: The spatial boundary includes ~~of~~ the former land treatment unit (LTU) and upgradient monitoring well S-3R to the west, ponded and marshy areas beyond monitoring well cluster S-85-5 to the north, monitoring wells S-84-15 and S-91-2 to the east and Flathead Lake to the south. These boundaries are further divided into investigative subsets about which independent decisions can be made. The spatial boundaries are dynamic and can be modified if field observations indicate a need to modify the boundaries of the study.

Temporal Boundaries of the Decision: The field investigations are anticipated to be completed by October 31, 2010. Groundwater sample results will continue to be collected and reported quarterly during the remainder of the interim monitoring period. Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).~~**Monitoring of the proposed monitoring wells will occur quarterly for a minimum of one year following installation. If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, a monitoring plan will be developed in coordination with the Agencies .**~~

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Practical Constraints of Data Collection: Practical constraints of data that will be collected include the physical and administrative access to the properties not owned by BNSF as well as existing structures and buried utilities associated with all the properties where borings and monitoring wells are planned to be completed. In addition, a sufficient volume of water may not be available for the collection of groundwater at each desired depth due to the geologic conditions at the site.

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1.1.5 Develop a Decision Rule

The decision rule states what regulatory response action would be appropriate depending on whether a chosen parameter is greater or less than the action level. For this study, groundwater and soil analytical results will be compared with ROD based target cleanup levels. Groundwater and soil analytical results and field chemistry measurements from this event as well as future groundwater analytical results will also be used to support future site decisions.

Decision Rule Primary Objective: If data collected during this upcoming field investigation and future quarterly monitoring events indicate that the dissolved phase constituents above target cleanup goals extends, or has the potential to extend, beyond the existing Controlled Groundwater Area (CGA), the need to revise the original boundaries of the CGA pursuant to Section 85-2-506 and 508, MCA as amended will be evaluated.

If data collected during this upcoming investigation indicate that the dissolved phase constituents do not extend, or have the potential to extend, beyond the existing CGA, then site wide quarterly monitoring will continue to demonstrate plume stability and to verify that in-situ degradation of dissolved creosote constituents in groundwater is occurring during the remainder of the interim monitoring period. Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).

Decision Rule Secondary Objective: If the replacement well S-85-5BR is determined to be in compliance with the target cleanup goals for zinc after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011). The Agencies will also determine in consultation with BNSF if the proposed technical impracticability area around nested wells S-85-5A and S-85-5B is necessary.

If the replacement well S-86-1R is determined to be in compliance with the target cleanup goals for Site COCs after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).

If the replacement wells S-85-5BR and S-86-1R are not in compliance or if compliance cannot be established following four quarters of monitoring, the interim monitoring plan will be revised and the need to establish a TI area around nested wells S-85-5A and S-85-5B will be evaluated in coordination with the Agencies. Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).

Groundwater sample results will continue to be collected during the regularly scheduled sampling events for the remainder of the interim monitoring period at S-85-8AR and S-85-6BR. Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).

Decision Rule Tertiary Objective: Groundwater sample results will continue to be collected during the regularly scheduled sampling events for the remainder of the interim monitoring period. Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).

1.1.6 Specify the Tolerable Limits on the Decision Errors

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The purpose of this step is to specify the tolerable limits on decision errors, which are used to establish performance goals for the data collection design, and discuss how decision errors will be addressed. For the 2010 Work Plan, the boring and monitoring locations as well as the number of samples (which can impact the statistical power associated with the sample approach) were established based on previous investigations, discussions between the Agencies, BNSF and its representatives, and Agency direction. These are specified in Section 2.0 of the 2010 Work Plan.

In order to mitigate the potential for false positive and/or false negative errors associated with field sampling, sample collection processes will be consistent with established and relevant Project Operating Procedures (POPs) included as attachment A to the 2010 Work Plan. This includes collection of duplicate samples (and subsequent comparison to primary samples using relative percent difference (RPD) statistics), implementing a decontamination procedure (which may include the use of disposable sampling equipment), and the collection of field blanks.

For laboratory analysis of samples, quality assurance/quality control (QA/QC) steps (such as the use of laboratory controls, matrix spikes, matrix spike duplicates, blanks, etc.) will be consistent with previous QA/QC procedures used at this Site and will be consistent with established and relevant procedures outlined in the Quality Assurance project Plan included as attachment E to the 2010 Work Plan. In addition, split samples may be taken to evaluate laboratory analytical performance. This will be at the discretion of the Agencies and property owners provided a sufficient volume of soil and/or groundwater can be collected from the boring.

1.1.7 Optimize the Design

The purpose of this step is to identify the most resource-effective data collection design for generating data expected to satisfy the DQOs specified in the preceding six steps. For this sampling event, the sample locations and the investigative approach were selected based on the results of previous sampling efforts at this site; discussions between the Agencies, BNSF and its representatives, and existing data needs.

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TABLE 1.1
SUMMARY OF DATA INPUT NEEDS

Evaluation Criteria	Performance Goals of In Situ Re	Proposed Performance Level	Data Needed to Estimate Performance	Source of Data
Long-Term Effectiveness and Permanence	Achieve conditions that are compatible with planned future u the site.	For the media treated, achieve RAC specified in the ROD and/or finalize proposed technical impracticability w if these RAOs cannot be achieved.	Contaminant concentration time following monitoring w installation.	Environmental sampling
Reduction of Toxicity, Mobility, Volume	Reduce effort needed to mainta long-term remedial operations a site.	If GWTS is permanently discontinue ensure impacted groundwater that d exceed the ROD cleanup levels doe migrate outside of existing CGA and proposed TI boundary.	Contaminant concentration time. Additional lithologic information.	Environmental sampling Soil borings
Short-Term Effectiveness	Maintain subsurface conditions t are compatible with the operatio the existing groundwater collect and treatment system.	At the boundaries of the proposed technical impracticability boundary, maintain the RAOs specified in the	Contaminant concentration groundwater at sentinel and Point of Compliance wells t determined.	Environmental sampling
Cost	Reduce long-term costs	Performance level to be determined stakeholders.	Estimated cost of interim response actions and long- monitoring	Cost estimate, rough (-30%, +50%).
Compliance with ARARs	Comply with ARARs identified ir ROD.	ARARs compliance	Contaminant concentration time.	Environmental sampling

~~**Scale of Decision Making**: The study area is divided into investigative subsets that represent different study areas. Independent decisions may be made for each of these areas. These areas are described as primary and secondary objectives as proposed:~~

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~~**Primary Objective:** Evaluate the extent of dissolved creosote constituents in groundwater that may exceed cleanup levels set forth in the EPA ROD. The results of this investigation and additional quarterly monitoring will be used to determine if the boundaries of the existing Controlled Groundwater Area and the proposed technical impracticability area need to be revised.~~

~~**Secondary Objective:** Better assess the source of zinc in groundwater that exceeds the cleanup level in the ROD by replacing galvanized steel constructed wells S-85-5B, S-85-6B, and S-85-5A with poly vinyl chloride constructed wells. The results of this investigation and additional quarterly monitoring will be used to determine long term monitoring requirements as well as to determine if the proposed technical impracticability area around nested wells S-85-5A and S-85-5B is necessary as well as determine if the existing controlled groundwater area that covers the former LTU Area can be lifted and still remain protective of human health and the environment.~~

~~**Tertiary Objective:** Replace monitoring wells S-3R and S-6 with deeper screened wells to allow for better potentiometric maps to be developed and to provide analytical data representative of background conditions. Due to drought conditions in the region, the groundwater table has dropped 3 to 4 feet since the wells were constructed and have had insufficient volume to collect a sample during the interim monitoring period.~~

~~**Practical Constraints of Data Collection:** Practical constraints of data that will be collected include the physical and administrative access to the properties not owned by BNSF as well as existing structure and buried utilities associated with the all the properties where borings and monitoring wells are planned to be completed. In addition, a sufficient volume of water may not be available for the collection of groundwater at each desired depth due to the geologic conditions at the site.~~

~~**cision Rule**~~

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~~The decision rule states what regulatory response action would be appropriate depending on whether a chosen parameter is greater or less than the action level. For this study, groundwater and soil analytical results will be compared with ROD based cleanup levels. Groundwater and soil analytical results and field chemistry measurements from this event as well as future groundwater analytical results will be used to support future site decisions.~~

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~~**Decision Rule Primary Objective:** If data collected during this upcoming field investigation and future quarterly monitoring events indicate that the dissolved phase constituents above target cleanup goals extends, or has the potential to extend, beyond the existing Controlled Groundwater Area (CGA), to the need to expand the original boundaries of the CGA pursuant to Section 85-2-506 and 508, MCA as amended will be evaluated.~~

~~If data collected during this upcoming investigation indicate that the dissolved phase constituents do not extend, or has the potential to extend, beyond the existing CGA, then site wide quarterly monitoring will continue to ensure the plume stability.~~

~~**Decision Rule Secondary and Tertiary Objective:** If the replacement wells are determined to be in compliance after four quarters, monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011).~~

~~If the replacement wells are not in compliance or if compliance cannot be established following four quarters of monitoring, a monitoring plan will be developed in coordination with the Agencies.~~

~~1.1.6 Specify the Tolerable Limits on the Decision Errors~~

~~The purpose of this step is to specify the tolerable limits on decision errors, which are used to establish performance goals for the data collection design, and discuss how decision errors will be addressed. For the 2010 Work Plan, the boring and monitoring locations as well as the number of samples (which can impact the statistical power associated with the sample approach) were established based on previous investigations, discussions between the Agencies, BNSF and its representatives, and Agency direction. These are specified in Section 3.0.~~

~~In order to mitigate the potential for false positive and/or false negative errors associated with field sampling, sample collection processes will be consistent with established and relevant Project Operating Procedures (POPs) included as attachment A to the 2010 Work Plan. This includes collection of duplicate samples (and subsequent comparison to primary samples using relative percent difference (RPD) statistics), implementing a decontamination procedure (which may include the use of disposable sampling equipment), and the collection of field blanks.~~

~~For laboratory analysis of samples, quality assurance/quality control (QA/QC) steps (such as the use of laboratory controls, matrix spikes, matrix spike duplicates, blanks, etc.) will be consistent with previous QA/QC procedures used at this Site. In addition, split samples may be taken to evaluate laboratory analytical performance. This will be at the discretion of the Agencies and property owners provided a sufficient volume of groundwater can be collected from the boring.~~

~~1.1.7 Optimize the Design~~

~~The purpose of this step is to identify the most resource-effective data collection design for generating data expected to satisfy the DQOs specified in the preceding six steps. For this sampling event, the sample locations and the investigative approach were selected based on the results of previous sampling efforts at this site; discussions between the Agencies, BNSF and its representatives, and existing data needs.~~

Appendix D

Correspondence Pertaining to Work Plan

Appendix E

Quality Assurance Project Plan

Appendix F

Health and Safety Plan

Young, Shelly

From: Hoogerheide.Roger@epamail.epa.gov
Sent: Friday, August 20, 2010 10:08 AM
To: David.Smith4@bnsf.com
Cc: Schmidt.Andrew@epamail.epa.gov; Colpitts, Ann; lidewitt@mt.gov; lscusa@mt.gov; Vranka.Joe@epamail.epa.gov; Young, Shelly
Subject: RE: Comments on the Final Draft Work Plan for Additional Data Collection

I talked with Lisa about the modifications and proposed revisions. We do not understand the haste to abandon well S-4 and prefer that the well remains until we have developed long-term monitoring requirements for the Site. All other modifications and revisions are acceptable and can be incorporated.

This email serves as approval to proceed. The Agencies will provide a formal signed letter upon a final cursory review of the workplan with all associated appendices.

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| From: |
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|"Young, Shelly" <Shelly.Young@aecom.com>
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| To: |
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|Roger Hoogerheide/MO/R8/USEPA/US@EPA, "Colpitts, Ann" <Ann.Colpitts@aecom.com>, "Smith, David M" <David.Smith4@bnsf.com> |
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|<lidewitt@mt.gov>, Andrew Schmidt/R8/USEPA/US@EPA
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  |RE: Comments on the Final Draft Work Plan for Additional Data Collection
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Hi Roger,

We have reviewed the current round of modifications made by the Agencies to the Final Draft 2010 Work Plan that was submitted on July 30, 2010. Per your conversation with Dave Smith today, we have made modifications to the Agency's August 17th revisions pertaining to the following:

1. Removed text related to the long-term monitoring plan as the purpose of this document is to present the work plan for the additional work requested by the Agencies not for future work that might be done at the Site.
2. Replace the text indicating well S-4 will be abandoned. The newly installed well S-10-3R will function as the background well.

In addition to the above changes, our proposed revisions include the following:
1. Revise text related to the TI boundary around S-85-5A and S-85-5B, particularly if the new well is not in compliance or if compliance cannot be established. The revision indicates the Agencies, in consultation with BNSF, will evaluate the need to establish the proposed TI area around wells S-85-5A and S-85-5B.
2. Revised text related to the QAPP; specifically, the Agency-approved plan was titled a Quality Assurance/Quality Control Plan and the text has been modified to refer to the 1985 QA/QC Plan, which is included as Appendix E to the work plan.

If the Agency is in agreement with the above changes, we will submit a final document incorporating both the Agencies’ and our revisions by August 31st. The final document will also include the appendices as requested by the Agencies.

Thanks!

Shelly Young
Project Manager/Environmental Engineer
AECOM Environment
Direct 406.896.4582
shelly.young@aecom.com

-----Original Message-----
From: Hoogerheide.Roger@epamail.epa.gov [
mailto:Hoogerheide.Roger@epamail.epa.gov]
Sent: Tuesday, August 17, 2010 2:00 PM
To: Young, Shelly; Colpitts, Ann; Smith, David M
Cc: lidewitt@mt.gov; Schmidt.Andrew@epamail.epa.gov
Subject: Comments on the Final Draft Work Plan for Additional Data Collection

(See attached file: 2010 Work Plan - Appx C - APS comment v2.docx)

(See attached file: 2010 Work Plan_Final Draft.docx)

The Schedule in Section 5.0 of the Final Draft Work Plan specifies that Agency approval will be received today. However, we have revised that schedule to Friday August 20 to allow you time to look over the changes. Appendix C may look like major modifications but it is more cut and paste various Sections that had already been reviewed to make it flow better. Please let us know by 12:00 pm Friday about these changes and we will provide a signed approval letter for the record. If you wish to discuss these changes please let us know ASAP when you are available to discuss. I will be out Weds through Friday next week and Andrew is out after this Thursday for two weeks so we have a limited window to discuss.

Please note that the following sentence has been inserted in several places throughout the document:

"Following the interim monitoring period, groundwater monitoring will continue as detailed in the Long-Term Monitoring Plan (to be developed in conjunction with or following the Agency's Five-Year Review in 2011)."

As a point of clarification, HQ policy on 5 years reviews where waste has been left in place above levels that allow for unlimited use and unrestricted exposure recommends that all monitoring wells be sampled every five years in order to make a long-term groundwater protectiveness statement   Given the need to begin collecting data for the five year review, I propose that we discuss the Agencies' data needs for the five year review soon so that the appropriate data can be collected in time to be available for the review.

Appendix E

Quality Assurance/Quality Control Plan

D930

QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR REMEDIAL INVESTIGATION WORK AT THE BURLINGTON NORTHERN SITE IN SOMERS, MONTANA

Document Number QAD237-200

Prepared for

BURLINGTON NORTHERN
Billings, Montana

Prepared by

ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.
Fort Collins, Colorado

and

Concord, Massachusetts

October 1985

ERT
ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.
BOX 2105, 1716 HEATH PARKWAY, FORT COLLINS, COLORADO 80522, (303) 493-8878

November 4, 1985
Ref. D930

Montana Operations Office
Environmental Protection Agency
Federal Office Building, Drawer 10096
301 South Park
Helena, MT 59626-0096

Attn: Mr. Eric W. Finke

Director, Waste Management Division
Environmental Protection Agency
One Denver Place
999 18th Street, Suite 1300
Denver, CO 80202-2413

Attn: Mr. Bob Duprey

Dear Gentlemen:

Enclosed for EPA review and approval is the revised Quality Assurance/Quality Control Plan for the Burlington Northern Site at Somers, Montana. The Method Verification Study is ongoing and additional, specific information will be provided by November 13, 1985.

We are also attaching a copy of Burlington Northern's responses to EPA's formal comments on the previous draft of this document. The responses are keyed by number to EPA's comments. Text changes made in response to the comments are noted by page to facilitate your review.

Sincerely,
ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.

Lena Blais

Lena Blais
Environmental Engineer

LB/smc

Enc.

cc: M. Burda, Burlington Northern

3D237/N1

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1.0 INTRODUCTION

1.1 Background

This plan describes the Quality Assurance (QA) organization, procedures, documentation requirements, acceptance criteria, audits and corrective action procedures for Environmental Research & Technology, Inc.'s (ERT) completion of requested response actions in Somers, Montana. This plan deals with field sampling activities and analytical laboratory operations. The field investigation will include surface water, groundwater, soil, and sediment sampling, as well as some waste sampling, for chemical analyses as described in Section 3. Further details on the purpose, scope and methodology of the investigation are provided in the Work Plan for a Remedial Investigation and Feasibility Study at the Burlington Northern Site in Somers, Montana (ERT, October 1985).

The primary objective of this QA plan is to ensure that all measurement data generated in the remedial investigation are of sufficient quality to permit a well-informed feasibility study and an endangerment assessment. The quality of the measurement data can be defined in terms of the following elements:

- Completeness - the adequacy in quantity of valid measurements to prevent misinterpretation and define the nature and extent of contamination.

- Representativeness - the extent to which discrete measurements accurately describe the greater picture which they are intended to represent. Good representativeness is achieved through careful, informed selection of sampling sites, drilling sites, drilling depths and analytical parameters; and through the proper collection and handling of samples to avoid interferences and prevent contamination and loss.

- Accuracy and Precision - the agreement between a measurement and the true value and the degree of variability in this agreement, respectively. Accuracy and precision of data collected in the remedial investigation will depend upon the measurement standards used and the meticulous, competent use of them by qualified personnel.

- Comparability - the extent to which comparisons among different measurements of the same quantity or quality will yield valid conclusions. Comparability among measurements in the remedial investigation will be achieved through the use of standard procedures and standard field data sheets.

- Traceability - the extent to which data can be substantiated by hard-copy documentation. Traceability documentation exists in two essential forms: that which links quantitation to authoritative standards, and that which explicitly describes the history of each sample from collection to analysis.

This plan describes the mechanisms that will be employed in the remedial investigation to ensure quality as defined above. The mechanisms can be categorized as prevention, assessment and correction, as follows:

1) Prevention of defects in quality through planning and design, documented instructions and procedures, and careful selection and training of skilled, qualified personnel;

2) Quality assessment through analysis of quality control samples, and through a program of regular audits and inspections to supplement continual informal review;

3) Permanent correction of conditions adverse to quality through a closed-loop corrective action system.

1.2 Organization/Responsibilities

Quality Assurance at ERT is performed by an independent division reporting to the Executive Vice President. The Quality Assurance Manager is a full-time professional with many years of experience in both environmental measurements and quality assurance. Reporting to the QA Manager is a full-time staff of auditors. The auditors conduct routine performance and systems audits of equipment, procedures and documentation, and report the findings to the QA Manager. The QA Division maintains the QA documentation archive (QA Library) and administrates revisions and distribution of the Quality Assurance Manual and all Standard Operating Procedures and Technical Instructions. Key operational groups have QC officers who coordinate the QA/QC activities within their respective groups and communicate regularly with the Quality Assurance Manager.

The project organization for the Somers Remedial Investigation is depicted in Figure 1-1. Responsibilities of key positions in the organization are described below:

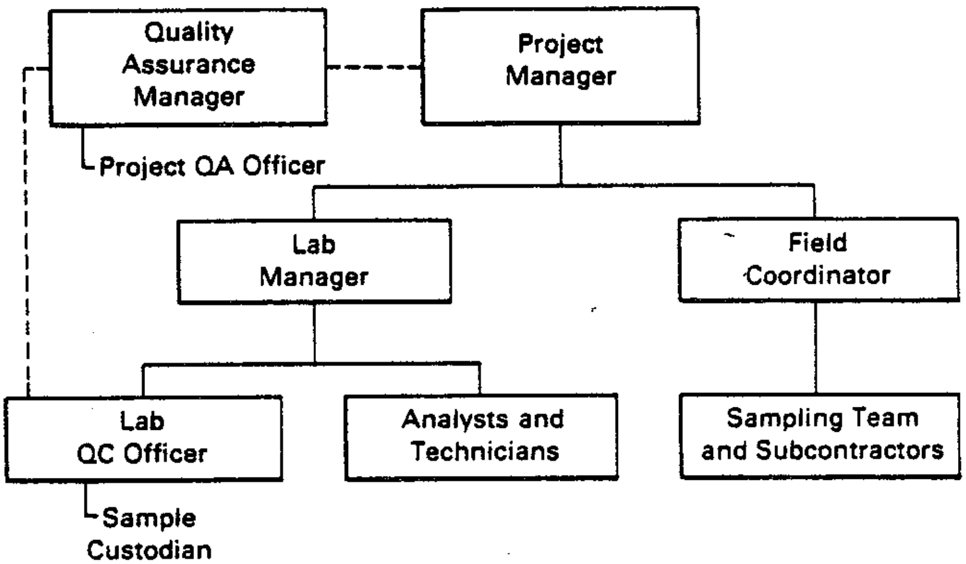

Figure 1-1 Project Quality Assurance Organization

8505075

- Project Manager: The Project Manager's responsibilities include review of all project data, scheduling of activities, authorization of revisions to the Site Operations Plan and the QA Plan, correspondence.

- Project Quality Assurance Officer: The Project Quality Assurance Officer conducts the QA activities during the remedial investigation. This person conducts routine audits of procedures and documentation, and reports directly to the quality assurance manager.

- Laboratory Manager: The Laboratory Manager is responsible for overall management of laboratory operations to meet project commitments, including scheduling of personnel and physical resources.

- Laboratory QC Officer: The Laboratory QC Officer is responsible for maintaining the laboratory Quality Control program. The Laboratory QC Officer maintains laboratory standards and traceability documentation and performs analytical data package validation. The Laboratory QC Officer reports directly to the Laboratory Manager, but also has indirect reporting responsibility to the Quality Assurance Manager.

- Sample Custodian: The Sample Custodian is responsible for issuance of sampling kits to the Field Coordinator and for inspection and log-in of incoming samples and control of sample storage.

- Field Coordinator: The Field Coordinator is responsible for the coordination and effective use of all personnel on site and will maintain a general log of activities. The Field Coordinator will also be responsible for issuance and tracking of measurement and test equipment, the proper labeling, handling, storage, shipping, and chain of custody procedures used at the time of sampling, and control and archiving of all field documentation, (log books, notebooks, data sheets, etc.) generated during the field investigation.

- Sampling Geologists/Engineers: The sampling geologists/ engineers responsibilities include collecting soil, water, and waste samples; conducting field measurements; and maintaining proper decontamination procedures; all according to documented procedures stated in the Quality Assurance Plan and the corresponding SOP's.

QA Plan Distribution

Project personnel performing key tasks which directly affect the quality of measurement data will each be assigned a numbered copy of this QA Plan. The purpose of numbering is to permit tracking of each copy as it changes hands with personnel changes, etc. Each of these QA Plan Holders will be responsible for keeping his copy of the plan up-to-date and maintaining a familiarity with and understanding of all current standard procedures associated with tasks assigned to him. Each QA Plan holder is responsible for implementing the QA Plan as it applies to his or her role in the project.

Each member of the project team should read and understand this plan before beginning work on the project.

2.0 QUALITY ASSURANCE/QUALITY CONTROL - FIELD ACTIVITIES

This section describes specific quality activities aimed at the prevention and early detection of circumstances adversely affecting quality in each of the field measurement tasks of the remedial investigation.

2.1 Training

All ERT, subcontractor, or co-contractor personnel working on the Somers project will be properly trained, qualified individuals. Prior to commencement of work, personnel will be given instruction specific to this project, covering the following areas:

- Organization and lines of communication and authority,
- Overview of the Work Plan and QA plan,
- Documentation requirements,
- Decontamination requirements,
- Health and Safety considerations.

Training of field personnel will be provided by the Field Coordinator or his/her qualified designee.

The analysts performing chemical analyses of samples for the Somers Project will be trained in and will have exhibited proficiency at the analytical methods to be employed.

2.2 Quality Control of Subcontractors

Subcontractor quality control is that system of activities which ensures that products or services obtained from subcontractors fulfill the needs of the project. Subcontractor quality control begins with subcontractor procurement. ERT's policy for control of procurement is described in the ERT Quality Assurance Manual for Measurements, Provision Number 13.

For the Somers project, the responsibility for procurement of subcontractors or co-contractors rests with BN. ERT, as appropriate, shall assist in the procurement process. The procurement process shall consider:

- Bidder's qualifications in terms of personnel and physical resources, Quality Assurance program and Health and Safety program,
- Results of pre-qualification audits, if appropriate,
- Price and technical qualifications.

Periodic quality control inspections of each contractor will be performed by the ERT Field Coordinator or his designee to evaluate adherence to the project QA Plan and the project Health and Safety Plan. Inspection will include (as appropriate):

- Type and condition of equipment,
- Calibration procedures,
- Personnel qualifications,
- Decontamination procedures,
- Documentation.

Results of the inspection should be entered in the field notebook, and reported on a regular basis to the Project Manager.

2.3 Evaluation of Existing Data and Existing Sampling Points

Any existing data that are pertinent to the project but have been collected by another agency may be incorporated into the data base for these response actions only after they have been validated. Validation will consist of a thorough review of all supporting documentation for each data point to verify its quality, in terms of representativeness, accuracy, precision and comparability, as defined in Section 1.1.

2.4 Document Control

Document Control for the Somers response actions serves a two-fold purpose. It is a formal system of activities that ensures that:

1) All participants in the project are promptly informed of revisions of the Quality Assurance Plan; and

2) All critical documents generated during the course of the response actions are accounted for during, and at the end of the project.

This QA Plan, the Field Operations Plan, and all Standard Operating Procedure documents have the following information on each page:

- Document Number
- Page Number
- Total number of pages in document
- Revision number
- Revision date

When any of these documents are revised, the affected pages are reissued to all personnel listed as document holders with updated revision numbers and dates. Issuance of revisions is accompanied by explicit instructions as to which documents or portions of documents have become obsolete.

Control of, and accounting for documents generated during the course of the project is achieved by assigning the responsibility for document issuance and archiving. Table 2-1 lists the key documentation media for the project and corresponding responsible parties for issuance, execution and archiving.

All documentation for the project will either be recorded in non-erasable ink, or will be photocopied promptly upon completion, and the photocopies dated. All documents will be signed by the person completing them.

Table 2-2 is a list of ERT Standard Operating Procedures applicable to the project. The Standard Operating Procedures themselves are contained in the Appendix.

2.5 Sample Control Procedures and Chain of Custody

Successful analysis depends on the capability to produce valid data and to demonstrate such validity. In addition to proper sample collection, preservation, storage and handling, appropriate sample identification procedures and chain of custody are necessary to help support the validity of the data. The procedures specified herein are those used by the Office of Enforcement, U.S. Environmental Protection Agency as of October, 1980.

TABLE 2-1

DOCUMENT CONTROL

Item	Issued By	Issued To	Archived By
Field Notebooks	Field Coordinator	Sampling Team	Sampling Team
Equipment Calibration Forms	Field Coordinator	Equipment Operators	Field Coordinator
Boring Logs	Field Coordinator	Boring Inspectors	Field Coordinator
Groundwater Standpipe Installation Report	Field Coordinator	Boring Inspectors	Field Coordinator
Sample Logs	Field Coordinator	Sampling Team	Field Coordinator
Chain-of-Custody Forms	Lab	Sampling/Analytical Coordinator	Lab, Field Coordinator
Analysis Request Forms	Field Coordinator	Sampling/Analytical Coordinator	Lab, Field Coordinator
Shipping Forms	Field Coordinator	Sampling/Analytical Coordinator	Lab, Field Coordinator
Sample Labels	Field Coordinator	Sampling Team	Lab

TABLE 2-2

ERT STANDARD OPERATING PROCEDURE LIST

Name	Subject
2005 (Draft)	Numerical Analysis and Peer Review
7110	Surface Soil Sampling
7115	Subsurface Soil Sampling
7120	Surface Water Sampling
7130	Groundwater Sampling
7140	Lake and Stream Bottom Sediment Sampling
7220	Monitoring Well Construction and Installation
7230	Test Pits/Trench-Subsurface Exploration
7315	Operation/Calibration of HNu Photoionization Analyzer
7510	Packaging and Shipment of Samples
7600	Decontamination of Equipment

Sampling kits will be provided to the Field Coordinator by the Sample Custodian. The sampling kits will be enclosed in coolers, and will include the appropriate sample containers, chain-of-custody forms and all appropriate shipping blanks. The sample containers provided in the sampling kits will be cleaned, treated with preservative (as appropriate, except sodium thiosulfate) and pre-labeled by the Sample Custodian. Completed sampling kits will be returned to the Sample Custodian by the Field Coordinator after the samples have been collected.

2.5.1 Sample Identification

The sample containers and shipping blanks contained in the sampling kits will be pre-labeled by the sample custodian to indicate the type and quantity of preservative (if any), the type of sample for which the container is intended, the sample custodian's initials and the date the sampling kits were assembled. As samples are collected and containerized in the field, the following information will be added to each label by the sampler:

- Station Location - Description of place where sample was taken (e.g. the well, boring or test pit identification).
- Date - A six-digit number indicating the year, month, and day of collection.
- Time - A four-digit number indicating the military time of collection.
- Sampler - Signature of person collecting the sample.
- Remarks - Any pertinent observations or further sample description.

After collection, identification, and preservation, the sample is maintained under chain-of-custody procedures discussed below.

2.5.2 Chain-of-Custody Procedures

To maintain and permanently document sample possession, chain-of-custody procedures are followed. A sample is under custody if:

- It is in your possession, or
- It is in your view, after being in your possession, or

- It was in your possession and then you locked it up to prevent tampering, or

- It is in a designated secure area.

Field Custody Procedures

1. The field sampler is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly.

2. The Field Coordinator determines whether proper custody procedures were followed during the field work and decides if additional samples are required.

3. Prior to commencement of sampling, the Field Coordinator will instruct the sampling team in the chain-of-custody procedures.

Transfer of Custody and Shipment

1. Samples are accompanied by a Chain-of-Custody Record (Figure 2-1) from the time they are collected. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the Sample Custodian at the laboratory.

2. Minimum information recorded on the chain-of-custody record in addition to the signatures and dates of all custodians will include:

   - Sampling site identification
   - Sampling date and time
   - Identification of sample collector
   - Sample identification
   - Sample description (type and quantity)
   - Analyses to be performed.

3. Samples will be packaged properly for shipment and dispatched to the laboratory for analysis, with a separate custody record accompanying each shipment. Shipping containers will be sealed with chain-of-custody tape for shipment to the laboratory. Chain-of-custody tape numbers are entered on the corresponding chain-of-custody form. The method of shipment, courier name(s) and other pertinent information are entered in the "Remarks" box. The shipper's waybill or air bill is retained by the last custodian prior to shipment.

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
Project No.	Field Logbook No.
Sampler: (*Signature*)	Chain of Custody Tape No.

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	ANALYSES						REMARKS

Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Date	Time	Received for Laboratory: (*Signature*)	Date	Time
Sample Disposal Method:	Disposed of by: (*Signature*)			Date	Time
SAMPLE COLLECTOR Environmental Research and Technology, Inc. 696 Virginia Road Concord, MA 01742 617-369-8910	ANALYTICAL LABORATORY			ERT № 10501	

1974-3 b1

Figure 2-1

4. Whenever samples are split with another laboratory, it is noted in the "Remarks" section. The note indicates with whom the samples are being split and is signed by both the sampler and recipient. If either party refuses a split sample, this will be noted and signed by both parties. The person relinquishing the samples to the facility or agency should request the signature of a representative of the appropriate party, acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this is noted in the "Remarks" space. When appropriate, as in the case where the representative is unavailable, the custody record should contain a statement that the samples were delivered to the designated location at the designated time.

5. Each shipment will be accompanied by the Chain-of-Custody Record identifying its contents. The original record will accompany the shipment, and a copy will be retained by the sampling supervisor.

6. The receiving laboratory's sample log should indicate the condition of samples as received, and should explicitly state whether the chain-of-custody seal is intact.

7. The receiving laboratory should retain a copy of each chain-of-custody record, with the shipper's waybill or air bill attached.

2.5.3 Field Forms

In addition to sample labels and chain-of-custody forms, a bound field notebook will be maintained by the Field Coordinator and each sampling team member to provide a daily record of significant events. All entries will be signed and dated. The notebook will be kept as a permanent record.

Other field documentation media are listed in Table 2-1. The SOPs provide instructions for the use of these forms.

2.6 Sampling/Sample Preservation

2.6.1 Sample Collection

Water Samples. Water samples will be collected in accordance with ERT SOP 7120, Surface Water Sampling and 7130, Ground Water Sample Collection from Monitoring Wells.

A minimum of one field blank sample (deionized water) and at least one duplicate sample shall be collected for each 20 samples or for each round of sampling whichever is more frequent. Field blanks are collected by transferring deionized water into the decontaminated sampling device, and then into the appropriate sample container (see Section 2.6.2) at a sampling site, and then sealing, labeling, and shipping it with the samples. The deionized water is carried to the field in a sealed airtight container (see Section 2.6.2). The source of deionized water should be the laboratory that will analyze the samples (ERT laboratory deionized water preparation is discussed in the ERT Analytical Laboratory Quality Control Handbook). Duplicate water samples will be collected by filling two containers (or sets of containers) simultaneously from the sampling implement (pump, bailer, bucket). For duplicate part-per-trillion PAH samples, eight bottles are filled and capped, and then split into two groups of four bottles. Field blanks and field duplicates wll not be labeled as blanks/duplicates on the sample labels or chain-of-custody forms, but will be identified as such in the field notebook and on the sample logs.

Groundwater samples will be collected from the monitoring wells in accordance with ERT SOP 7130. To ensure representative samples, pH, temperature and conductance readings will be taken repeatedly during well purging. Purging will continue until the readings stop changing, then sampling will commence. Sample containers will not be prerinsed with sample. Sample containers will be filled to capacity, with no air bubbles.

Samples destined for analysis of dissolved inorganics will be filtered with a 0.45-micron membrane filter in a Millipore (or equivalent) filtration apparatus equipped with a hand or electrical vacuum pump. If field filtration is also necessary or desirable for organics samples, use a glass membrane filter. Glass membrane filters containing wetting agents will not be used. If necessary, wetting agents will be removed in the laboratory prior to use of the filters, by washing with acetone, then hexane, and then heating until dry. Filtered samples must be transferred immediately to the appropriate containers.

All sample collection apparatus will be fully decontaminated, in accordance with ERT SOP 7600, before sampling and between monitoring wells. For one of every 20 sampling events, the decontamination rinsate will be collected in the appropriate sample containers, labeled, and sent to the laboratory for analysis.

Soils and Sediments. Environmental soil sampling will be conducted in accordance with ERT SOPs 7115, Subsurface Soil Sampling and 7230, Subsurface Exploration. Sediment samples will be collected in accordance with ERT SOP 7140, Lake and Stream-Bottom Sediment Sampling. Waste sampling in the old disposal lagoon will be conducted in accordance with ERT SOP 7110, Surface Soil Sampling. Soil samples will be containerized in clean, 8-ounce widemouth glass jars. The waste sample will be containerized in a clean widemouth glass jar and a VOA Vial.

Amber glass will be used, if available for all PAH samples. If amber glass jars are not used, jars will be wrapped in aluminum foil to minimize exposure to light.

With environmental soil and sediment samples, at least one sample in every 20 will be collected in replicate; or at least one replicate soil and one replicate sediment per sampling round (whichever is more frequent). Replicate samples will be collected by repeating the sampling procedure at a sampling point to obtain two samples. Field replicates will not be identified as replicates on the sample labels or chain-of-custody forms, but will be identified as such in the field notebook and on the sample logs.

All sample collection apparatus will be fully decontaminated, in accordance with ERT SOP 7600, before sampling and between sampling points. For one of every 20 sampling events, the decontamination rinsate will be collected in the appropriate sample containers, labeled, and sent to the laboratory for analysis.

2.6.2 Sample Containers

The required sample containers, filling instructions and preservation procedures are listed in Table 2-3. Amber glass will be used for the PAH and extractable organics, VOA vials for volatiles and

TABLE 2-3

SAMPLE CONTAINERS, PRESERVATION PROCEDURES, AND MAXIMUM HOLDING TIMES OF SAMPLES

Parameter	Containers	Preservation[1]	Maximum Holding Time[2]
Water			
PAH	Four 1-liter amber glass bottles, teflon-lined caps	cool, 4°C; protect from light	7 days (until extraction)
HSL	One 1-liter amber glass bottle, teflon-lined cap	cool, 4°C (0.008% $Na_2S_2O_3$, if residual Cl is present)	7 days (until extraction)
	One 40-ml VOA vial, teflon septum	cool, 4°C (0.008% $Na_2S_2O_3$, if residual Cl is present)	14 days
	Two 1-liter cubitainers	HNO_3 to pH <2	6 months
Suspended Solids	One 1-liter cubitainer	cool, 4°C	7 days
Metals[1] and Hardness	One 1-liter cubitainer	HNO_3 to pH <2	6 months
Soil, Sediment			
PAH	One 8-ounce, widemouth, amber glass jar, teflon-lined cap	cool, 4°C; protect from light	7 days (until extraction)
Extractables	One 8-ounce, widemouth jar teflon-lined cap	cool, 4°C	14 days (until extraction)
Metals[3]	One 8-ounce, widemouth jar	cool, 4°C	6 months

TABLE 2-3 (CONTINUED)

Parameter	Containers	Preservation[1]	Maximum Holding Time[2]
Soil, Sediment (Continued)			
HSL	One 8-ounce, widemouth jar teflon-lined cap	cool, 4°C	
	One 40-ml VOA vial, teflon septum		

Federal Register Guidelines/Vol. 49, No. 209/Friday, October 26, 1984/p. 43260.

[1]Sample preservation will be performed immediately upon sample collection. For composite samples each aliquot will be preserved at the time of collection, if possible. Each aliquot of the composite, which would require multile preservatives, will be preserved only by maintaining at 4°C until compositing and sample spitting is completed.

[2]Samples will be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.

[3]Except mercury and hexavalent chromium.

"cubitainers" for the inorganics. Preservatives will be placed in the containers (as necessary) by the laboratory, prior to issuance of the sampling kits. The exception to this is Sodium Thiosulfate (if needed) which will be added by the sampling team only if residual chlorine is present in the sample[1].

The deionized water supply used for field blanks will be contained in sample bottles.

Containers will be prepared in the laboratory as follows:

Amber Glass Bottles, Widemouth Glass Jars, and D.I. Water Supply Container

1. Rinse three times with Burdick & Jackson quality redistilled Methanol.

2. Allow to air dry in a contaminant free area.

3. Caps and liners must be washed and rinsed also.

VOA Vials

Bake at 110°C for approximately 15 minutes. Containers will be stored and shipped with the Teflon-lined caps securely fastened.

2.6.3 Sample Preservation and Shipment

The samples must be iced or refrigerated at 4°C from the time of collection until extraction. PAH's are known to be light sensitive; therefore, PAH samples, extracts and standards will be stored in amber bottles, or wrapped in aluminum foil, and kept away from prolonged exposure to light. If residual chlorine is known or suspected to be present[1], preservation is required for organics samples. Add 80 mg of sodium thiosulfate per liter of sample. PAH samples will be extracted within 7 days, and analysis completed within 40 days. For other organics and inorganics, the procedures in Table 2-3 apply.

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[1]The presence, or likelihood of the presence of residual chlorine will be determined based on knowledge of water supply treatments in effect, if water supply samples are collected. No measurements of residual chlorine are anticipated.

Samples will be protected from breakage and shipped in the coolers. Each cooler will be sealed with chain-of-custody tape, so that any opening of the cooler during shipment will be indicated. Ice (or equivalent) will be used to maintain a temperature of 4°C. A carrier will be selected which will insure delivery at the laboratory within 24-36 hours after collection.

Records of sample shipments will be maintained by the Field Coordinator. Copies of chain-of-custody records and shipper's airbills or waybills will be retained. All samples will be logged, with method and date of shipment in the sample logs and Field Notebook.

2.7 Field Measurement Equipment

Measurements of temperature, pH and specific conductance of well purge water will be performed using a water quality meters. Field screening of samples for prioritization of organics analyses will be performed using an HNu photoionization detector (see ERT SOP 7315).

All field measurement equipment will be controlled to ensure that measurements obtained are accurate and defensible. Table 2-4 summarizes the routine quality control (QC) checks to be performed on each type of equipment.

In addition, these measurement devices will be issued through a formal equipment tracking system and operated by trained personnel, in accordance with the appropriate SOPs.

TABLE 2-4

FIELD MEASUREMENT EQUIPMENT QUALITY CONTROL

Device	Calibration	Routine Check		Reference
		Method	Frequency	
pH Meter	Standardize in two or more standard buffer solutions	Calibration check-analyze standard buffer solution	1/10 Samples	Manufacturers Manual
		Analyze replicates	1/10 Samples	
Conductivity Meter	Standardize using two or more KCL solutions	Calibration check-analyze standard KCL solution	1/10 Samples	Manufacturers Manual
		Analyze replicates	1/10 Samples	
HNu	Calibrate by sampling clean air and gas containing known concentration of a representative specie	Resample calibration standard	Daily	ERT SOP 7315

3.0 ANALYTICAL LABORATORY QUALITY CONTROL

The ERT Analytical Laboratory operates under a formal quality control program governed by ERT's Analytical Laboratory Quality Control Handbook. This program covers quality related activities applicable to laboratory operations from the arrival of incoming samples to the issuance of validated analytical data.

This section of the Quality Assurance/Quality Control Plan outlines the specific provisions of the laboratory quality control program applicable to the Somers site investigation. More specific detail on analytical procedures and their inherent quality control checks are to be found in the analytical method documents referenced in this section or contained in Section 4.0.

3.1 Log-in and Storage of Samples

All samples submitted to the laboratory for chemical analysis will be accompanied by chain-of-custody documentation. The laboratory sample custodian will complete each chain-of-custody record by signing and dating it as final custodian. All samples will be carefully inspected for:

- Intact chain-of-custody seal
- Intact air-tight seal
- Temperature
- Evidence of damage
- Completeness of contents (samples, shipping blanks, etc.)
- Completeness of accompanying records.

The condition of each sample, as determined in this inspection will be explicitly stated on the chain-of-custody record.

After inspection, each sample will be logged in and assigned a unique laboratory sample identification number. Information entered in the logbook for each sample should include:

- Field sample identification number,
- Laboratory sample identification number,

- Date received
- Project name and number,
- Collection date,
- Sample type,
- Analyses sought,
- Assigned storage location.

Samples will be refrigerated at 4°C until analyzed. Storage refrigerators will be kept locked to prevent unauthorized entry and to satisfy the chain-of-custody requirements.

3.2 Analytical Quality Control

3.2.1 Inorganics

Inorganics will be analyzed for in sludge, surface water, and groundwater as part of HSL screening. Based upon the results of these analyses, additional inorganics are expected to be selected as monitoring parameters for soil, surface water, and groundwater.

The analytical methods to be used for determination of inorganics selected for monitoring are listed in Table 3-1 and are taken from EPA-600/4-79-020;Rev. March 1983. Digestion will be performed using HNO_3/H_2O_2.

The following minimum quality control checks will be employed in the inorganics analyses:

- Calibration - Prior to each round of analyses, the analytical instrument will be calibrated at a minimum of five concentrations of each measurable to be analyzed. The lowest concentration will be at or near detection limit. The other four will define the linear range of the instrument or the anticipated range of concentrations in the samples.

- Check Standards - Check standards, at concentrations representing the mid point of the calibration curve, will be analyzed at a frequency of once every 10 to 15 samples. Results will be used to verify the standard calibration curve used to reduce the analytical data. Check standard recoveries will be compared to the control limits (Table 3-2) and will be rerun whenever they exceed those limits. If the recovery of the re-run exceeds the control limits, the analytical instrument will be recalibrated.

TABLE 3-1

ANALYTICAL METHODS FOR INORGANICS AND ORGANICS

Parameter	Method
PAH (soils, sediments)	EPA Method 625[1], with Soxhlet extraction (SW-3540)[2]
Benzene Extractables (soil)	EPA Method 9071[2], with benzene substituted for freon
HSL Scan (water, sludges)	CLP[3]
PAH (parts per billion, in water)	EPA Method 625
PAH (parts per trillion, in water)	SIM[4]
Metals (in water)	EPA Method 200.7
Metals (in soil)	CLP[5]
Suspended Soils (water)	EPA Method 160.1
Hardness (water)	EPA Method 130.2

[1]"Base/Neutrals, Acids and Pesticides - Method 625" Federal Register, Vol. 49, No. 209, Friday, October 26, 1984, P. 43385.

[2]Test Methods for Evaluating Solid Waste (SW-846), USEPA, April 1984.

[3]EPA Contract Laboratory Program (IFB WA 85-J176, -J177, -J188, -J266), Revised January 1985.

[4]Select Ion Monitoring (see Section 4.0).

[5]EPA Contract Laboratory Program, Statement of Work No. 75, July 1985.

TABLE 3-2

QUALITY CONTROL LIMITS

INORGANICS

		Control Limits[1]			
		Spiked Samples (RPD)		Calibration Standards Check (RPD)	
Medium	Parameter	LCL	UCL	LCL	UCL
Water	Chromium	-34	+4	-10	+10
	Copper	-12	+2	-10	+10
	Zinc	-35	-3	-10	+10
Soil	Chromium	-13	+13	-10	+10
	Copper	-23	+27	-10	+10
	Zinc	-15	+23	-10	+10

[1]RPD = recovery, percent difference
LCL = lower control limit
UCL = upper control limit

- Spiked Samples - One out of every 10 to 15 samples will be spiked with a known quantity of standard. For these spikes, two aliquots of a sample will be taken, one will be spiked and both will be extracted and analyzed. Results will be used to detect sample matrix interferences.

- Duplicates - One duplicate analysis will be performed for every 10 to 15 samples.

- Blanks - one blank will be analyzed for every 10 to 15 samples.

3.2.2 Organics

Table 3-1 lists the methods to be used in analysis of organic compounds. Oily samples will be subjected to sample clean-up procedures to minimize analytical interferences. The clean-up procedures will be taken from the "Handbook for the Analysis of Petroleum Refinery Residuals and Waste" (Draft 1984).

HSL screening will identify the 20 highest additional peaks and if significant new monitoring parameters emerge, they will be added to the organic parameter list.

The following general quality control procedures will be employed in the organics analyses. Further detail on quality control procedures are given in the analytical methods in Table 3-1 and in Section 4.0.

- GC/MS Tuning - Prior to analysis of samples for the Somers site investigation, the GC/MS system will be tuned by analysis of Decafluorotriphenylphosphine (DFTPP), and must meet the ion abundance criteria before any samples or quality control samples are analyzed.

- Reagent Blanks and Method Blanks - Prior to analysis of each batch of samples from the Somers site, the analytical method will be certified by the analysis of reagent blanks and method blanks to detect and minimize analytical interferences.

- Determination of Control Limits - If the laboratory has not already established control limits for the method in use, control limits will be determined on the basis of an analysis of at least four unspiked aliquots and four spiked aliquots of a representative sample.

- Calibration - The GC/MS system will be calibrated with a minimum of five concentration levels of calibration standard for each parameter to be analyzed in the samples. One of the concentrations of each standard will be slightly above the method detection limit. The other concentrations will be correspond to the expected range of concentrations in the samples or to the linear working range of the GC/MS system. Details of the calibration procedure are provided in the analytical methods.

- Daily GC/MS Performance Tests - GC/MS performance tests will be performed in accordance with the appropriate standard method each day that samples from the site are to be analyzed.

- Calibration Check Standards - Each day of sample analyses for the Somers site, after the GC/MS performance tests, calibration check standards will be analyzed to confirm the validity of the original five-point calibration. If the response to a calibration check standard differs from the initial calibration, investigation and corrective action will be performed, including a five-point recalibration, if necessary. Sample analyses will not be resumed until this criterion is met.

- Method Performance Spikes - For part-per-trillion PAH in water, method performance spikes, consisting of deionized water spiked with each PAH compound at a known concentration, will be used to validate method performance for a given analytical case. Method performance criteria will be established using the method performance study as outlined in Section 8 of the EPA Method 610.

- Quality Control Check Samples - Once for every 20 samples (except parts-per-trillion PAH), a quality control check sample containing 100 µg/l of the parameters being analyzed will be extracted and analyzed for monitoring method performance. Control limits are given in Table 3-3. When control limits are exceeded for any of the measurement parameters, the measurement system will be investigated and the test will be rerun for those parameters. The investigation-retest cycle will be repeated until the problem has been solved.

- Surrogate Recoveries - All Somers samples and all standards will be spiked with surrogates for the purpose of monitoring analytical accuracy. Surrogate recovery rates will be logged and compared to the control limits (see Table 3-3). Whenever surrogate recoveries are outside the control limits, another aliquot of the extract for the affected sample(s) will be analyzed.

- Method Blanks - Method blanks will be extracted and analyzed at the rate of 1 per 15 samples analyzed. Method blanks will consist of organic-free water.

TABLE 3-3

QUALITY CONTROL LIMITS
ORGANICS

Medium	Parameter	Control Limits: QC Check Samples	Control Limits: Matrix Spikes	Control Limits: Surrogates
Soil/Sediment	PAH (ppm)	Table 6[1]	Table 5.2[2]	Table 4.2[2]
Water	PAH (ppb)	Table 6[1]	Table 5.2[2]	Table 4.2[2]
Water	PAH (ppt)	----- To Be Determined -----		

[1]"Base/neutrals, acids, and pesticides - Methods 625", Federal Register, Vol. 49, No. 209, Friday, October 26, 1984, p. 43385.

[2]EPA Contract Laboratory Program (IFB WA 85-J176, -J177, -J188), Revised January 1985.

- Shipping Blanks - Each package (cooler) of sample containers sent to the site from the laboratory will contain a shipping blank consisting of two VOA vials filled with organic-free water. The blanks will remain in the cooler during sample collection and will accompany the samples back to the laboratory. The blanks will then be logged-in, stored and analyzed with the associated samples. If the blanks indicate the possibility of contamination, the Project Manager will be promptly notified.

- Duplicate Sample Analysis - For PAH in solids and sediments, 1 sample out of every 15 will be extracted and analyzed in duplicate for determination of analytical precision.

- Matrix Spikes and Matrix Spike Duplicates - For PAH in soil and sediment, a matrix spike and matrix spike duplicate will be performed for each type of matrix (soil, sediment, sludge) once each round of analyses or once for every 20 samples, whichever is more frequent. The procedure for matrix spikes will conform to the provisions of the Contract Laboratory Program (ref. 4). The control limits in Table 3-3 are preliminary estimates, and will be revised, as necessary based on results obtained. Reanalysis of samples will not necessarily be required when these limits are exceeded.

3.3 Documentation

All analytical results shall be thoroughly documented in reproduction quality. Duplicate records will be kept whenever possible. Project records shall be maintained in a secure area for at least 5 years after the completion of the project.

For each analytical result, including all blanks, spikes, calibration standards, surrogates and samples, supporting quality assurance documentation shall be maintained that includes at least the following:

- Complete chain-of-custody records for the sample;

- Records of traceability to EPA Reference Materials, NBS Reference Materials, or appropriate, recognized standards for all analytical standards, surrogate standards, spikes, balance calibration weights, and volumetric standards;

- Records of all sample preparation, including weights and volumes of reagents, dilution ratios, etc. These records will be in laboratory notebooks and/or formalized data sheets, and will undergo regular review by a supervisor or quality control officer. All notebook pages and data sheets will be signed and dated by originator and reviewer.

- Documentation of all manual calculations in reproduction quality.

3.4 Analytical Data Validation

Data validation is a process of review of the analytical results and documentation against established criteria. The Laboratory Quality Control Officer is responsible for performing the validation.

Statistical Evaluation

The precision and accuracy of all data will be computed and compared to the control limits as part of the data validation process. Precision is determined from the analytical results of duplicate samples; accuracy is computed from spike recoveries.

The results of all other quality control checks will be reviewed in terms of the following criteria:

- Method blank values should be reasonably low, so that there is no evidence of contamination of reagents and glassware.
- Shipping blanks should also be reasonably low, indicating that samples have been adequately protected from contamination.
- The daily calibration curves should be linear over their entire range, and all samples analyzed should be within that range.
- Surrogate recoveries (as applicable) should be within control limits.

If any of the above criteria are not met, the Laboratory Supervisor and Project Manager will be notified and will meet with the Laboratory Quality Control Officer to discuss remedies and the status of the data.

Documentation Review

For each batch of analyses, supporting documentation will be reviewed for completeness, correctness, and legibility in terms of the criteria in Section 3.3.

4.0 SPECIAL ANALYTICAL METHOD FOR LOW-LEVEL PAH IN WATER

4.1 Scope and Applicability

This method covers the determination of PAH that are partitioned into an organic solvent and are amenable to gas chromatography. The parameters listed in Table 4-1 will be quantitatively determined using this method.

This method is restricted to use by or under the supervision of analysts experienced in the operation of gas chromatograph/mass spectrometers and skilled in the interpretation of mass spectra. Each analyst must demonstrate the ability to generate acceptable results with this method using the procedure described.

4.2 Summary of Method

Four 1-liter volumes of sample are extracted by separating into two 2-liter samples and combining these two extracts. Analysis on the concentrated extract is performed by gas chromatography/mass spectroscopy using the selected ion monitoring mode.

4.3 Interferences

Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the total ion current profiles. All of these materials must be routinely demonstrated to be free from interferences under the conditions of the analysis by running laboratory reagent blanks.

Glassware must be scrupulously cleaned. Clean all glassware as soon as possible after use by rinsing with the last solvent used in it. This should be followed by detergent washing with hot water, and rinses with tap water, reagent water, then methanol. It should then be oven dried at 150°C for 30 minutes, and heated in a muffle furnace at 400°C for 15 to 30 minutes. Solvent rinses with methylene chloride may be substituted for the muffle furnace heating. Volumetric ware should not

TABLE 4-1

COMPOUNDS AND MS QUANTITATION MASS IONS

Compound	Quantitation Mass Ion	Internal Standard Reference
Naphthalene	128	1
Acenaphthylene	152	1
Acenaphthene	154	1
Fluorene	166	2
Phenanthrene	178	2
Anthracene	178	2
Fluoranthene	202	2
Pyrene	202	2
Benzo(a)anthracene	228	3
Chrysene	228	3
Benzo(b)fluoranthene	252	3
Benzo(k)fluoranthene	252	3
Benzo(a)pyrene	252	3
Indeno(1,2,3,cd)pyrene	276	3
Dibenz(a,h)anthracene	278	3
Benzo(g,h,i)perylene	276	3

Internal Standards

1) Acenaphthene-d10	164
2) Phenanthrene-d10	188
3) Benz(a)pyrene-d12	264

be heated in a muffle furnace. After drying and cooling, glassware should be sealed and stored in a clean environment to prevent any accumulation of dust or other contaminants. Store it inverted or capped with aluminum foil. The use of high purity reagents and solvents helps to minimize interference problems. Purification of solvents by distillation in all-glass systems may be required.

4.4 Apparatus

4.4.1 Glassware

a) Separatory funnel - 2000 ml, with Teflon stopcock.

b) Concentrator tube, Kuderna-Danish - 10 ml, graduated (Kontes K-570050-1025 or equivalent). Calibration must be checked at the volumes employed in the test. Ground-glass stopper is used to prevent evaporation of extracts.

   Snyder column, Kuderna-Danish - Three-ball macro (Kontes K-503000-0121 or equivalent).

c) Evaporative flask, Kuderna-Danish - 500 ml (Kontes K-570001-0500 or equivalent). Attach to concentrator tube with springs.

d) Matrix interferences may be caused by contaminants that are coextracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the municipality being sampled.

e) Snyder column, Kuderna-Danish - Two-ball micro (Kontes K-569001-0219 or equivalent).

f) Micro reaction vessels, 2.0 ml (Supelco 3-3295).

4.4.2 Gas Chromatograph

The analytical system is complete with a temperature programmable gas chromatograph and all required accessories including syringes, analytical columns, and gases. The injection port is designed for on-column injection when using packed columns and for splitless injection when using capillary columns.

4.4.3 Column

A J&W 30-meter fused silica capillary column coated with DB-5 bonded phase, or equivalent.

4.4.4 Mass Spectrometer

A mass spectrometer utilizing a 70 volt (nominal) electron energy in the electron impact ionization mode and producing a mass spectrum which meets all the criteria when 50 ng of decafluorotriphenyl phosphine (DFTPP; bis(perfluorophenyl) phenyl phosphine) is injected through the GC inlet. Any GC to MS interface that gives acceptable calibration points for each compound of interest in Table 4-1 and achieves all acceptable performance criteria may be used. The GC to MS interface used for this project is constructed of all glass or glass lined materials. Glass is deactivated by silanizing with dichloro-dimethylsilane.

A computer system interfaced to the mass spectrometer allows the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer has software that allows searching any GC/MS data file for ions of a specific mass and plotting such ion abundances versus time or scan number. The computer allows acquisition at pre-selected mass windows for selected ion monitoring.

4.5 Reagents

a) Reagent water - Reagent water is defined as a water in which an interferent is not observed at the method detection limit of each parameter of interest.

b) Acetone, methanol, methylene chloride - Pesticide quality or equivalent.

c) Sodium sulfate - (ACS) Granular, anhydrous. Purify by heating at 400°C for 4 hrs. in a shallow tray.

d) Surrogate Spiking Solution - A solution of ca. 50 ng/ml of each of fluorene-d10, naphthalene-d8 and chrysene-d12 is prepared by weighing appropriate aliquots of the purified crystals into a volumetric flask and diluting to volume with methanol or acetone.

e) Internal Standard Solutions - A solution containing ca. 200 ng/ml of each internal standard is prepared by weighing an appropriate aliquot of the purified crystal into a volumetric flask and diluting to volume with methylene chloride.

4.6 Calibration

Prior to use of this method a five-point response factor calibration curve must be established showing the linear range of the analysis. The mass spectrometer response for each PAH relative to the internal standard is determined daily, as described in Section 4.10. Daily standards concentrations must be chosen from within the linear range of useable concentrations as determined by the initial method calibration curve.

Daily response factors for each compound must be compared to the initial calibration curve. If the daily response factors are within ±35 percent of the corresponding calibration curve value the analysis may proceed. If the daily response factors are not within ±35 percent of the corresponding calibration curve value, the five-point calibration curve must be repeated prior to the analysis of samples.

Peak location criteria will be established using relative retention time. An initial determination of retention times for each PAH relative to its respective internal standard (Table 4-1) will be made using five-point calibration standards. Average relative retention times and standard deviations will be calculated and 95 percent confidence limits established. Relative retention times of daily calibration standards must be within these 95 percent confidence limits for each PAH compound. In addition, sample component relative retention times must be within ±0.1 relative retention time units of the standard component relative retention time.

4.7 Extraction

Samples are extracted at pH >12. Each 4-liter sample is separated into two 2-liter aliquots in two 2-liter separatory funnels. Each 2-liter aliquot is spiked in the separatory funnel with naphthalene-d8, fluorene-d10, and chrysene-d12 using the surrogate spiking solution. A 2.0 ml volume of a mixed surrogate spiking standard in acetone is added to each 2-liter separatory funnel. Each aliquot is then extracted three times (80 ml/80 ml/80 ml) with methylene chloride. The three methylene chloride extracts are passed through an anhydrous sodium sulfate drying column, and combined in a Kuderna-Danish evaporative concentrator. The extracts are concentrated to a volume of ca. 1 ml. The two ca. 1 ml extracts for each sample are combined, 4 ml of cyclohexane is added, and the extract further reduced to ca. 1-2 ml.

If cleanup of the extract is required, proceed to the alumina column cleanup procedure, ERT SOP# 6320. Otherwise, continue with the extract concentration as outlined below.

Concentrate the extract or cleaned extract to ca. 0.5 ml and transfer to a 2.0 ml microreaction vessel containing 0.5 ml (500 ul) of benzene. The methylene chloride is evaporated using a nitrogen stream. The evaporative concentrator tube is successively rinsed with methylene chloride, the rinsings added to the reaction vessel and the methylene chloride again evaporated. Continue this process until at least five (5) 1 ml rinsings of the tube have occurred. Evaporate the final methylene chloride, leaving the 500 ul of benzene. All microreaction vessels should be permanently marked at the 500 μℓ level and additional benzene added, when necessary, to insure a final 500 μℓ extract volume. Cap with a Teflon fitted septum cap and submit the vial to the GC/MS Laboratory for analysis.

4.8 Daily GC/MS Performance Tests

At the beginning of each day that analyses are to be performed, the GC/MS system must be checked to see that acceptable performance criteria are achieved for DFTPP. These DFTPP performance test require the following instrumental parameters:

Electron Energy 70 volts (nominal)

Mass Range - 35 to 450 amu

Scan Time - to give at least 5 scans per peak but not to exceed 7 seconds per scan.

At the beginning of each day, inject 2 mL (50 ng) of DFTPP standard solution. Obtain a background corrected mass spectrum of DFTPP and check that all the key ion criteria in Table 4-2 are achieved. If all the criteria are not achieved, the analyst must retune the mass spectrometer and repeat the test until all criteria are achieved.

4.9 Gas Chromatography/Mass Spectroscopy

Just prior to analysis a 100 µl aliquot of sample is removed and combined with 25 µl of the internal standard dilution, given a final internal standard concentration of ca. 50 ng/ml in the extract. Representative aliquots are injected into the capillery column of the gas chromatograph using the following conditions:

Injector Temp - 290°C
Transfer Line Temp - 310°C
Initial Oven Temp - 35°C
Initial Hold Time - 2 min.
Ramp Rate - 10°C/min.
Final Temperature - 310°C

The effluent from the GC is fed into the ion source of the mass spectrometer. The MS is operated in the selected ion monitoring mode using appropriate windows to include the masses of each PAH as shown in Table 4-1.

4.10 Calculations

The following formula is used to calculate the response factors of the internal standard to each of the calibration standards.

$$RF = (A_s C_{is})/(A_{is}\ C_s)$$

where:

A_s = Area of the characteristic ion for the parameter to be measured.

A_{is} = Area of the characteristic ion for the internal standard.

TABLE 4-2

DFTPP ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria
51	30 to 60 percent of mass 198
68	less than 2 percent of mass 69
70	less than 2 percent of mass 69
127	40 to 60 percent of mass 198
197	less than 1 percent of mass 198
198	base peak, 100 percent
199	5 to 9 percent of mass 198
275	10 to 30 percent of mass 198
365	greater than 1 percent of mass 198
441	present but less than mass 443
442	greater than 40 percent of mass 198
443	17 to 23 percent of mass 442

C_{is} = Concentration of the internal standard, (ng/ml).

C_s = Concentration of the parameter to be measured, (ng/ml).

Based on these response factors, updated daily sample concentration for each PAH is calculated using the following formula.

$$\text{Concentration, ng/ml} = \frac{(A_s)\ (I_s)}{(A_{is})(RF)}$$

where:

A_s = Area of the characteristic ion for the parameter to be measured.

A_{is} = Area of the characteristic ion for the internal standard.

I_s = Amount of internal standard added to each extract (ug).

Based upon the sample extract volume (ml) and the original sample volume (l), the sample concentration (ng/l) is calculated from the extract concentration.

4.11 Quality Control

4.11.1 Background Blank Concentration

Multiple analyses of distilled water blanks were analyzed to determine the level of laboratory background concentration. Results of these measurements are shown on Table 4-3. A laboratory blank will be analyzed with each batch (ca. 8 samples) of samples extracted. The analytical results for all blanks will be averaged and the average compared to the initial background study concentrations. If they agree within ±50 percent, the sample concentrations will be corrected by subtracting the laboratory blank concentration from respective sample concentrations.

Minimum Detectable Limit (MDL)

The MDL for this method will be determined as outlined in Appendix A of EPA Method 610 (July 1982). The results of that study and the MDL to be reported for each component will be provided under separate cover.

TABLE 4-3

DETERMINATION OF BACKGROUND BLANK CONCENTRATION
(Number of Observations = 18)

Compound	Mean	Standard Deviation
Naphthalene	11	3.9
Acenaphthylene	BDL	
Acenaphthene	BDL	
Fluorene	BDL	
Phenanthrene/anthracene	3	1.9
Fluoranthene	BDL	
Pyrene	BDL	
Bene(a)anthracene/chrysene	BDL	
Benzofluoranthenes	BDL	
Benz(a)pyrene	BDL	
Indeno(1,2,3,cd)pyrene	BDL	
Dibenz(a,h)anthracene	BDL	
Benzo(ghi)perylene	BDL	

Results in parts per trillion (ppt).

BDL = below detection limit = 2 ppt.

Spike Recovery

Method performance will be verified using distilled water fortified with each of the PAH of interest following the requirements of Section 8, EPA Method 610. The results of that study will be provided under separate cover. Method acceptance criteria will be calculated as per Section 8.3.3. Each batch of samples (ca. 8) will be accompanied by a spike recovery sample. The analytical results of the spike recovery samples will be calculated and compared to the calculated QC acceptance criteria.

5.0 NUMERICAL ANALYSIS AND PEER REVIEW

All numerical analyses, including manual calculations, mapping, and computer modeling will be documented and subjected to quality control review in accordance with ERT SOP 2005, Numerical Analysis and Peer Review. All records of numerical analyses will be legible, reproduction-quality and complete enough to permit logical reconstruction by a qualified individual other than the originator.

6.0 AUDITS AND CORRECTIVE ACTION

Periodic audits will be conducted to assess the level of adherence to this QA plan. Routine audits of field notebooks and other controlled field documents will be conducted by the Project Quality Assurance Officer at a frequency consistent with the rate of progress in field investigation activities. Audits of procedures will be conducted at least once during the remedial investigation, to evaluate adherence to standard procedures.

Whenever quality deficiencies are observed that warrant immediate attention, formal corrective action request forms will be issued to the project manager by the Quality Assurance Officer. The Corrective Action Form is shown in Figure 6-1. This is a multicopy form. The QA Officer retains one copy of the form when it is issued. The project manager completes the form and signs it when corrective action has been implemented, and returns the original to the QA Officer to close the loop.

The Quality Assurance Division maintains a record of all corrective action requests and reports their status to ERT management in a quarterly report.

FIGURE 6-1

ERT
ENVIRONMENTAL RESEARCH & TECHNOLOGY INC

CAR NO. ______________________

DATE ______________________

CORRECTIVE ACTION REQUEST

TO FROM	
REPORTED CONDITIONS ANSWER DUE DATE	SIGNATURE
REVIEW AND COMMENTS	SIGNATURE
REVIEW AND COMMENTS	FOLLOW UP ACTION

1525-A18/77)

APPENDIX

STANDARD OPERATING PROCEDURES (SOPs)

2005 (Draft)	Numerical Analysis and Peer Review
7110	Surface Soil Sampling
7115	Subsurface Soil Sampling
7120	Surface Water Sampling
7130	Groundwater Sampling
7140	Lake and Stream Bottom Sediment Sampling
7220	Monitoring Well Construction
7230	Test Pits/Trench-Subsurface Exploration
7315	Operation/Calibration of HNu Photoionization Analyzer
7510	Packaging and Shipment of Samples
7600	Decontamination of Equipment

Appendix F

Health and Safety Plan

BNSF Railway Company
Contract No. BF 57864

HEALTH AND SAFETY PLAN

BNSF Former Tie Treatment Plant
401 Somers Road
Somers, Montana, 59932

Prepared for:

BNSF Railway Company
139 Last Chance Gulch
Helena, Montana 59601

Prepared by:

AECOM
207 North Broadway, Suite 315
Billings, Montana 59101

Health and Safety Plan Expiration Date: August 2011

Project No: 60147072

HEALTH AND SAFETY PLAN APPROVAL

This Health and Safety Plan (HASP) was prepared for employees performing a specific, limited scope of work. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present on the project site. While it is not possible to discover, evaluate, and protect in advance against all possible hazards, which may be encountered during the completion of this project, adherence to the requirements of the HASP will significantly reduce the potential for occupational injury.

By signing below, I acknowledge that I have reviewed and hereby approve the HASP for the BNSF Former Tie Treatment Plant site. This HASP has been written for the exclusive use of AECOM, its employees, and subcontractors. The plan is written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Reviewed by:

Angelia Winn — August 30, 2010

Angelia Winn
District SH&E Manager
(970) 530-3348

Date

Approved by:

Daniel Schillings — August 31, 2010

Dan Schillings
BNSF Account SH&E Manager
(210) 601-4129

Date

Concurrence by:

August 31, 2010

Shelly Young
Project Manager
(406) 896-4582

Date

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) (including Attachments A-G) provides a general description of the levels of personal protection and safe operating guidelines expected of each employee or subcontractor associated with the environmental services being conducted at the BNSF Railway Company (BNSF) Former Tie Treatment Plant site, located at 401 Somers Road in Somers, Montana 59932 (Site). This HASP also identifies chemical and physical hazards known to be associated with the AECOM-managed activities addressed in this document.

HASP Supplements will be generated as necessary to address any additional activities or changes in site conditions, which may occur during field operations.

1.1 GENERAL

The provisions of this HASP are mandatory for all AECOM personnel engaged in fieldwork associated with the environmental services being conducted at the subject site. A copy of this HASP, any applicable HASP Supplements and the U.S. Operations Safety, Health, and Environmental (SH&E) Manual shall be maintained on site and available for review at all times. Record keeping will be maintained in accordance with this HASP and the applicable Standard Operating Procedures (SOPs). In the event of a conflict between this HASP, the SOPs and federal, state, and local regulations, workers shall follow the most stringent/protective requirements.

1.2 POLICY STATEMENT

It is the policy of AECOM to provide a safe and healthy work environment for all of its employees. AECOM considers no phase of operations or administration is of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. Every accident and every injury is avoidable. At AECOM, we believe every accident and every injury is avoidable. We will take every reasonable step to reduce the possibility of injury, illness, or accident. These concepts are detailed in AECOM's, *Safety, Health, and Environmental Policy Statement*.

The practices and procedures presented in this HASP and any supplemental documents associated with this HASP are binding on all AECOM employees while engaged in the subject work. In addition, all site visitors shall abide by these procedures as the minimum acceptable standard for the work site. Operational changes to this HASP and supplements that could affect the health or safety of personnel, the community, or the environment will not be made without prior approval of the AECOM Project Manager (PM) and the assigned Account SH&E Manager.

1.3 REFERENCES

This HASP conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), *Occupational Safety and Health Standards* (with special attention to Section 120, *Hazardous Waste Operations and Emergency Response*).
- Title 29, Part 1926 of the Code of Federal Regulations (29 CFR 1926), *Safety and Health Regulations for Construction*.
- National Institute for Occupational Safety and Health (NIOSH)/OSHA/U.S. Coast Guard (USCG)/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, Publication No. 85-115, 1985.
- Title 49 of the Code of Federal Regulations (49 CFR), *Department of Transportation* (with a special emphasis on Chapter II, Federal Railroad Administration regulations).
- BNSF-specific Safety Requirements.

The requirements in this HASP also conform to AECOM's North America SH&E Program requirements as specified in the U.S. Operations SH&E Manual, a copy of which will be maintained on site at all times.

2.0 SITE INFORMATION AND SCOPE OF WORK

AECOM will conduct environmental services at the BNSF Former Tie Treatment Plant site. Work will be performed in accordance with the applicable Statement of Work (SOW) and associated Work Plans developed for BNSF Former Tie Treatment Plant site. Deviations from the listed SOW will require that a Safety Professional review and changes made to this HASP, to ensure adequate protection of personnel and other property.

The following is a summary of relevant data concerning the Site, and the work procedures to be performed. The Work Plan prepared by AECOM as a companion document to this HASP provides significantly greater details concerning both site history and planned work operations.

2.1 SITE INFORMATION

This section provides a general description and historical information associated with the site.

2.1.1 General Description

The BNSF Former Tie Treatment Plant site is located at 401 Somers Road in Somers, Montana 59932. Flathead Lake borders the property to the south. The location is an inactive industrial site undergoing corrective action.

2.1.2 Site Background/History

The Site is located in northwestern Montana in the unincorporated town of Somers, Flathead County (Figure 2-1). BNSF and its predecessors operated a railroad tie treating plant from 1901 until its closure in 1986. The plant treated railroad ties and other miscellaneous lumber products to protect the materials from weathering and insects. Wood preservatives used at the site were creosote, zinc chloride, and for a short time, chromated zinc chloride. Wood treatment was conducted in retorts and cylinders. The plant's design capacity for creosote treatment was 10,000 cubic feet of wood per day.

Wastewater generated during the treatment process was disposed of in two locations at the Site. During the operation of the Somers plant, BNSF discharged wastewater to the Comprehensive Environmental Responsibility, Compensation, and Liability Act of 1981 (CERCLA) lagoon and overflow from this lagoon discharged through an open ditch into Flathead Lake. Prior to 1946 waste material discharged through the open ditch accumulated and formed a pond in the area adjacent to Flathead Lake, termed the "swamp pond." In 1971, the CERCLA lagoon and ditch were abandoned, and in 1984, a recycling program was implemented to eliminate all wastewater discharges. Two new wastewater impoundments were constructed in 1971 north of the retort and were subject to regulation under the Resource Conservation and Recovery Act (RCRA). The RCRA impoundments were used for wastewater disposal until 1984. A recycling system was implemented at the Somers tie plant in 1984, and all wastewater discharge was halted.

In February 1984, the Montana Department of Health and Environmental Sciences (MDHES) sampled soils in the CERCLA lagoon. Based on these results, the United States Environmental Protection Agency (EPA) proposed the Site for inclusion on the National Priorities List (NPL) in October 1984 (49 CFR 40320, October 15, 1984). The proposed listing cited "potential negative effects on Flathead Lake and the water supply for the town of Somers, which is drawn from the lake". EPA subsequently withdrew its proposal to list the site on the NPL on February 11, 1991.

In October 1985, BNSF entered into an Administrative Order on Consent (AOC) with EPA to conduct a remedial investigation and feasibility study (RI/FS). The RI/FS report was finalized with the issuance of the Record of Decision (ROD) in September 1989. In 1990, BNSF and EPA entered into a Consent Decree (CD) to implement the remedy selected in the ROD. The ROD specified a soil remedy consisting of a combination of excavation and onsite land treatment of impacted soils coupled with a groundwater remedy for the remaining subsurface residuals. The 1989 ROD and subsequent *Explanations of Significant Differences (ESDs)* documented the soil and groundwater remedy and numeric, ARAR-based and human health risk-based cleanup criteria for the Somers Site. Design of the selected remedies then proceeded; the on-site land treatment unit

(LTU) and Ground Water Treatment System (GWTS) were built in 1991 and 1992, respectively, and Site cleanup was initiated in 1993.

Part of the soil remedial efforts conducted in 1993 included excavating the swamp area to a depth of approximately twelve feet and the CERCLA lagoon to depths up to fifteen feet, the total excavated in-place volume was approximately 19,000 cubic yards (CY) and 22,300 CY, respectively. Excavated soils were placed on the LTU for treatment. The swamp excavation removed the majority of soils containing creosote, a dense non-aqueous phase liquid (DNAPL). Monitoring has been conducted to evaluate the groundwater quality conditions in this area and groundwater results have met cleanup levels since June 1996. The CERCLA lagoon excavation removed most, but not all, of the DNAPL-containing soils. The final lift of soil treated in the LTU met the residential cleanup goals in 2001, closure activities were conducted in 2002, and the LTU is now in post-closure care.

Impacted soil below the water table was to be treated as part of the groundwater remedy. The Phase I groundwater remedy was designed to address the impacted soil and groundwater remaining after excavation. The impacted groundwater in this area is characterized by the presence of residual creosote within the boundaries of the former lagoon and by dissolved creosote constituents downgradient of the lagoon. The Phase I groundwater remedy was designed to achieve two main objectives: 1) removing and controlling the most heavily impacted groundwater at the Site and 2) obtaining field-scale data on the effectiveness of in-situ bioremediation for use in the Phase II design.

The 1998 *Final Phase II Groundwater Remedy Remedial Design* compared the ability of the Phase I system and five alternate remedies to meet the groundwater remedial objectives for the site. The review of the alternatives presented in the Phase II report indicated that the remedial alternatives evaluated are not capable of aquifer restoration in a reasonable time frame. However, operation and monitoring of the Phase I system and the fate and transport analyses have shown that the low-permeability aquifer provides a natural containment barrier. The inability of the Phase I system, or any of the remedial alternatives evaluated, to restore the aquifer was presented in the *Technical Impracticability Evaluation for Groundwater Restoration (TI Evaluation)*.

Given EPA's approval of the TI Evaluation and implementation of institutional controls (a controlled groundwater use area was established by the Montana Department of Natural Resources and Conservation in 2003), BNSF requested to terminate operation of the GWTS in the September 1, 2004 *Request to Modify Groundwater Treatment System* (Request) report. The GWTS was turned off on October 12, 2007 following approval from the EPA and the Montana Department of Environmental Quality (also referred to as the Agencies or Agency). An interim monitoring period commenced in January 2008 to determine if dissolved creosote constituents and the associated plume in the alluvial aquifer are naturally attenuating and to show that the plume is not migrating outside of the TI boundary following shut down of the system.

2.1.3 Previous Investigations

Through numerous investigations, the Site has demonstrated the following contaminants: creosotes (coal tar pitch), zinc chloride, naphthalene, petroleum hydrocarbons, vinyl chloride, and aliphatic halogens. Previous investigations are summarized below.

In March 1984, BNSF initiated a series of remedial investigations at the Somers site. The 1984 Phase I investigation involved the installation of 16 groundwater monitoring wells, soil and waste sampling, groundwater sampling and the sampling and analysis of drinking water supplies.

The 1987 Phase II investigations involved:

- Additional waste sampling and analysis
- Installation of 15 new groundwater monitoring wells at nine locations
- Three rounds of groundwater sampling
- Soil and sediment sampling; sampling of surface water in the slough north of the plant site, in Flathead Lake and in Swan Lake
- Evaluation of air quality data and impacts

- Two rounds of sampling of the town water supply and of private wells
- Assessment of the potential for contaminant uptake by cattle and by waterfowl
- Bioassay studies using sediments from Flathead Lake

Additionally, as a part of the Phase II investigation a test burn of creosote impacted soils was conducted at a RCRA incineration facility. Groundwater from the Site was collected for laboratory treatability testing and land treatment studies were conducted using creosote impacted soil at the BNSF RCRA facility in Paradise, Montana.

The 1988 Phase III investigation involved installation of three groundwater monitoring wells, three rounds of groundwater sampling, installation of three piezometers, soil sampling in nine test pits and soil investigation in numerous test pits, aquifer testing and groundwater modeling, and additional sampling of Flathead Lake and the slough.

These investigations determined that groundwater within the CERCLA lagoon and a portion of the swamp pond contained creosote oil. Creosote oil is a DNAPL liquid, which is more dense than water and does not readily mix with water. Because DNAPLs are denser than water, they can sink in the aquifer and collect in lithologic changes in the subsurface. The presence of DNAPL poses unique challenges to groundwater cleanup.

2.2 SCOPE OF WORK

Routine site activities consist of operation and maintenance (O&M) of the site and conducting quarterly monitoring events. Regular O&M activities include mowing, spraying of noxious weeds, snow removal activities, and other tasks common to overall site maintenance. Additional O&M activities involved performing bimonthly pump and compressor maintenance and conducting inspections of the building and site following shut-down. Monitoring activities include collecting groundwater depths from site-wide monitoring wells, collection of samples from the plume stability and natural attenuation well networks, and semi-annual sampling of the municipal well. In addition, groundwater samples will be collected from five LTU wells during the fall in conjunction with the quarterly interim monitoring sampling event.

Work is planned in 2010 in addition to the routine activities described above and will be conducted per the *2010 Work Plan for Additional Data Collection* (2010 Work Plan) upon approval from the Agencies. The additional work will evaluate the extent of dissolved constituents of concern (COCs) in groundwater that may exceed cleanup levels set forth in the ROD or subsequent ESDs. Additional wells and borings will be installed at the request of the Agencies (**Figure 1**). A set of existing galvanized steel constructed wells will also be replaced with poly vinyl chloride (PVC) constructed wells to better assess the source of zinc in groundwater that exceeds the cleanup level in the ROD. Finally, monitoring wells S-3R and S-6 with deeper wells as the existing wells have been dry in recent years. In addition to the work described above, the Agencies have requested samples be collected from all site-wide wells in preparation for the EPA 5-year review in 2011. Wells that have not been sampled for a number of years will be developed prior to monitoring.

2.2.1 Additional Work Operations

The following additional tasks will also be performed as necessary in support of planned site activities:

<u>Mobilization/Demobilization</u>: Mobilization and demobilization represent limited pre and post-task activities. These activities include driving to and from the site; initial site preparations, such as trailer and toilet facilities setup; and post-work activities, such as removing files and office equipment and general housekeeping.

<u>Equipment Decontamination</u>: AECOM and subcontractor personnel will perform decontamination of equipment used to perform work within controlled work areas.

<u>Investigative-Derived Waste (IDW) Management</u>: IDW will be collected and categorized as non-hazardous or hazardous. Potentially hazardous IDW (purge water, and decontamination fluids, and soil cuttings [if any]) will be tested and disposed of within 90 calendar days of completing the field activities. Potentially hazardous IDW waste will be staged onsite, then delivered to an IDW storage facility for processing. Non-hazardous IDW (normal trash) will be disposed of in a timely fashion during fieldwork.

3.0 PROJECT HEALTH AND SAFETY ORGANIZATION

3.1 PROJECT MANAGER, SHELLY YOUNG

The Project Manager (PM) has overall management authority and responsibility for all site operations, including safety. The specific safety responsibilities for the PM are listed in Section 4.2 of SH&E 301, *Project SH&E Planning Documentation*[1]. The PM, with support from the Client Service Manager, will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations.

3.2 ACCOUNT SH&E MANAGER, DAN SCHILLINGS

The Account SH&E Manager is the member of AECOM's Safety, Health and Environmental Department assigned to oversee health and safety requirements for BNSF projects and provide any needed technical support. The Account SH&E Manager will be the first point-of-contact for all of the project's health and safety matters. Duties include the following[1]:

- Approving this HASP and any required changes.
- Approving the designated Site Safety & Health Officer (SSHO).
- Reviewing all personal exposure monitoring results.
- Investigating any reported unsafe acts or conditions.

3.3 SITE SUPERVISOR, NANCY GILLILAND

The site supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans. The PM may act as the site supervisor while on site.

3.3.1 Responsibilities

The site supervisor is responsible to[1]:

- Discuss deviations from the work plan with the SSHO and PM.
- Complete a BNSF Safety Action Plan and submit it to the appropriate personnel.
- Discuss safety issues with the PM, SSHO, and field personnel.
- Assist the SSHO with the development and implementation of corrective actions for site safety deficiencies.
- Assist the SSHO with the implementation of this HASP and ensuring compliance.
- Assist the SSHO with inspections of the site for compliance with this HASP and applicable SOPs.

3.3.2 Authority

The site supervisor has authority to:

- Verify that all operations are in compliance with the requirements of this HASP, and halt any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the SSHO, Account SH&E Manager, and the PM.

3.3.3 Qualifications

In addition to being Hazardous Waste Operations and Emergency Response (HAZWOPER)-qualified (see Section 4.1), the Site Supervisor is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

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[1] Additional responsibilities as cited in the BNSF Programmatic SH&E Management Plan.

3.4 SITE SAFETY & HEALTH OFFICER, NANCY GILLILAND

3.4.1 Responsibilities

The SSHO is responsible to[1]:

- Update the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the Account SH&E Manager.
- Be aware of changes in AECOM's SH&E Policy.
- Monitor the lost time incidence rate for this project and work toward improving it.
- Inspect the site for compliance with this HASP and the SOPs using the appropriate audit inspection checklist provided by the Account SH&E Manager.
- Work with the site supervisor and PM to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contact the Account SH&E Manager for technical advice regarding safety issues.
- Provide a means for employees to communicate safety issues to management in a discreet manner (i.e., suggestion box, etc.).
- Determine emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Ensure that all site personnel and visitors have received the proper training and medical clearance prior to entering the site.
- Establish any necessary controlled work areas (as designated in this HASP or other safety documentation).
- Present tailgate safety meetings and maintain attendance logs and records.
- Discuss potential health and safety hazards with the Site Supervisor, Account SH&E Manager, and the PM.
- Select an alternate SSHO by name and inform him/her of their duties, in the event that the SSHO must leave or is absent from the site.

3.4.2 Authority

The SSHO has authority to:

- Verify that all operations are in compliance with the requirements of this HASP.
- Issue a "Stop Work Order" under the conditions set forth in Section 4.7 of this HASP.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the Account SH&E Manager and the PM.

3.4.3 Qualifications

In addition to being HAZWOPER-qualified (see Section 4.1), the SSHO is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

3.5 EMPLOYEES

3.5.1 Employee Responsibilities

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the policies and procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.
- Providing feedback to health and safety management relating to omissions and modifications in the HASP or other safety policies.

- Notifying the SSHO, in writing, of unsafe conditions and acts.

3.5.2 Employee Authority

The health and safety authority of each employee assigned to the site includes the following:

- The right to refuse to work and/or stop work authority when the employee feels that the work is unsafe (including subcontractors or team contractors), or where specified safety precautions are not adequate or fully understood.
- The right to refuse to work on any site or operation where the safety procedures specified in this HASP or other safety policies are not being followed.
- The right to contact the SSHO or the Safety Professional at any time to discuss potential concerns.

3.6 SUBCONTRACTORS

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in SH&E 303, *Evaluation of Subcontractors*. Each AECOM subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE).

AECOM considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures, in order to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior to the start of onsite activities, if required.

Hazards not listed in this HASP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the AECOM PM or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

3.7 VISITORS

Authorized visitors (e.g., BNSF Representatives, regulators, AECOM management staff, etc.) requiring entry to any work location on the site will be briefed by the PM on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these requirements at all times.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

4.0 SAFETY PROGRAMS

4.1 HAZWOPER QUALIFICATIONS

Personnel performing work at the job site must be qualified as HAZWOPER workers (unless otherwise noted in specific THAs or by the SSHO), and must meet the medical monitoring and training requirements specified in the following safety procedures:

- SH&E 109, *SH&E Training Program*
- SH&E 501, *Hazard Communication Program*
- SH&E 307, *Project Safety Meetings*
- SH&E 701, *Hazardous Waste Operations and Emergency Response (HAZWOPER)*

Personnel must have successfully completed training meeting the provisions established in 29 CFR 1910.120 (e)(2) and (e)(3) (40-hour initial training). As appropriate, personnel must also have completed annual refresher training in accordance with 29 CFR 1910.120 (e)(8); each person's most recent training course must have been completed within the previous 365 days. Personnel must also have completed a physical exam in accordance with the requirements of 29 CFR 1910.120 (f), where the medical evaluation includes a judgment of the employee's ability to use respiratory protective equipment and to participate in hazardous waste site activities. These requirements are further discussed in SH&E 701, *Hazardous Waste Operations and Emergency Response (HAZWOPER)*.

If site monitoring procedures indicate that a possible exposure has occurred above the OSHA permissible exposure limit (PEL), employees may be required to receive supplemental medical testing to document symptoms specific to the particular materials present.

4.2 SITE-SPECIFIC SAFETY TRAINING

All personnel performing field activities at the site will be trained in accordance with SH&E 109, *SH&E Training Program*. For this project, training will include the requirements specified in the following:

1. SH&E 501, *Hazard Communication Program*
2. SH&E 307, *Project Safety Meetings*
3. SH&E 701, *Hazardous Waste Operations and Emergency Response (HAZWOPER)*
4. SH&E 706, *Railway Work*

In addition to the general health and safety training programs, personnel will be:

- Instructed on the contents of applicable portions of this HASP and any supplemental health and safety information developed for the tasks to be performed.
- BNSF Contractor Orientation and Roadway Worker Protection On-Track Safety Training qualified within the past one year
- e-RailSafe qualified (unless the site is exempted)
- Workers will be instructed on the proper ultraviolet radiation protection measures per SH&E 515, *Non-Ionizing Radiation*
- Informed about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure and heat stress.
- Made aware of task-specific physical hazards and other hazards that may be encountered during site work. This includes any BNSF-specific required training for health and safety.
- Made aware of fire prevention measures, fire extinguishing methods, and evacuation procedures.

The site-specific training will be performed prior to the worker performing the subject task or handling the impacted materials and on an as-needed basis thereafter. Training will be conducted by the SSHO (or his/her designee) and will be documented on the form attached to SH&E 307, *Project Safety Meetings*.

4.2.1 Competent-Person Training Requirements

In order to complete the planned scope of work, an OSHA-designated competent person must be onsite to perform the required daily inspections of equipment and/or operations. The competent person may be an AECOM or subcontractor employee.

4.3 HAZARD COMMUNICATION

Section 5.2 provides information concerning the materials that may be encountered as environmental contaminants during the work activities. In addition, any organization wishing to bring any hazardous material onto any AECOM-controlled work site must first provide a copy of the item's Material Safety Data Sheet (MSDS) to the SSHO for approval and filing (the SSHO will maintain copies of all MSDSs on site). MSDSs may not be available for locally-obtained products, in which case some alternate form of product hazard documentation will be acceptable. In accordance with the requirements of SH&E 501, *Hazard Communication Program*, all personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDSs.

All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

Attachment B provides copies of MSDSs for those items planned to be brought on site at the time this HASP is prepared. This information will be updated as required during site operations.

4.4 CONFINED SPACE ENTRY

The SSHO/site supervisor shall identify all potential confined spaces in accordance with SH&E 713, *Confined Spaces* with the BNSF-specific confined space guidance in Section 4.10.10. In addition, the SSHO/site supervisor will inform all employees of the location of confined spaces. Confined space entry procedures and training requirements are listed in SH&E 713.

4.5 HAZARDOUS, SOLID, OR MUNICIPAL WASTE

If hazardous, solid, and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, and/or local regulations.

4.6 GENERAL SAFETY RULES

All site personnel shall adhere to SH&E 103, *Safe Work Standards and Rules*, during site operations. In addition, the housekeeping, sanitation, and personal hygiene requirements in SH&E 104, *General Housekeeping* will be observed. Specific excerpts from SH&E 104 are listed below.

4.6.1 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials.

4.6.2 Smoking, Eating, or Drinking

Smoking, eating and drinking will not be permitted inside any controlled work area at any time. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking). Consumption of alcoholic beverages is prohibited at any AECOM site.

4.6.3 Personal Hygiene

The following personal hygiene requirements will be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

Potable Water - An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual-use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.

Non-Potable Water - Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating:

Non-Potable Water
Not Intended for Drinking Water Consumption

Toilet Facilities: A minimum of one toilet will be provided for every 20 personnel on site, with separate toilets maintained for each sex except where there are less than 5 total personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities on-site facilities are not required.

Washing Facilities: Employees will be provided washing facilities (e.g., buckets with water and Alconox) at each work location. The use of water and hand soap (or similar substance) will be required by all employees following exit from the Exclusion Zone, prior to breaks, and at the end of daily work activities.

4.6.4 Buddy System

All field personnel will use the buddy system when working within any controlled work area. Personnel belonging to another organization on site can serve as "buddies" for AECOM personnel. Under no circumstances will any employee be present alone in a controlled work area. For areas not in controlled work areas, the procedures outlined in SH&E 306, *Working Alone* will be followed at all times.

4.6.5 Weather

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. For additional requirements, refer to SH&E 616, *Heat Stress Prevention Program*, and SH&E 615, *Cold Stress Prevention Program*.

Severe weather can occur with little warning. The employee must be aware of the potentials for lightning, flash flooding and high wind events.

Be Prepared, Know What is Coming your Way

- Listen to the radio for severe weather alerts.
- Check the Storm Prediction Center's web page for alerts and warnings.

http://www.spc.noaa.gov/products/wwa/

- Pay attention to the weather in your area, up wind of your location, and in the watershed upstream from your location.
- When in the field, be aware of the route you must take to get to shelter.

When working in low areas be aware of the potential for flash flooding and the route to higher ground.

4.6.5.1 Heat Stress

Types of Heat Stress

Heat related problems include **heat rash, fainting, heat cramps, heat exhaustion and heat stroke**. **Heat rash** can occur when sweat isn't allowed to evaporate; leaving the skin wet most of the time and making it subject to irritation. **Fainting** may occur when blood pools to lower parts of the body and as a result, does not return to the heart to be pumped to the brain. Heat related fainting often occurs during activities that require standing erect and immobile in the heat for long periods of time. **Heat cramps** are painful spasms of the muscles due to excessive salt loss associated with profuse sweating.

Heat exhaustion typically results from the loss of large amounts of fluid and excessive loss of salt from profuse sweating. The skin will be clammy and moist and the affected individual may exhibit giddiness, nausea and headache.

Heat stroke occurs when the body's temperature regulatory system has failed. The skin is hot, dry, red and spotted. The affected person may be mentally confused and delirious. Convulsions could occur. **EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH.** A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The person should be soaked with water to promote evaporation. Fan the person's body to increase cooling.

Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

Early Symptoms of Heat-Related Health Problems:

decline in task performance	excessive fatigue	incoordination reduced
vigilance	decline in alertness	muscle cramps
unsteady walk	dizziness	

Susceptibility to Heat Stress Increases due to:

lack of physical fitness	obesity	lack of acclimatization
drug or alcohol use	increased age	sunburn
dehydration	infection	

People unaccustomed to heat are particularly susceptible to heat fatigue. First timers in PPE need to gradually adjust to the heat.

The Effect of Personal Protective Equipment

Sweating normally cools the body as moisture is removed from the skin by evaporation. However, the wearing of certain personal protective equipment (PPE), particularly chemical protective coveralls (e.g., Tyvek), reduces the body's ability to evaporate sweat and thereby regulate heat buildup. The body's efforts to maintain an acceptable temperature can therefore become significantly impaired by the wearing of PPE.

Measures to Avoid Heat Stress:

The following guidelines should be adhered to when working in hot environments:

- Establish work-rest cycles (short and frequent are more beneficial than long and seldom).
- Identify a shaded, cool rest area.
- Rotate personnel, alternative job functions.
- Water intake should exceed sweat produced. Most workers exposed to hot conditions drink an insufficient amount of fluids than needed because of a lack of thirst. **DO NOT DEPEND ON THIRST TO SIGNAL WHEN AND HOW MUCH TO DRINK**. Consume enough liquid to force urination every two hours. In humid climates ice water or ice should be consumed to help maintain normal body temperature since evaporation does not provide an efficient mechanism for heat removal.
- Eat light meals before and during work shifts. Avoid highly salted foods.
- Drink sports drinks such as Gatorade® diluted 1:1 with water.

- Save most strenuous tasks for non-peak heat hours such as the early morning or at night.
- Avoid alcohol during prolonged periods of heat. Alcohol will cause additional dehydration.

The implementation and enforcement of the above mentioned measures will be the joint responsibility of the Project Manager and health and the Site Safety Officer. Potable water and fruit juices should be made available each day for the field team.

Table 4-1: Temperature Adjustment Factors

Time of Day	
Before daily temperature peak[2]	+2°F
10 am – 2 pm (peak sunshine)	+2°F
Sunshine	
No clouds	+1°F
Partly Cloudy (3/8 – 5/8 cloud cover)	-3°F
Mostly Cloudy (5/8 – 7/8 cloud cover)	-5°F
Cloudy (>7/8 cloud cover)	-7°F
Indoor or nighttime work	-7°F
Wind (*ignore if indoors or wearing CPC*)	
Gusts greater than 5 miles per hour at least once per minute	-1°F
Gusts greater than 10 miles per hour at least once per minute	-2°F
Sustained greater than 5 miles per hour	-3°F
Sustained greater than 10 miles per hour	-5°F
Humidity (*ignore if wearing CPC*)	
Relative Humidity greater than 90%	+5°F
Relative humidity greater than 80%	+2°F
Relative Humidity less than 50%	-4°F
Chemical Protective Clothing (CPC)	
Modified Level D (coveralls, no respirator)	+5°F
Level C (coveralls w/o hood, full-face respirator)	+8°F
Level C (coveralls with hood, full-face respirator)	+10°F
Level B with airline system	+9°F
Level B with SCBA	+9°F and right one column[3]
Level A	+14°F and right one column[2]
Other	Specified in the HASP
Miscellaneous	
Unacclimated work force	+5°F
Partially acclimated work force	+2°F
Working in shade	-3°F
Breaks taken in air conditioned space	-3°F

[2] This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak it can be ignored.

[3] Locate the proper column based on work rate, then move one column to the right (next higher work rate) before locating the corresponding adjusted temperature.

Table 4-2: Work Rest Schedule

Work-Rest Regimen	Adjusted Temperature (^{o}F)			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
No specified requirements	< 80	< 75	< 70	< 65
15 minute break every 90 minutes of work	80 – 90	75 - 85	70 - 80	65 – 75
15 minute break every 60 minutes of work	>90 – 100	> 85 - 95	>80 - 85	>75 - 80
15 minute break every 45 minutes of work	>100 – 110	>95 - 100	>85 - 90	>80 - 85
15 minute break every 30 minutes of work	>110 - 115	>100 - 105	>90 - 95	>85 - 90
15 minute break every 15 minutes of work	>115 - 120	>105 - 110	>95 -100	>90 - 95
Stop Work	**>120**	**>110**	**>100**	**>95**

Note: Time spent performing decontamination or donning/doffing CPC should not be included in calculating work or break time lengths.

Heat Stress Monitoring Techniques

Site personnel should regularly monitor their heart rate as an indicator of heat strain by the following method:

Radial pulse rates should be checked by using fore-and middle fingers and applying light pressure top the pulse in the wrist for one minute at the beginning of each rest cycle. If the pulse rate exceeds 110 beats/minute, the next work cycle will be shortened by one-third and the rest period will be kept the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, the work cycle will be shortened again by one-third.

4.6.5.2 Responding to Heat-Related Illness

The guidance below will be used in identifying and treating heat-related illness.

Table 4-3: Identification and Treatment of Heat-Related Illness

Type of Heat-Related Illness	Description	First Aid
Mild Heat Strain	The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.	• Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. • If an air-conditioned spot is available, this is an ideal break location. • Once the victim shows improvement, he/she may resume working; however, the work pace should be moderated to prevent recurrence of the symptoms.
Heat Exhaustion	Usually begins with muscular weakness and cramping, dizziness, staggering gait, and nausea. The victim will have pale, clammy moist skin and may perspire profusely. The pulse is weak and fast and the victim may faint unless they lie down. The bowels may move involuntarily.	• Immediately remove the victim from the work area to a shady or cool area with good air circulation (*avoid drafts or sudden chilling*). • Remove all protective outerwear. • Call a physician. • Treat the victim for shock. (*Make the victim lie down, raise his or her feet 6–12 inches, and keep him/her cool by loosening all clothing*). • If the victim is conscious, it may be helpful to give him/ her sips of water. • Transport victim to a medical facility ASAP.

Type of Heat-Related Illness	Description	First Aid
Heat Stroke	The most serious of heat illness, heat stroke represents the collapse of the body's cooling mechanisms. As a result, body temperature may rise to 104 degrees Fahrenheit or higher. As the victim progresses toward heat stroke, symptoms such as headache, dizziness, nausea can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly and death is imminent if exposure continues. Heat stroke can occur suddenly.	• Immediately evacuate the victim to a cool/shady area. • Remove all protective outerwear and as much personal clothing as decency permits. • Lay the victim on his/her back w/the feet slightly elevated. • Apply cold wet towels or ice bags to the head, armpits, and thighs. • Sponge off the bare skin with cool water. • The main objective is to cool without chilling the victim. • Give no stimulants or hot drinks. • Since heat stroke is a severe medical condition requiring professional medical attention, emergency medical help should be summoned immediately to provide onsite treatment of the victim and proper transport to a medical facility.

4.6.5.3 Cold Stress

<u>Type of Cold Stress</u>

Cold injury is classified as either localized, as in frostbite, frostnip or chilblain; or generalized, as in hypothermia. The main factors contributing to cold injury are exposure to humidity and high winds, contact with wetness and inadequate clothing.

The likelihood of developing frostbite occurs when the face or extremities are exposed to a cold wind in addition to cold temperatures. The freezing point of the skin is about 30^{o} F. When fluids around the cells of the body tissue freeze, skin turns white. This freezing is due to exposure to extremely low temperatures. As wind velocity increases, heat loss is greater and frostbite will occur more rapidly.

<u>Symptoms of Cold Stress</u>

The first symptom of frostbite is usually an uncomfortable sensation of coldness, followed by numbness. There might be a tingling, stinging or aching feeling in the affected area. The most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes.

Symptoms of hypothermia, a condition of abnormally low body temperature, include uncontrollable shivering and sensations of cold. The heartbeat slows and can become irregular, the pulse weakens and the blood pressure changes. Pain in the extremities and severe shivering can be the first warning of dangerous exposure to cold.

Maximum severe shivering develops when the body temperature has fallen to 95^{o} F. Productive physical and mental work is limited when severe shivering occurs. Shivering is a serious sign of danger. Immediately remove any person who is shivering from the cold.

<u>Methods to Prevent Cold Stress</u>

When the ambient temperature, or a wind chill equivalent, falls to below 40^{o} F (American Conference of Governmental Industrial Hygienists recommendation), site personnel who must remain outdoors should wear insulated coveralls, insulated boot liners, hard hat helmet liners and insulated hand protection. Wool mittens are more efficient insulators than gloves. Keeping the head covered is very important, since 40% of body heat can be lost when the head is exposed. If it is not necessary to wear a hard hat, a wool knit cap provides the best head protection. A facemask may also be worn.

Persons should dress in several layers rather than one single heavy outer garment. The outer piece of clothing should ideally be wind and waterproof. Clothing made of thin cotton fabric or synthetic fabrics such as polypropylene is ideal since it helps to evaporate sweat. Polypropylene is best at wicking away moisture while still retaining its insulating properties. Loosely fitting clothing also aids in sweat evaporation. Denim is not a good protective fabric. It is loosely woven which allows moisture to penetrate. Socks with a high wool content are best. If two pairs of socks are worn, the inner sock should be smaller and made of cotton, polypropylene or similar types of synthetic material that wick away moisture. If clothing becomes wet, it should be taken off immediately and a dry set of clothing put on.

If wind conditions become severe, it might become necessary to shield the work area temporarily. The SSO and the PM will determine if this type of action is necessary. Heated break trailers or a designated area that is heated should be available if work is performed continuously in the cold at temperatures, or equivalent wind chill temperatures, of 20° F.

Dehydration occurs in the cold environment and can increase the susceptibility of the worker to cold injury due to significant change in blood flow to the extremities. Drink plenty of fluids, but limit the intake of caffeine.

<table>
<tr><th colspan="2">Sunny Sky Air Temperature</th><th colspan="2">No Noticeable Wind</th><th colspan="2">Wind 8 km/h (5 mph)</th><th colspan="2">Wind 16 km/h (10 mph)</th><th colspan="2">Wind 24 km/h (15 mph)</th><th colspan="2">Wind 32 km/h (20 mph)</th></tr>
<tr><td>°C below zero*</td><td>°F below zero*</td><td>Max. work period</td><td>Number of breaks /4 hours</td><td>Max. work period</td><td>Number of breaks /4 hours</td><td>Max. work period</td><td>Number of breaks /4 hours</td><td>Max. work period</td><td>Number of breaks /4 hours</td><td>Max. work period</td><td>Number of breaks /4 hours s</td></tr>
<tr><td>26 to 28</td><td>15 to 19</td><td>normal breaks</td><td>1</td><td>normal breaks</td><td>1</td><td>75 minutes</td><td>2</td><td>55 minutes</td><td>3</td><td>40 minutes</td><td>4</td></tr>
<tr><td>29 to 31</td><td>20 to 24</td><td>normal breaks</td><td>1</td><td>75 minutes</td><td>2</td><td>55 minutes</td><td>3</td><td>40 minutes</td><td>4</td><td>30 minutes</td><td>5</td></tr>
<tr><td>32 to 34</td><td>25 to 29</td><td>75 minutes</td><td>2</td><td>55 minutes</td><td>3</td><td>40 minutes</td><td>4</td><td>30 minutes</td><td>5</td><td colspan="2" rowspan="5">Non-emergency work should stop</td></tr>
<tr><td>35 to 37</td><td>30 to 34</td><td>55 minutes</td><td>3</td><td>40 minutes</td><td>4</td><td>30 minutes</td><td>5</td><td colspan="2" rowspan="4">Non-emergency work should stop</td></tr>
<tr><td>38 to 39</td><td>35 to 39</td><td>40 minutes</td><td>4</td><td>30 minutes</td><td>5</td><td colspan="2" rowspan="3">Non-emergency work should stop</td></tr>
<tr><td>40 to 42</td><td>40 to 44</td><td>30 minutes</td><td>5</td><td colspan="2" rowspan="2">Non-emergency work should stop</td></tr>
<tr><td>43 and below</td><td>45 and below</td><td colspan="2">Non-emergency work should stop</td></tr>
</table>

4.6.5.4 Ultraviolet Radiation Protection

To protect against exposure to ultraviolet (UV) radiation, workers will observe the following requirements:

1. All workers will wear sunglass-type safety glasses at all times when working outdoors during daylight hours.
2. Workers will utilize a commercial sunblock with a minimum solar protection factor (SPF) of 15 or higher.
3. Wide-brim hard hats are recommended as they provide additional UV protection.

4.7 USE OF UTILITY KNIVES OR OTHER OPEN-BLADED CUTTING TOOLS

All utility knives with manually retracting blades (including “pocket knives” and other “collapsible, open-blade cutting tools”) are no longer permitted on any AECOM jobsite, unless specifically authorized on a task-specific basis in this HASP and associated THA/JSA. The only acceptable type of utility knife will be those with automatically retracting blades. Other “cutters” must be equipped with a completely enclosed and guarded blade. Additional recommendations regarding the use of cutting tools can be found in SH&E 610, *Hand and Power Tools*.

4.8 EQUIPMENT SAFETY CARDS

Equipment safety cards have been produced by the SH&E Department for review prior to operating portable mechanized equipment (e.g., chainsaws, chop saws, power washers, etc.). Equipment safety cards should be used as a point of reference prior to using the specified piece of equipment. The cards will be used in conjunction with the manufacturers operating instructions. Personnel must be adequately trained in the tools usage prior to operation, thus using the card as a reminder or THA/JSA for additional safe operation. The cards are not a substitute for training, which at a minimum, must consist of having an observed skill set indicating good working knowledge and equipment operation time. The applicable Equipment Safety Cards are included in Attachment C of this HASP.

4.9 STOP WORK AUTHORITY

All employees have the right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions as outlined in SH&E 101, *Stop Work Authority*. Whenever the SSHO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the SSHO is authorized and required to stop work, which shall be immediately binding on all affected AECOM employees and subcontractors.

Upon issuing the stop work order, the SSHO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective; however, operations shall not resume until the Safety Professional has concurred that workplace conditions meet acceptable safety standards.

4.10 BNSF-SPECIFIC SAFETY REQUIREMENTS

4.10.1 BNSF Contractor Safety Action Plan

Prior to mobilizing to the site to begin work, AECOM shall complete and submit BNSF's Contractor Safety Action Plan found at contractororientation.com. The completed safety action plan shall be sent to the BNSF project representative and a copy maintained on-site by the site supervisor of SSHO.

4.10.2 Job Safety Briefing

Before beginning any task, a complete job safety briefing will be conducted with all individuals involved with the task, and again if the task changes. If the Task is within 25 feet of any track, the job briefing must include the BNSF flagman. All AECOM, subcontractor, and lower-tier subcontractor employees will receive safety instruction from AECOM's SSHO or a qualified representative prior to the start of any project. AECOM and its subcontractor supervisor will review the safety guidelines contained in Attachment E to familiarize their employees with safety issues that exist when working in a railroad environment. This should be reviewed at least weekly, and immediately with any new employee(s) coming on the job. It is the responsibility of the AECOM's SSHO to instruct employees on these guidelines and to require their compliance.

4.10.3 Personal Protective Equipment

All contractor employees working at the BNSF Former Tie Treatment Plant site will be required to wear OSHA approved safety glasses with side shields, hard hats with a high visibility ORANGE cover, reflective traffic safety vests (ANSI Class II or higher AND ORANGE), and above the ankle, lace-up, safety toed boots with a defined heel. Office employees restricted to office work will not be required to comply. These requirements are in addition to the requirements outlined in SH&E 115, *Personal Protective Equipment Program*.

4.10.4 Fouling Tracks

Train or equipment movement should be expected on any track, in any direction, at any time. Work will not be performed at less than 25 feet from the centerline of any track without a BNSF representative present to provide track protection, unless track is protected by other approved means and work has been authorized by the BNSF Railroad representative in charge of the project.

Do not walk between rails or foul track, except when duties require and proper protection is provided. When necessary to cross tracks, look in both directions and keep a minimum of 25 feet from the nearest end of stationary rail equipment. <u>Do not crawl under or between rail cars.</u> Under certain conditions, trains and equipment can approach without being heard. Proper attention and protection are essential to personal safety when working near railroad tracks.

4.10.5 Work Protection

If work protection is provided, every employee must know:

- Who the BNSF qualified flagman is, and how to contact him/her;
- Limits of the work protection;
- The method of communication to stop and resume work;
- Entry into work limits when designated.

When track protection is required, a Daily Job Briefing Field Documentation Card (Attachment F) will be completed daily by the entire field crew including subcontractors. All field crew must understand the track protection that is being provided.

Note: Individuals or equipment entering work limits that were not previously job briefed must notify the flagman immediately, and be given a job briefing if working less than 25 feet from the centerline of the track.

4.10.6 Riding on Equipment

Riding on rail equipment is prohibited unless authorized by the BNSF Railroad representative in charge of the project.

4.10.7 Underground Utilities/Excavation

AECOM must obtain the specific approval of the responsible BNSF Project Representative prior to excavating. It is AECOM's responsibility to contact a one-call service and provide appropriate notification to other companies who may have underground utilities in an area to be excavated. The BNSF Project Representative will work with AECOM to make sure that appropriate personnel, including BNSF Signal, Telecommunications, Structures, and Track employees, are contacted at (800) 533-2891 to determine whether there are any underground communication lines, electrical lines, or pipes in an area to be excavated. The form entitled *Underground Cable Location & Acknowledgement* (Attachment G) must be completed by AECOM prior to initiating excavation work. This does not preclude the calling of the "One Call" system.

Work is NOT to proceed where there is doubt regarding the location of underground obstructions, including utilities. Should an underground line, pipe, or other obstruction be unexpectedly encountered, immediately discontinue excavation activities and contact the responsible BNSF Project Representative and AECOM incident reporting line. Where the obstruction is a utility, and the owner of the utility is known, then the owner of the utility will be immediately notified, as well.

Prior to any boring work on Railroad property, AECOM shall explore the proposed location for such work with hand tools to a depth of at least three (3) feet below the surface of the ground to determine whether pipeline or other structures exist below the surface, provided, however, that in lieu of the foregoing, AECOM shall have the right to use suitable detection equipment or other generally accepted industry practice (e.g. consulting with the Underground Services Association) to determine the existence or location of pipelines and other subsurface structures prior to drilling or excavating with mechanized equipment. Should AECOM request, by giving thirty (30) working days in advance of requested entry, Railroad will provide AECOM any information that Railroad has in its possession concerning the existence and approximate location of underground utilities and pipelines in the proposed location of such work and, prior to any such boring, AECOM will review all such material to preclude AECOM's fouling any existing pipelines or structures. Railroad does not warrant the accuracy of information relating to subsurface conditions and AECOM's operations will be subject at all times to the liability provisions of the contract.

4.10.8 Heavy Equipment

All heavy equipment must be equipped with roll-over protection and contain lockable battery disconnects. Do not leave unattended equipment within 25 feet of the track centerline, unless obtaining specific approval from the responsible BNSF Project Representative. Under no circumstances is equipment to be left where it is within 8' 6" of the track centerline, or otherwise it could be struck by a train or on-track equipment.

4.10.9 Damage to BNSF Railroad Property

Any damage to BNSF Railroad property will be reported immediately to the BNSF representative in charge of the project. Any vehicle or machine contact with a track, signal equipment or structure (bridge) that could result in derailment will be reported by the quickest means possible to the BNSF Railroad representative in charge of the project or the respective System or Network Operations Center. Emergency numbers are to be obtained from the BNSF Railroad representative in charge of the project, prior to the start of any work, and posted at the job site for the duration of the project.

4.10.10 Passing Trains

When a train is approaching, personnel or equipment working less than 25 feet from the centerline of track will stop work and move as far away from the track as practical, until the ENTIRE train has passed. This assures the train engineer that the train has been seen and it is safe to proceed. Failure to do this could result in the engineer placing the train into an emergency that could result in damage to the train and delay to railroad traffic. After notification by the BNSF Railroad flagman that no other trains are within the working limits, work may then resume. If a train is stopped on a track, work can only be performed that is beyond 8 feet of the nearest rail of the track the train is on. No work within 8 feet of the nearest rail can be performed. In passing around the ends of standing cars, engines, roadway machines, or work equipment, leave at least 20 feet between yourself and the end of the equipment. Do not go between pieces of equipment if the opening is less than one railcar length (50 feet).

<u>NOTE:</u> Some projects may require a different procedure. In these cases, the BNSF Railroad representative in charge of the project will advise AECOM of the proper work procedure adjacent to passing trains.

Violent arm, flag, or flashlight movement while trains are passing indicates an emergency (requires trains to stop) and must not be done unless an emergency exists. NEVER stand with your back to a moving train. Metal banding and other components sometimes break during shipment and can swing out several feet from the train.

4.10.11 Stepping or Sitting on Rails

Stepping, walking, or sitting on the top of rail is prohibited. The railhead becomes very slick from oil buildup and presents a slipping hazard.

4.10.12 Confined Space Entry

BNSF <u>does not</u> allow the downgrading of the following permit-required confined spaces:

- Permit-required spaces associated with environmental treatment systems, including sanitary sewer systems
- Permit-required confined spaces that are entered vertically with workers subsequently moving significant distances horizontally, in a direction away from the entry point, for example below grade pipe tunnels

In addition to the Pre-Entry/Entry Requirements specifically required by applicable OSHA standards, BNSF has the below listed specific requirements. AECOM will:

- Obtain from the responsible BNSF Project Representative a *Confined Space Identification Form* specific to each permit-required confined space that is to be entered during the course of a project. This form lists the known or suspected hazards of the permit-required confined space.
- Use a Confined Space Entry Permit system.
- Coordinate entry operations with affected BNSF personnel where appropriate.
- Provide and use its own air monitoring and rescue equipment.
- Determine that outside emergency responders are available and equipped to handle rescues that may require entry into a confined space.
- Provide the responsible BNSF Project Representative with copies of closed-out permits, and

- Advise the responsible BNSF Project Representative of any hazards encountered or created that were not listed on the space specific *Confined Space Identification Form*.

4.10.13 Fall Protection

BNSF requires fall protection equipment to be worn when on railroad bridges where the distance to the top of the deck to the ground or water surface below is 12 feet or more. While this is the cited FRA Bridge Worker Safety Standard, this policy is less restrictive than both the OSHA and AECOM fall protection requirements of six feet. As a result, all AECOM personnel will don a personal fall protection system when exposed to unprotected falls of six feet or more as outlined in SH&E 605, *Fall Protection*.

4.11 ENVIRONMENTAL COMPLIANCE AND MANAGEMENT

This project and the individual taskings will comply with all federal, state, provincial, and local environmental requirements as well as SH&E 102, *Environmental Compliance Program*.

4.11.1 Air Emissions

The air emissions produced during this project will not exceed any applicable federal, state, county, or municipal emission limits, nor will the planned emissions require a regulatory air permit.

4.11.2 Hazardous Waste Management

Soil cuttings and monitoring well purge water will be containerized and stored on site in 55-gallon steel drums pending receipt of analytical results. Disposal options will be developed based on the laboratory results. It is currently anticipated that none of the investigation-derived waste (IDW) will exhibit hazardous characteristics.

4.11.3 Stormwater Pollution Prevention

The proposed project does not anticipate the need for stormwater protection measures; however, the project location will be thoroughly evaluated for locations where an environmental spill or release could impact either open stormwater drainage or below grade stormwater systems. If these systems are identified at the project site, they will be properly protected. The area of land disturbance for this project is less than one acre; therefore, no State of Louisiana construction stormwater discharge permit is required.

4.11.4 Wetlands Protection

After reviewing the U.S. Fish and Wildlife Service's National Wetlands Inventory Mapper, wetlands were identified within one mile of the project site.

4.11.5 Critical Habitat Protection

After reviewing the U.S. fish and Wildlife Service's Critical Habitat Mapper, no critical habitats were noted at within one mile of the project site or the general area.

5.0 HAZARD ASSESSMENT

5.1 HAZARD ANALYSIS

Task hazard analysis (THA) or Job Safety Analysis (JSA) is a technique used to identify hazards and hazard controls associated with a specific job function. THAs/JSAs focus on the relationship between the workers, the task, the resources required to complete the task, and the work environment. These variables must be evaluated to identify the potential hazards associated with the task. Once identified, steps can be taken to eliminate, reduce, or control the hazards to an acceptable risk level. Guidelines for developing THAs/JSAs are located in SH&E 302, *Risk Assessment and Hazard Analysis*.

Section 2.2 describes the work activities anticipated to be performed during this project. Individual THAs/JSAs for the tasks associated with this work can be found in Attachment A.

5.1.1 Unanticipated Work Activities/Conditions

Operations at the site may require additional tasks not identified in Section 2.2 or addressed in Attachment A THAs/JSAs. Before performing any task not covered in this HASP a THA/JSA must be prepared, and approved by the Safety Professional.

5.2 ENVIRONMENTAL CONTAMINANT EXPOSURE HAZARDS

The following is a discussion of the hazards presented to worker personnel during this project from on-site chemical and radiological hazards known or suspected to be present on site. Hazards associated with chemical products brought to the site during work operations are addressed separately, under the Hazard Communication process described in Section 4.3.

Exposure symptoms and applicable first aid information for each suspected site contaminant listed in Section 2 are located in the following subsections.

5.2.1 Petroleum Hydrocarbons

Hydrocarbon fuels (including gasoline, diesel fuel and jet fuel) are complex mixtures of hydrocarbons and additives. The constituents of hydrocarbon fuels posses a range of vapor pressures. For highly volatile components, chronic exposures or exposures to a high concentration may cause unconsciousness, coma, and possible death from respiratory failure. Exposure to low concentrations of vapor may produce flushing of the face, slurred speech, and mental confusion. Fuels are also irritating to the skin, and may cause drying and dermatitis as a result of prolonged contact.

Various components and additives of the fuels can themselves present significant additional hazards. The aromatic compounds benzene, toluene, ethylbenzene and xylene (BTEX) are of greatest concern in relation to site investigation activities, and are addressed separately below. However some additives used for performance enhancement (e.g., methyl tert-butyl ether - MTBE), oxygenation (e.g., alcohols and MTBE) and water scavenging (e.g., ethylene glycol methyl ether - EGME) can also present significant hazards as a result of prolonged inhalation or skin exposure. In the past tetra-ethyl and tetra-methyl lead, both of which have been identified as carcinogens and present moderate skin contact hazards, were added to gasoline for anti-knock control.

There are no set limits for petroleum hydrocarbons, however, gasoline guidelines may be used instead. Both the OSHA PEL and ACGIH TLV for gasoline are 300 ppm. The OSHA PEL and ACGIH TLV for Oil Mist is $5 mg/m^3$. Control of inhalation exposure to gasoline (and its various constituents and additives) can be accomplished through the use of air purifying respirators equipped with organic vapor cartridges. The use of skin protection (i.e., chemically - protective gloves) is required when handling gasoline-contaminated materials.

5.2.2 Acids (Sulfuric Acid)

Acids represent a major class of chemical substances. An acid is a compound that ionizes in water to yield a hydrogen ion [H^+]. All acids have a pH of < 7, while bases have a pH of > 7. Acids vary in strength and corrosiveness, but all acids represent both an inhalation and skin contact hazard. Many acids are irritants to the eyes, mucous membranes, and respiratory systems due to their affinity for water and ease in which they transition into the aqueous phase. Acids also represent a skin contact hazard due to their corrosiveness, in which skin may be severely damaged. Acids are frequently used in industrial cleaning processes and in the production of fertilizers and detergents.

The following information addresses the acids most commonly used in industrial cleaning and general maintenance activities. Should other acids be identified, supplemental information can be provided to this Addendum 1. However, since most acids share similar hazards and modes of exposure (inhalation and skin contact), the work procedures, monitoring requirements and protective equipment already required should be adequate to address these situations. The standard first aid treatment for acid spills on the skin is, as for other corrosive agents, irrigation with large quantities of water. Washing is continued for at least ten to fifteen minutes to cool the tissue surrounding the acid burn and to prevent secondary damage. Contaminated clothing is removed immediately and the underlying skin washed thoroughly.

Sulfuric (or sulphuric) acid, H_2SO_4, is a strong mineral acid. It is soluble in water at all concentrations. Sulfuric acid has many applications, and is one of the top products of the chemical industry. The corrosive properties of sulfuric acid are accentuated by its highly exothermic reaction (releases heat) with water. Burns from sulfuric acid are potentially more serious than those of comparable strong acids (e.g. hydrochloric acid), as there is additional tissue damage due to dehydration and particularly secondary thermal damage due to the heat liberated by the reaction with water. Both the ACGIH TLV and OSHA PEL for sulfuric acid is 1 mg/m^3.

5.2.3 Asbestos

Asbestos is a general term for a group of fibrous mineral types found naturally occurring in many parts of the world. Most notable in the United Sates is chrysotile, a white-colored mineral widely used in fire-retardant product and thermal insulation. Other forms include amosite (a brownish mineral) and crocidolite (a bluish mineral).

Long-term exposure to asbestos via inhalation has been linked to a number of diseases, including asbestosis (a fibrosis of the lung) and mesothelioma (a cancer of the pleural sac surrounding the lungs). Ingestion of asbestos, though considered much less of a hazard than inhalation, has been implicated in some forms of stomach cancer. Short-term acute exposures produce no documented health effects beyond irritation of the nose, lungs and eyes that is typical of high-concentrations dusts.

Protection against inhalation exposure can be provided by the use of air purifying respiratory protection, using P100 particulate matter cartridges. The use and disposal of Level C outer protective clothing during site work will prevent skin or clothing from becoming contaminated and a source of later fiber release. In order to minimize the potential releases of asbestos fibers during site activities, it will be necessary to employ positive dust suppression techniques (i.e., water). Both the OSHA PEL and the ACGIH TLV is 0.1 f/cc.

5.2.4 Volatile and Semi-Volatile Organic Compounds

Volatile Organic Compounds refer to a group of volatile compounds or mixtures that are relatively stable chemically and that exists in the liquid state at temperatures of approximately 32° to 82°F.

Volatile Organic Compounds (VOC's) are typically organic solvents used for extracting, dissolving, or suspending materials such as fats, waxes, and resins that are not soluble in water. The removal of the solvent from a solution permits the recovery of the solute intact with its original properties. Solvents are used in paints, adhesives, glues coatings, and degreasing/ cleaning agents.

Semivolatile Organic Compounds (SVOC's) are less volatile chemicals that tend to persist in the environment.

Inhalation and percutaneous absorption are the primary routes of exposure. Organic compounds are metabolized or they accumulate in the lipid-rich tissues such as the liver, fat cells, or the nervous system.

Solvent inhalation by workers can cause effects ranging from an alcohol-like intoxication to narcosis and death from respiratory failure. Symptoms that include drowsiness, headache, dizziness, dyspepsia, and nausea.

5.2.5 BTEX

5.2.5.1 Benzene

Benzene is a known human carcinogen. Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure. The OSHA PEL is 1 ppm, and the ACGIH TLV is 0.5 ppm.

5.2.5.2 Toluene

Exposure to vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, tearing, and a sensation of prickling, tingling, or creeping on the skin that has no objective cause. Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria. In severe cases, exposure to toluene may cause unconsciousness and death. The liquid is irritating to the eyes and the skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. Toluene may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause irreversible liver and kidney injury. Both the OSHA PEL and the ACGIH TLV are 50 ppm.

5.2.5.3 Ethyl Benzene

Ethyl benzene vapor is severely irritating to the eyes and to the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the CNS characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethyl benzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethyl benzene is low; however, ingestion of it poses a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are suspected at the levels that produce pronounced, unignorable, disagreeable skin and eye irritation. The established PEL is set well below this intolerable level. The OSHA PEL and the ACGIH TLV are both 100 ppm.

5.2.5.4 Xylene

Liquid xylene is a skin irritant that causes itching, dryness, and defatting. Prolonged contact may cause blistering. Inhaling xylenes can depress the CNS; ingesting xylenes can result in gastrointestinal disturbance and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported. Both the OSHA PEL and the ACGIH TLV are 100 ppm.

5.2.6 Petroleum Distillates

Petroleum, thick natural oil obtained from beneath the earth, consists of various hydrocarbons, a class of chemicals containing hydrogen’s and carbons. Petroleum distillates, also called hydrocarbons or petrochemicals, refer to a broad range of compounds which are extracted by distillation during the refining of crude oil. During the fractional distillation of petroleum, crude oil is heated to allow various compounds to turn from liquid into gas and then captured as they rise, cool, and condense. Lighter, more volatile compounds rise higher before they condense and are collected on distillation trays. Heavier, less volatile compounds such as diesel fuel and oil are collected on lower distillation trays. Waxes and asphalts are collected from the bottom after the other products have volatilized.

Petroleum distillates contain both aromatic hydrocarbons (carbon rings) and aliphatic hydrocarbons (straight carbon chains). The chemical structure of the hydrocarbon largely defines the nature and behavior of these compounds. Aromatic hydrocarbons are the most toxic compounds found in petroleum products. Most aromatic hydrocarbons are long-term toxins and known cancer causing agents. These aromatic compounds are found in all crude oils and most petroleum products. Many aromatic hydrocarbons have a pleasant odor and include such substances as naphthalene, xylene, toluene, and benzene. Aliphatic hydrocarbons are flammable and may be explosively flammable. Aliphatic hydrocarbons include methane, propane, and kerosene.

Aliphatic and aromatics pose a special health risk if ingested and vomited. When swallowed, the lighter, more volatile distillate products can be sucked into the lungs interfering with the lung's functions and chemical pneumonia may result. Aspiration of fluid into the lungs can occur both during swallowing and vomiting of the product. Upon skin contact, petroleum distillates can produce local skin irritation and sensitivity to light in some individuals. Environmentally, many of the petroleum distillate products add to smog and water pollution due to improper disposal or during their manufacture and use.

Products which contain petroleum distillates should be used carefully. Wear gloves to avoid skin contact and avoid breathing vapors of volatile compounds. Always keep petroleum distillate products out of reach of children. Do not mix different petroleum distillate products. Refer to the specific petroleum distillate product listed in this guide for safe use, storage, and disposal information.

5.2.7 Naphthalene

Naphthalene is a white solid that evaporates easily. Fuels such as petroleum and coal contain naphthalene. It is also called white tar, and tar camphor, and has been used in mothballs and moth flakes. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell. The major commercial use of naphthalene is in the manufacture of polyvinyl chloride (PVC) plastics. Its major consumer use is in moth repellents and toilet deodorant blocks. Naphthalene is very hazardous in case of ingestion; hazardous in case of eye contact (irritant), or inhalation; slightly hazardous in case of skin contact (irritant, permeator). Severe over-exposure can result in death. Both the OSHA PEL and the ACGIH TLV are 10 ppm and the OSHA PEL in mg/m^3 is 50.

5.2.8 Vinyl Chloride

Vinyl chloride is a colorless gas, which exhibits a high odor threshold (20 ppm). It is often used as a chemical intermediate in the production of certain types of plastics. It is also found as an environmental contaminant at sites contaminated by more complex chlorinated compounds, where it is a produced as the result of natural degradation. As a gas the primary route of exposure to vinyl chloride is via inhalation. As with many other types of chlorinated and other organic compounds, high airborne concentrations of vinyl chloride have been demonstrated to depress central nervous system function. Lower-level chronic exposure can produce effects to the liver, and vinyl chloride has been shown to produce liver cancer. This carcinogenic effect is of the greatest importance in the establishment of occupational exposure limits.

Both the OSHA PEL and ACGIH TLV for vinyl chloride are 1 ppm as an 8-hour time weight average. And since vinyl chloride's odor threshold greatly exceeds this limit the use of supplied-air respiratory protection is required to control exposures.

5.2.9 Dust

Dust generated during coring or cutting of concrete, boring, or excavations can be hazardous to the respiratory system and irritating to the eyes. Dust can also carry the contaminants of concern potentially exposing workers by skin contact and inhalation. The ACGIH has established an eight-hour exposure limit for dust at 10 mg/M^3. The concentrations of the chemicals of concern in the soil are low enough that inhalation of dust would not by itself be an exposure hazard. However contamination of skin and clothing can provide additional exposures. Therefore the generation and contact with dust should be minimized.

Water or other methods should be used to control dust during dusty operations; however care must be used to prevent electrical shock if electric tools are used in the same area. If dusts become irritating and engineering controls such as the application of water cannot be used, respirators should be donned as discussed in Section 7.

5.2.10 Assessment of Exposure Hazards

Inhalation – Various sampling techniques will be utilized to obtain soil samples. A hand auger will be used to collect near-surface/subsurface soil samples to depths of approximately 5 feet. Hand augering involves the manual placement and insertion (turning) of a small auger blade. Soil is displaced by the blade, creating a hole that allows access to soils located below the ground surface. Direct push and Hollow Stem Auger systems may be also be utilized. Since only small volumes of soil are disturbed, the potential for airborne release of contaminants when performing this work is minimal. The removal of significant spoils, and the vapor migration space provided by the hollow auger stem can allow significant emissions of vapor-phase contaminants (in the event that volatile contaminants are present).

Skin Contact – To avoid direct dermal contact with contaminated media, protective clothing, as described in Section 7 will be required when collecting samples and decontaminating sampling equipment.

Ingestion – Protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas (see Section 8.2).

5.3 PHYSICAL HAZARDS

The physical hazards that may be encountered at the Somers Site are discussed below.

- Hazardous Noise – Workers may be exposed to hazardous levels of noise from drilling rig and supporting equipment. Hearing protection will be provided to all workers.
- Drill Rigs/Heavy Equipment – Drill rigs have rotating equipment that could entangle clothes and as well as hands/arms. Also, hydraulic lines operate under pressure and could rupture discharging heated hydraulic fluid or the line could whip under pressure and strike a worker. When in motion, drill rigs could strike equipment, other vehicles, overhead power lines, or workers.
- Overhead Electrical Lines – The mast of the drill rig could contact overhead electrical lines causing electrocution of nearby workers or workers who were in contact with the rig. The drill rig could also catch fire when exposed to high voltage.
- Subsurface Utilities – The drill rig could drill into subsurface utility lines (e.g., electrical, fiber optic, gas line, etc.).
- Heat Stress – Summer in Montana can present outdoor workers with heat stress resulting from temperatures in excess of 100 F.
- Power Hand/Manual Hand Tools -The use of manual hand or power tools presents workers with hazards such as cuts, abrasions, contusions, and electrocution (power tools only).
- Severe Weather - The SSO will monitor local radio, NOAA weather radio, Internet weather sites, or other weather warning systems to plan for and identify possible severe weather situations at the project site. Site work may be delayed, postponed, or cancelled due to severe weather. Vehicle and equipment use at a site may also be restricted under unfavorable weather conditions.
- Lightning
    - Lightning can strike up to a distance of 10 miles, but thunder can only be heard at a distance of 8 miles. If you can hear thunder, you are at risk of being struck by lightning.
    - Therefore, if site personnel working outdoors hear thunder or see lightning, work will be stopped and personnel will move to an indoor location.
    - If indoor facilities are not available, personnel should seek shelter inside passenger vehicles such as cars and pickups. Avoid touching metal parts of the vehicle.
    - During a thunderstorm avoid trees/poles, standing water, high areas, very low areas and streams, and metal structures (fences, scaffolding, etc.).
    - Work will resume 30 minutes following the final observance of thunder and/or lightning and when the storm is moving away from the work area.

5.4 BIOLOGICAL HAZARDS

The site consists of undeveloped and/or partially developed property. Snakes, spiders, and insects are the biological hazards that are anticipated to be most applicable to this Site.

5.4.1 Insects and Spiders

Spiders and wasps may be found in derelict buildings, sheltered areas, and even on open ground. Exercise care when collecting samples and avoid reaching into areas where visibility is limited. If stung by a wasp or bee, or bitten by a spider, notify a co-worker or someone who can help if you should you have an allergic reaction. Stay calm and treat the area with ice or cold water. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite or sting or any swelling or numbness beyond the site of the bite or sting.

Studies have determined that repellants containing DEET as a main ingredient are most effective against spiders, mosquitoes, and other insects. DEET can be directly applied to the exposed skin of adults and/or clothing. Permanone® is another repellent however; it can only be directly applied to clothing.

5.4.2 Ticks

Ticks are bloodsuckers, attaching themselves to warm-blooded vertebrates to feed. Deer ticks are the most common carriers of Lyme disease, a bacterial infection that is transmitted to humans through the bite of the tick.

Personnel should carefully inspect themselves each day for the presence of ticks or any rashes. This is important since prompt removal of the tick can prevent disease transmission. Female deer ticks are about one-quarter inch in length and are black and brick red in color. Males are smaller and all black.

Removal of the tick is important in that the tick should not be crushed and care must be taken so that the head is also removed. If the head is not completely removed or if the tick is allowed to remain for days feeding on human blood, a condition known as tick paralysis can develop, which is due to a neurotoxin that the tick apparently injects while engorging. This neurotoxin acts upon the spinal cord causing incoordination, weakness and paralysis.

One characteristic symptom of Lyme disease is a bulls-eye rash that develops around the bite site. The rash appears in about 60-80% of all Lyme disease cases. Contact your DHSM immediately if you develop such a rash.

Tick season lasts from April through October; peak season is May through July. Wear light-colored clothing (easier to spot ticks) with long sleeves and make sure that shirts are tucked into pants and pants are tucked into socks or boots. Ticks have a tendency to crawl upwards. These procedures will make it more difficult for a tick to reach your skin.

Studies have determined that repellants containing DEET as a main ingredient are most effective against spiders and ticks. DEET can be directly applied to the exposed skin of adults and/or clothing. Permanone® is another repellent however; it can only be directly applied to clothing.

5.4.3 Chiggers

Chigger bites are from the tiny, six-legged larvae of the chigger mite, which are so small they can’t be seen without a magnifying glass. Chiggers hide out in the grass, weeds, and vegetation, and then bite their victim by inserting their mouthparts into a pore or hair follicle of the skin. Within 3 to 6 hours of exposure to a chigger, a small, inflamed welt will appear on the skin and will itch intensely. Itching can continue for a week or more, and if nothing is done to relieve itching, secondary infections may develop from scratching. Chiggers are not known to carry disease in the U.S.

If you have been working in a chigger-infested area, take these special precautions:

- Mow vegetation from the working area.
- Eliminate shade and moisture from the area.
- Wear high boots and pants made out of tightly woven fabric.

- Tuck your pants into your socks or boots.
- Wear an insect repellent that is applied to skin, clothing, and clothing openings.
- Bring a field chair to sit on—don't sit on the grass.
- Stick to roads and trails.

When you return from a chigger-infested area in the field, do the following:

- Wash your clothes in hot, soapy water. If you can't wash your clothes, put them in a sealed, plastic bag in your hotel room. Don't wear clothes until they are washed in hot water or exposed to hot sunshine.
- Take a hot bath or shower, and wash with soap numerous times to dislodge larvae.

If you are bitten, there are numerous over-the-counter treatments that a pharmacist can recommend, such as benzocaine, hydrocortisone, and calamine lotion. Treat the itching as soon as possible to prevent secondary infection from scratching.

5.4.4 Feral Dogs

Packs of feral dogs can be dangerous, so if you observe them on the site, call animal control immediately. If a dog approaches you, take the following steps to reduce your chances of being attacked:

- Don't run away or run past the dog.
- Remain calm. Don't scream. If you say anything, speak calmly and firmly. Avoid eye contact. Try to stay still until the dog leaves, or back away slowly until the dog is out of sight. Don't turn and run.
- If you fall to the ground or are knocked down, curl into a ball, placing your hands over your head and neck. Protect your face.

If a dog bites someone, take the following steps:

- Restrain the dog immediately, if it is safe to do so. The dog will have to be quarantined or tested for rabies.
- Check on the victim's condition. Call 911 if paramedic response is required.

Call the District SH&E Manager to arrange for medical treatment.

5.4.5 Rodent Infestation

Rodent infestation in the workplace has the potential to cause serious communicable diseases including Hantavirus pulmonary syndrome and bubonic plague. The most common rodent-borne disease is Hantavirus which may infect workers who inhale tiny droplets containing the virus when fresh rodent urine, droppings or nesting materials are stirred up.

Working conditions that my put workers at risk of Hantavirus include:

- Contact with rodent feces or dried urine which may mobilize particles of these wastes into the air where they may be inhaled
- Entry into rooms or warehouses that have been closed up and infested for extended periods
- Activities that stir up dust which may mobilize Hantavirus

If working in areas of obvious rodent infestation, take the following precautions:

- Do not enter rooms or warehouses that have been closed up unless absolutely necessary.
- If work in closed up areas or areas with rodent infestation is necessary, contact professional exterminators to eliminate the infestation and clean up the location

- If an exterminator is not available/possible, employees should clean up the infested area using the following steps:
  - When going into outbuildings or rooms that have been closed for an extended period, open them up and air out before cleaning
  - Don an air purifying respirator equipped with HEPA P-100 cartridges and nitrile gloves before cleaning
  - Don't stir up dust by sweeping up or vacuuming up droppings, urine or nesting materials
  - Thoroughly wet contaminated areas with detergent or liquid (household bleach) to deactivate the virus. Most general-purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1 and 1/2 cups of household bleach in 1 gallon of water may be used in place of commercial disinfectant.
  - Once everything is wet, take up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.
  - Spray dead rodents with disinfectant and flea repellent (to avoid bubonic plague), then double-bag and dispose in appropriate waste disposal system. Contact the local or state health department other disposal methods.
  - Finally, remove respirator and disinfect gloves before taking them off with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

If you experience hantavirus symptoms (fatigue, fever, and muscle aches) within 1 to 5 weeks of exposure to potentially affected rodents and their droppings, contact the District SH&E Manager immediately.

5.4.6 Snakes

Poisonous snakes are found in most of the states we work in. The same cautions discussed regarding spiders and wasps apply. If bitten, stay calm and seek help. Do NOT cut the bite area, but use a snakebite kit if available. Try to be able to identify the snake to medical personnel. Remember that bites of nonpoisonous snakes can become infected. Get medical attention for any animal bite.

5.5 RADIOLOGICAL HAZARDS

Radiological hazards are not anticipated to be applicable to this project.

5.6 ULTRAVIOLET HAZARDS

The average forecasted UV Index for the Montana area from April through September run from 6 to 8 with July averaging 8 to 10 meaning that worker's UV exposures normally are MODERATE TO HIGH range. Workers performing field work outdoors may be susceptible to sunburn if not properly protected with sunscreen or protective clothing and hats.

5.7 OTHER HAZARDS

Due to recent H1N1 concerns throughout the United States, hands should be frequently washed with soap/water or an alcohol-based antibacterial hand wash, especially prior to eating/drinking.

6.0 ACTIVITY SPECIFIC REQUIREMENTS

6.1 SUPPLEMENTAL SAFETY PROCEDURES

As discussed in Section 5.0, personnel may be exposed to a variety of chemical, physical, radiological, and biological hazards resulting from task- or equipment-specific activities. The requirements for the control of many of these hazards are discussed in SOPs found in the 500 to 700 Series of the U.S. Operations SH&E Manual.

Specific procedures applicable to this project include:

- SH&E 501, *Hazard Communication Program*
- SH&E 508, *Flammable and Combustible Materials*
- SH&E 509, *Biological Hazards*
- SH&E 515, *Non-Ionizing Radiation*
- SH&E 610, *Hand and Power Tools*
- SH&E 701, *HAZWOPER*
- SH&E 710, *Heavy Equipment Operations*
- SH&E 716, *Drilling and Boring*

In addition, the following supplemental procedures have been developed to address requirements not covered within the established AECOM SOPs (SH&E 500 to 700-series). SOPs and supplemental procedures are specified on a task-specific basis in the individual THAs found in Attachment A.

6.1.1 Subsurface Utilities

Various forms of underground/overhead utility lines or pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. Should intrusive operations cause equipment to come into contact with utility lines, the SSO and the Safety Professional will be notified immediately. Work will be suspended until the applicable utility agency is contacted and the appropriate actions for the particular situations can be taken. For this project, the national one-call 811 number or the Montana One-Call service 800-798-9365 may be used. The following precautions should also be observed:

- Obtaining as-built drawings for the areas being investigated from the property owner;
- Visually reviewing each proposed soil boring locations with the property owner or knowledgeable site representative;
- Performing a geophysical survey to locate utilities;
- Hiring a private line locating firm to determine the location of utility lines that are present at the property;
- Identifying a no-drill zone; or
- Hand digging in the proposed soil boring locations if insufficient data is available to accurately determine the location of the utility lines.

6.1.2 Hazardous Noise Environments

Working around drill rigs and other heavy equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

AECOM has compiled noise monitoring data that indicates that work locations within 25 feet of operating heavy equipment (e.g., drill rigs, earthworking equipment) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (earplugs or earmuffs) within 25 feet of any operating piece of heavy equipment.

6.1.3 Slip, Trips and Fall Hazards

On any work area, it is expected that the ground might be uneven. The ground surface might be unreliable due to settling. Surface debris might be present and wet or swampy areas can exist.

Employees should walk around, not over or on top of debris or trash piles. When carrying equipment, identify a path that is clear of any obstructions. It might be necessary to remove obstacles to create a smooth, unobstructed access point to the work areas on site.

During the winter months, snow shovels and salt crystals should be kept on site to keep work areas free of accumulated snow and ice.

Maintaining a work environment that is free from accumulated debris is the key to preventing slip, trip and fall hazards at construction sites. Essential elements of good housekeeping include

- Orderly placement of materials, tools and equipment;
- Placing trash receptacles at appropriate locations for the disposal of miscellaneous rubbish;
- Prompt removal and secure storage of items that are not needed to perform the immediate task at hand; and,
- Awareness on the part of all employees to walk around, not over or on, equipment that might have been stored in the work area.

6.1.4 Drill Rig Operations

The use of drill rigs in areas where unprotected personnel are working warrants special attention on the part of all personnel. Operators should ensure that equipment is working properly and is being run in a safe manner and should be aware of the location of unprotected personnel at all times while operating this machinery to avoid serious accidents.

In order to assure that all equipment used on site presents no unwarranted safety hazards, the owner/operator of each drill rig must perform a safety evaluation and certification in accordance with the procedures and requirements found in SH&E 716, *Drilling and Boring* and complete the *Drill Rig Safety Inspection Checklist*. This checklist must be provided to the Site Supervisor/SSO daily for inclusion in the project files. Any discrepancies noted on the checklist must be corrected prior to the initiation of drilling activities.

6.1.5 Manual Lifting

Most materials associated with investigation, remedial, or construction-related activities are moved by hand. The human body is subject to severe damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process. Whenever possible, use at least two people to lift, or roll/lift with your arms as close to the body as possible. Under no circumstances should any one person lift more than 49 pounds unassisted. For additional requirements refer to SH&E 607, *Manual Lifting*. Additional measures related to manual materials handling activities may be applicable under SH&E 608, *Handling Drums and Large Containers*.

6.1.6 Hand and Power Tools

The use of any powered hand tool will comply with the requirements in SH&E 610, *Hand and Power Tools*. All electrically powered hand tools will be connected through a ground fault circuit interrupter (GFCI). All tools will be inspected prior to use. For those tool(s) that are damaged or otherwise defective, the tool will be red tagged and taken out of service. Workers utilizing powered hand tools will be provided with the applicable Equipment Safety Cards in Attachment C and briefed regarding the hazards presented by that particular tool. <u>All workers must be trained on the use of the particular tool they are utilizing and this training must be documented.</u> The SSO/site supervisor will maintain the training records onsite.

6.1.7 Groundwater Level Static Checks

Prior to performing any groundwater level static checks ensure a photoionization detector (PID) is present and field checked for operational compliance. Obtain appropriate instrument for measuring water level and ensure it is operating correctly prior to departing to the field. If the groundwater level you are measuring is in a preexisting well use caution while opening well cap for critters that may have entered and let it air out for 15 minutes. Use the PID to measure the head space (see section 6.2.1, Table 6-2) and if the air meets acceptable criteria proceed with the tasking.

6.1.8 Soil Sampling

During certain times of the year such as the early summer months when soil sampling is being conducted it will be necessary to protect oneself from snakes. One method in conjunction with snake chaps, leather gloves and an a face shield or goggles will be to utilize a weed eater to clear brush and to create noise. Due to the snake infestation, inclines, loose soils, rocks this may result in slower sampling times and increased vigilance in order to ensure site personnel remain safe from critters that roam the site.

6.2 EXPOSURE MONITORING PROCEDURES

Monitoring procedures will be employed during site characterization activities to assess employee exposure to chemical and physical hazards (as required). Monitoring will consist primarily of onsite determination of various parameters (e.g., airborne contaminant concentrations and heat stress effects), but may be supplemented by more sophisticated monitoring techniques, if necessary.

6.2.1 Real-Time Exposure Measurement

Monitoring shall be performed within the work area on site in order to detect the presence and relative levels of toxic substances (as required). The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in each THA/JSA (Attachment A) as work is performed.

Table 6-1 specifies the real-time monitoring equipment, which may be used for this project.

Table 6-1: Monitoring Parameters and Equipment

INSTRUMENT	MANUFACTURER/MODEL*	SUBSTANCES DETECTED
Photo Ionization Detector (PID)	RAE Systems mini-RAE Photovac Microtip HNu Model Hnu (min. 10.6 eV bulb)	Petroleum hydrocarbons Organic Solvents
Multi or 4 Gas Detectors	RAE Systems Multi-RAE	Lower Explosive Limit Oxygen (O_2) Carbon Monoxide (CO) Hydrogen Sulfide (H_2S)
Combustible Gas Indicator (CGI) May be combined with individual or multi-gas detectors.		Explosivity
Particulate Monitor	MIE Model PDM-3 mini-RAM	Aerosols, mist, dust, and fumes
Colorimetric Detector Tubes	Sensidyne Draeger	Benzene 0.5–10 ppm

*Or similar unit, as approved by the SH&E Professional

6.2.1.1 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions. The concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigative actions, etc.) must be implemented prior to commencing activities at the specific work area.

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSO or the Safety Professional.

Reasons to upgrade:

- Known or suspected presence of dermal hazards.
- Occurrence or likely occurrence of gas, vapor, or dust emission.
- Change in work task that will increase the exposure or potential exposure to hazardous materials.

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected.
- Change in site conditions that decrease the potential hazard.
- Change in work task that will reduce exposure to hazardous materials.

Table 6-2: Monitoring Procedures and Action Levels for Intrusive Activities (including Sampling)

PARAMETER	ZONE LOCATION AND MONITORING INTERVAL	RESPONSE LEVEL (ABOVE BACKGROUND)	RESPONSE ACTIVITY
VOCs (total by PID)	Breathing Zone, every 30 minutes during well development activities	< 10 units	Continue work in required PPE and continue monitoring.
		10-25 units (sustained for more than 5 minutes)	Continue work in required PPE, continue monitoring, and use benzene detector tubes
		25-50 units (sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridge).
		> 50 units (sustained for more than 5 minutes)	Cease work, exit, and contact the SP and PM.
VOCs (total by PID)	Edge of Exclusion Zones, every 30 minutes during well development activities	< 10 units	Continue work in required PPE, monitor air, and implement engineering controls.
		> 10 units (sustained for more than 5 minutes)	Continue mitigation measures and contact the SP
Benzene (by colorimetric Tube)	Breathing zone, where indicated by VOC readings	No color change	Continue work activities
		Noticeable color change up to 10 ppm	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridges)
		> 10 ppm	Cease work, exit the area, and contact the SP and PM
Hydrocarbons (Total by PID)	Every 30 minutes in the worker's breathing zone or in the immediate work area.	< 5 ppm	Continue Level D or Modified Level D work and continue monitoring.
		>5 ppm – 10 ppm	Periodically monitor with benzene-specific detector tubes. Contact the SSO or SH&E Manager, implement mitigation measures, and continue work in Level D/Modified Level D (unless otherwise indicated by benzene results).
		>10 ppm – 100 ppm	Upgrade to Level C PPE (minimum full-face APR with GMA cartridges or equivalent). Continue environmental monitoring.
		≥ 100 ppm	Cease work, exit the area, contact the SSO or SH&E Manager for guidance.

Note: All VOC monitoring will be conducted using PID only.

6.2.1.2 Monitoring Equipment Calibration

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer's recommendations. If the owner's manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or off-site migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

6.2.1.3 Personal Sampling

Should site activities warrant performing personal sampling to better assess chemical exposures experienced by AECOM employees, the SSO, under the direction of a Certified Industrial Hygienist (CIH), will be responsible for specifying the monitoring required. Within five working days after the receipt of monitoring results, the CIH will notify each employee, in writing, of the results that represent that employee's exposure. Copies of air sampling results will be maintained in the project files.

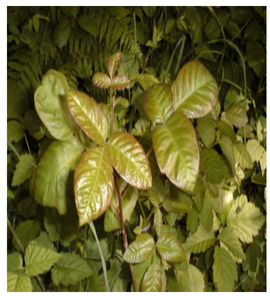
If the site activities warrant, the subcontractor will ensure its employees' exposures are quantified via the use of appropriate sampling techniques. The subcontractor shall notify the employees sampled in accordance with health and safety regulations, and provide the results to the SSO for use in determining the potential for other employees' exposure.

6.2.2 Biological Hazard Injury and Illness Prevention

Contact with bodies of water, animals, insects, and plants can cause injury and illness to personnel. Care must be taken to ensure that these types of injuries are avoided. Preventative measures are outlined in SH&E 509, *Biological Hazard Injury and Illness Prevention*. Some examples of biological hazards include:

1. Natural and artificial bodies of water (e.g., lakes, rivers, ponds, lagoons, etc.) may contain a variety of microorganisms. Microorganisms, in particular, present a significant hazard to personnel who may come into contact with water bodies. Contact with microorganisms in water may result in dermatitis, infection (i.e., in cuts/lacerations), digestive distress, and other diseases. Always be aware of areas that may contain excessive amounts of microorganisms. Such areas may include areas of standing water; areas of warm water (i.e., cooling tower effluents, etc.); and areas downstream of municipal wastewater treatment. To prevent exposure to microorganisms in water, always adhere to the following:
    - Wear protective gloves (i.e., nitrile, etc.) and other appropriate PPE to prevent skin contact with water.
    - Never drink from natural or artificial bodies of water. Such water is considered non-potable and is not safe for drinking.
2. Wild animals, such as bears, snakes, raccoons, squirrels, and rats. These animals not only can bite and scratch, but can carry transmittable diseases (e.g., rabies). Avoid the animals whenever possible. If bitten, go to the nearest medical facility.
3. Insects such as mosquitoes, ticks, bees, and wasps. Mosquitoes can potentially carry and transmit the West Nile Virus. Ticks can transmit Lyme disease or Rocky Mountain Spotted Fever. Bees and wasps can sting by injecting venom, which causes some individuals to experience anaphylactic shock (extreme allergic reaction). Whenever you will enter areas that provide a habitat for insects (e.g., grass areas, woods), wear light-colored clothing, long pants and shirt, and spray exposed skin areas with a DEET-containing repellent. Keep away from high grass wherever possible. Keep your eyes and ears open for bee and wasp nests. If bitten by insects, see a doctor if there is any question of an allergic reaction.
4. Plants such as poison ivy and poison oak can cause severe rashes on exposed skin. Be careful where you walk, wear long pants, and minimize touching exposed skin with your hands after walking through thickly vegetated areas until after you have thoroughly washed your hands with soap and water. Examples of common poisonous or irritating plant species, common to the United States, are shown in Table 6-3.

Table 6-3: Hazardous Plant Identification Guide

Poison Ivy • Grows in West, Midwest, Texas, East • Several forms – vine, trailing shrub, or shrub • Three leaflets (can vary 3-9) • Leaves green in summer, red in fall • Yellow or green flowers • White berries	 
Poison Oak • Grows in the East (NJ to Texas), Pacific Coast • 6-foot tall shrubs or long vines • Oak-like leaves, clusters of three • Yellow berries	 
Poison Sumac • Grows in boggy areas, especially in the Southwest and Northern states • Shrub up to 15 feet tall • Seven to 13 smooth-edged leaflets • Glossy pale yellow or cream-colored berries	 

6.2.2.1 Response Measures for Contact with Hazardous Plants

If you have been exposed to poison ivy, oak, or sumac, act quickly because the toxin in the plants penetrates the skin within minutes. If possible, stay outdoors until you complete the first two steps:

1. Cleanse the exposed skin with generous amounts of isopropyl alcohol
2. Wash the skin with water
3. Take a regular shower with soap and warm water. Do not use soap until this point because it will pick up the toxin from the surface and move it around
4. Wash clothes, tools, and anything else that may have been in contact with the toxin, with alcohol and water. Be sure to wear hand protection during that process

Signs and symptoms of exposure include redness and swelling that appears 5 mins to 2 hours after exposure. Blistering and itching will follow. If you have had a severe reaction in the past, you should see an occupational physician right away. After binding, plain soap and water may not be effective in removing urushiol (the oil commonly disseminated by these particular plants). Otherwise, according to the Federal Drug Administration (FDA), there are quite a few effective over-the-counter (OTC) products to help with symptoms, including Cortaid and Lanacort, baking soda, Aveeno oatmeal bath, and calamine lotion. These OTC remedies may produce mild and temporary relief of the itch but will not remove the oil. Again, cleanse immediately after exposure w/plain soap/water, then wash with products like OTC Zanfel per package instructions. Wash all clothing/bedding in hot soapy water since urushiol oil from the plant will stay on them and if worn/touched, will continue to re-expose if contracted with any part of one's skin. AECOM's occupational care consultant, or a pharmacist, can help you make an educated choice.

6.2.3 Environmental Protection

Protection of the surrounding environment is not expected to be an issue as a result of the proposed work at the Former Wire Pro Facility site. Environmental THA's for various tasks have been developed by AECOM to assess the risks of the proposed work at the site. Environmental Task hazard analysis is a technique used to identify environmental hazards and hazard controls associated with the work being performed at a site. An Environmental THA focuses on the relationship between the environment, the task, the resources required to complete the task, and the work environment. These variables must be evaluated to identify the potential environmental hazards associated with the task. Once identified, steps can be taken to eliminate, reduce, or control the hazards to an acceptable risk level.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 PERSONAL PROTECTIVE EQUIPMENT

The purpose of personal protective equipment (PPE) is to provide a barrier, which will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. SH&E 115, *Personal Protective Equipment Program*, lists the general requirements for selection and usage of PPE. Table 7-1 lists the minimum PPE required during site operations and additional PPE that may be necessary. The specific PPE requirements for each work task are specified in the individual JSA/THAs found in Attachment A.

By signing this HASP you are agreeing that you have been properly trained in the use, limitations, care and maintenance of the protective equipment you will use at this project. If you have not received training on the proper use, care, and, limitations of the PPE required for this project, then contact the PM/SSHO for the proper training prior to signing this HASP.

Table 7-1: Personal Protective Equipment

TYPE	MATERIAL	ADDITIONAL INFORMATION
Minimum PPE		
Safety Vest (Orange color)	ANSI Type II high-visibility	Must have reflective tape/be visible from all sides
Boots	Leather	ANSI approved safety toe
Safety Glasses		ANSI Approved; ≥98% UV protection
Hard Hat (Orange color)		ANSI Approved; recommended wide-brim
Work Uniform		No shorts/cutoff jeans or sleeveless shirts
Additional PPE:		
Hearing Protection	Ear plugs and/ or muffs	In hazardous noise areas
Leather Gloves		If working with sharp objects or powered equipment.
Protective Chemical Gloves	Inner: Nitrile/Butyl Rubber Outer:	
Level C Respiratory Protection	MSA (Full Face or equivalent) equipped with GMA/P100	
Faceshield		Safety glasses or goggles must be worn concurrently.
Sunscreen	SPF 30 or higher	
Cold Weather Gear	Hard hat liner, hand warmers, insulated gloves	

7.2 PPE DOFFING AND DONNING INFORMATION

The following information is to provide field personnel with helpful hints that, when applied, make donning and doffing of PPE a more safe and manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the booty and the underlying sturdy leather work boot, resulting in significant cuts to the legs/ankles. Recommend using a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the booty, then proceed by manually tearing the material down to the sole of the booty for easy removal.
- When applying duct tape to PPE interfaces (wrist, lower leg, around respirator, etc.) and zippers, leave approximately one inch at the end of the tape to fold over onto itself. This will make it much easier to

remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE.

- Have a "buddy" check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation.
- Never perform personal decontamination with a pressure washer.

7.3 DECONTAMINATION

7.3.1 General Requirements

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials, etc).

All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. Depending on specific site hazards, attendants may be required to wear a level of protection that is equal to the required level in the Exclusion Zone (EZ).

All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to entering the Support Zone (SZ).

Decontamination procedures may vary based on site conditions and nature of the contaminant(s). If chemicals or decontamination solutions are used, care should be taken to minimize reactions between the solutions and contaminated materials. In addition, personnel must assess the potential exposures created by the decontamination chemical(s) or solutions. The applicable Material Safety Data Sheet (MSDS) must be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.

All contaminated PPE and decontamination materials shall be contained, stored and disposed of in accordance with site-specific requirements determined by site management.

7.3.2 Decontamination Equipment

The equipment required to perform decontamination may vary based on site-specific conditions and the nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:

- Soft-bristle scrub brushes or long-handled brushes to remove contaminants;
- Hoses, buckets of water or garden sprayers for rinsing;
- Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions;
- Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment;
- Metal or plastic cans or drums for the temporary storage of contaminated liquids; and
- Paper or cloth towels for drying protective clothing and equipment.

7.3.3 Personal/Equipment Decontamination

All equipment leaving the EZ shall be considered contaminated and must be properly decontaminated to minimize the potential for exposure and off-site migration of impacted materials. Such equipment may include, but is not limited to: sampling tools, heavy equipment, vehicles, PPE, support devices (e.g., hoses, cylinders, etc.), and various handheld tools.

All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the EZ.

Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors. Following equipment decontamination, employees may be required to follow the proper personal decontamination procedures above.

For larger equipment, a high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to ensure proper decontamination.

For smaller equipment, use the following steps for decontamination:

1. Remove majority of visible gross contamination in EZ.
2. Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment.
3. Rinse equipment.
4. Visually inspect for remaining contamination.
5. Follow appropriate personal decontamination steps outlined above.

All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ). Signs of visible contamination may include an oily sheen, residue or contaminated soils left on the equipment. All equipment with visible signs of contamination shall be discarded or re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed.

8.0 SITE CONTROL

8.1 GENERAL

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established directly prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps, posted in the support vehicle or trailer and discussed during the daily safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made. General examples of zone layouts have been developed for drilling and earth moving activities and are attached to this section.

8.2 CONTROLLED WORK AREAS

Each HAZWOPER controlled work area will consist of the following three zones:

- Exclusion Zone: Contaminated work area.
- Contamination Reduction Zone: Decontamination area.
- Support Zone: Uncontaminated or "clean area" where personnel should not be exposed to hazardous conditions.

Each zone will be periodically monitored in accordance with the air monitoring requirements established in this HASP. The Exclusion Zone and the Contamination Reduction Zone are considered work areas. The Support Zone is accessible to the public (e.g., vendors, inspectors).

8.2.1 Exclusion Zone

The Exclusion Zone is the area where primary activities occur, such as sampling, remediation operations, installation of wells, cleanup work, etc. This area must be clearly marked with hazard tape, barricades or cones, or enclosed by fences or ropes. Only personnel involved in work activities, and meeting the requirements specified in the applicable THA/JSA and Sections 4.1 and 4.2 will be allowed in an Exclusion Zone.

The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample collection activities. To meet this requirement, the following minimum distances will be used:

- **Direct Push Drilling Activities**. A distance of 20 feet in all directions will be cleared from the rig.
- **HSA Drilling**. Determine the mast height of the drill rig. This height will be cleared, if practical, in all directions from the bore-hole location and designated as the exclusion zone. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of spoils piles.
- **Potholing Activities**. A distance of 25 feet will be cleared in all directions from the backhoe and the location where the excavated soil is deposited.
- **Hand Augering**. A distance of 10 feet will be cleared in all directions from the sampling location in order to accommodate additional sampling equipment.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the EZ and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

8.2.2 Contamination Reduction Zone

The Contamination Reduction Zone is the transition area between the contaminated area and the clean area. Decontamination is the main focus in this area. The decontamination of workers and equipment limits the physical transfer of hazardous substances into the clean area. This area must also be clearly marked with hazard tape and access limited to personnel involved in decontamination. Decontamination procedures are further explained in Section 7.3.

8.2.3 Support Zone

The Support Zone is an uncontaminated zone where administrative and other support functions, such as first aid, equipment supply, emergency information, etc., are located. The Support Zone shall have minimal potential for significant exposure to contaminants (i.e., background levels).

Employees will establish a Support Zone (if necessary) at the site before the commencement of site activities. The Support Zone would also serve as the entry point for controlling site access.

8.3 SITE ACCESS DOCUMENTATION

If implemented by the PM, all personnel entering the site shall complete the “Site Entry/Exit Log” located at the site trailer or primary site support vehicle.

8.3.1 Visitor Access

Visitors to any HAZWOPER controlled-work area must comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

1. A written confirmation must be received by AECOM documenting that each of the visitors has received the proper training and medical monitoring required by this HASP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.
2. Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.
3. All visitors must be escorted by an AECOM employee.

If the site visitor requires entry to any EZ, but does not comply with the above requirements, all work activities within the EZ must be suspended. Until these requirements have been met, entry will not be permitted.

8.4 SITE SECURITY

Site security is necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards.
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site.
- Prevent theft.
- Avoid interference with safe working procedures.

To maintain site security during working hours:

1. Maintain security in the Support Zone and at access control points.
2. Establish an identification system to identify authorized persons and limitations to their approved activities.
3. Assign responsibility for enforcing authority for entry and exit requirements.
4. When feasible, install fencing or other physical barrier around the site.
5. If the site is not fenced, post signs around the perimeter and whenever possible, use guards to patrol the perimeter. Guards must be fully apprised of the hazards involved and trained in emergency procedures.

6. Have the PM approve all visitors to the site. Make sure they have valid purpose for entering the site. Have trained site personnel accompany visitors at all times and provide them with the appropriate protective equipment.

To maintain site security during off-duty hours:

1. If possible, assign trained, in-house technicians for site surveillance. They will be familiar with the site, the nature of the work, the site's hazards, and respiratory protection techniques.
2. If necessary, use security guards to patrol the site boundary. Such personnel may be less expensive than trained technicians, but will be more difficult to train in safety procedures and will be less confident in reacting to problems around hazardous substances.
3. Enlist public enforcement agencies, such as the local police department, if the site presents a significant risk to local health and safety.
4. Secure the equipment.

Figure 8-1: Drilling Site Control Layout

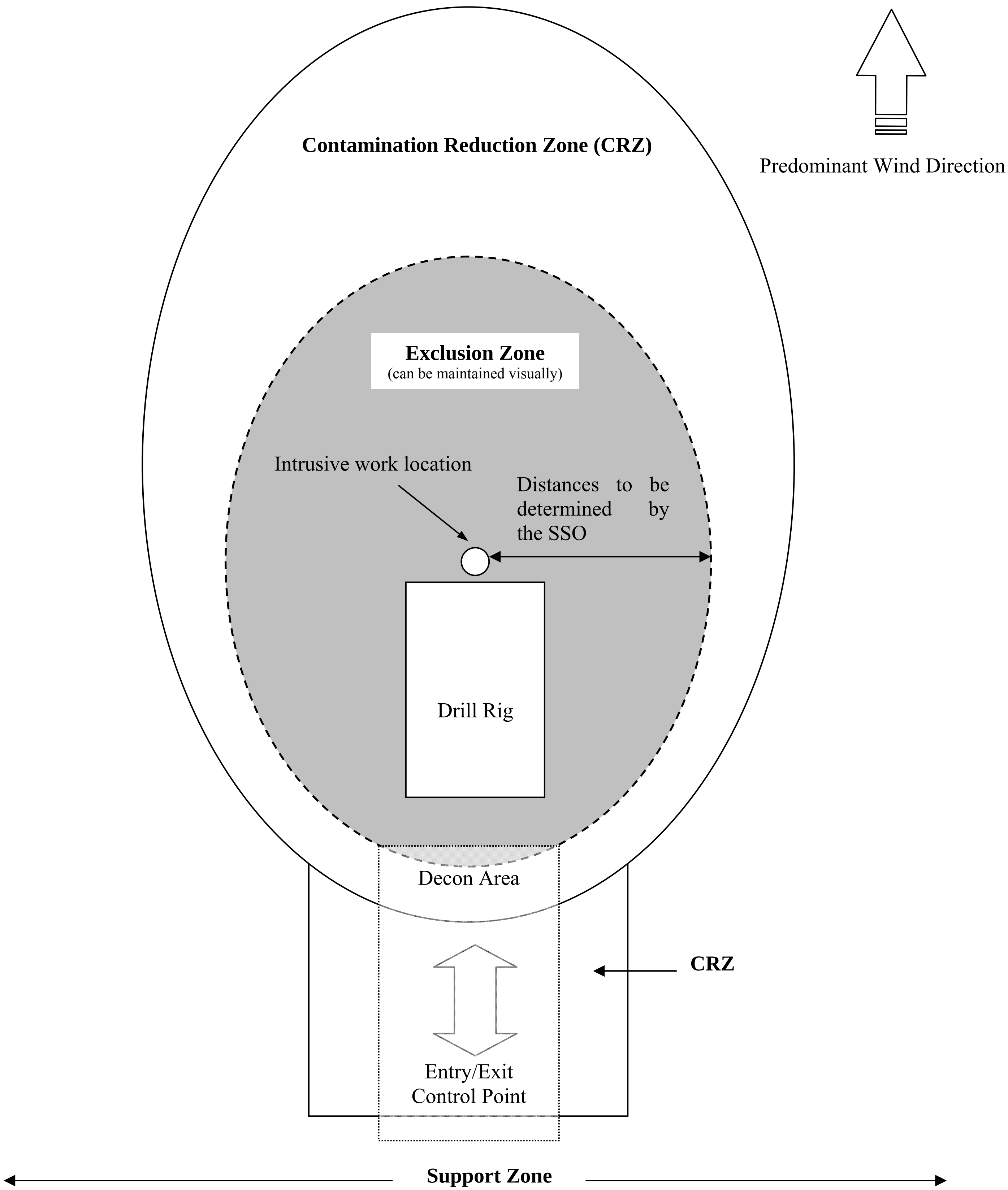
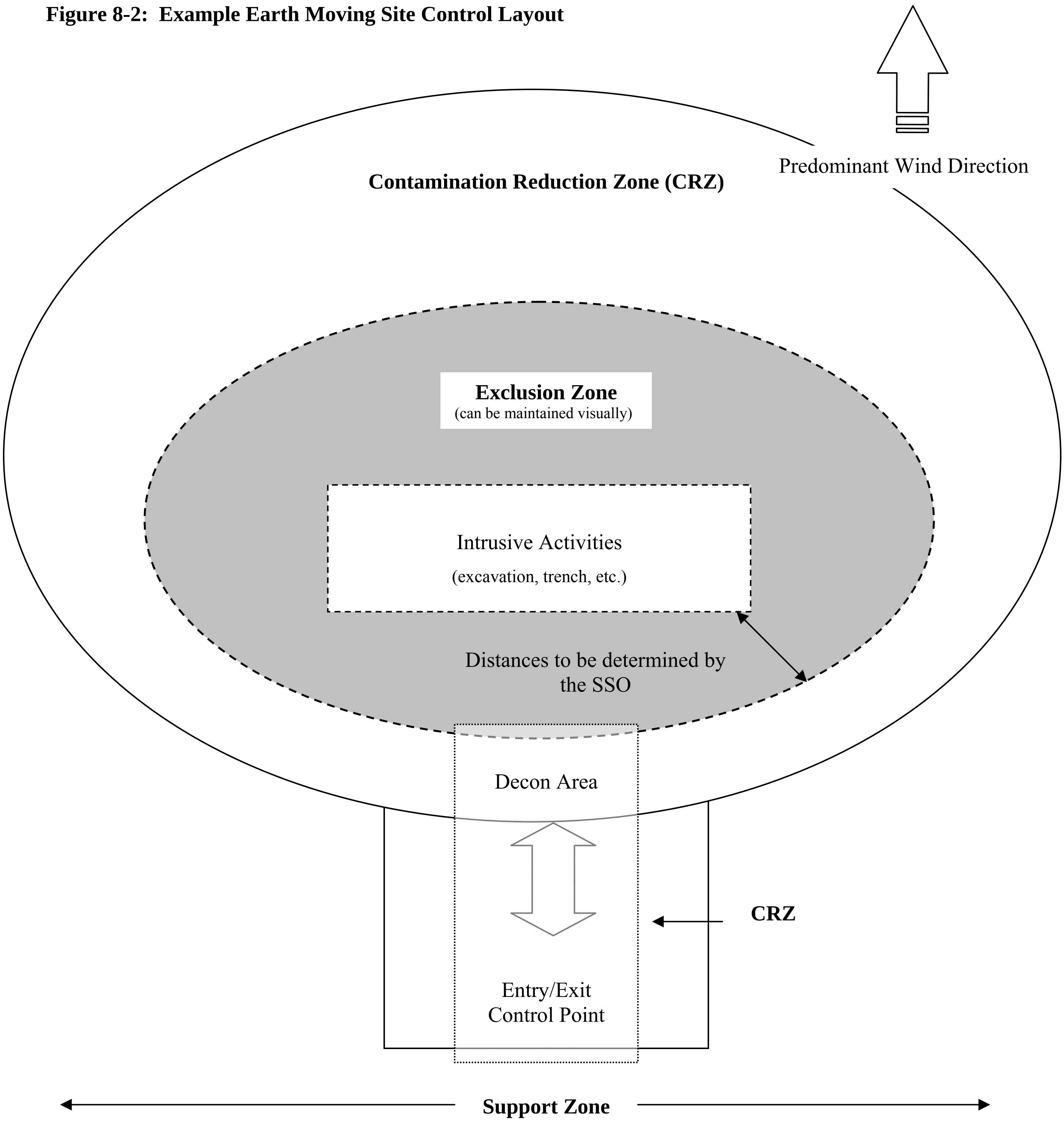


Figure 8-2: Example Earth Moving Site Control Layout



9.0 EMERGENCY RESPONSE PLANNING

9.1 EMERGENCY ACTION PLAN

Although the potential for an emergency to occur is remote, an emergency action plan has been prepared in accordance with SH&E 112, *Emergency Action Planning* for this project should such critical situations arise. The only significant type of onsite emergency that may occur is physical injury or illness to a member of the AECOM team. The Emergency Action Plan (EAP) will be reviewed by all personnel prior to the start of field activities. A test of the EAP will be performed within the first three (3) days of the project field operations. This test will be evaluated and documented in the project records.

Three major categories of emergencies could occur during site operations:

1. Illnesses and physical injuries (including injury-causing chemical exposure)
2. Catastrophic events (fire, explosion, earthquake, or chemical)
3. Safety equipment problems

9.1.1 Emergency Coordinator

The duties of the Emergency Coordinator (EC) include:

- Implement the EAP based on the identified emergency condition
- Notify the appropriate project and SH&E Department personnel of the emergency (Table 9-3)
- Verify emergency evacuation routes and muster points are accessible
- Conduct routine EAP drills and evaluate compliance with the EAP

9.1.2 Site-Specific Emergency Procedures

Prior to the start of site operations, the EC will complete Table 9-1 with any site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures. AECOM personnel are required to participate in any evacuation drills scheduled and conducted at BNSF facilities by BNSF personnel.

Table 9-1: Emergency Planning

Emergency	Evacuation Route	Muster Location
Chemical Spill	• Upwind	• To be determined on site
Fire/Explosion	• US 93 North or South	• To be determined on site
Tornado	• To be determined on site	• To be determined on site
Lightning	• To be determined on site	• Vehicle
Additional Information		
Communication Procedures	Communications with off-site personnel will be by cell phone.	
CPR/First Aid Trained Personnel	Shelly Young and Nancy Gilliland; other on-site personnel may be qualified as well	
Site-Specific Spill Response Procedures	N/A	

9.1.3 Spill Containment Procedure

Work activities may involve the use of hazardous materials (i.e., fuels, solvents) or work involving drums or other containers. Where these activities exist, a site-specific Spill Reporting Card will be developed (Attachment D). Procedures in SH&E 503, *Incident Spill Response* as well as those outlined below will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers
- Tops/lids will be placed back on containers after use.
- Containers of hazardous materials will be stored appropriately away from moving equipment.

At least one spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e., speedy dri) shall be available at each work site (more as needed).

- All hazardous commodities in use (i.e., fuels) shall be properly labeled.
- Containers shall only be lifted using equipment specifically manufactured for that purpose.
- For drums/containers, follow the procedures in SH&E 608, *Handling Drums and Large Containers*, to minimize spillage.

9.1.4 Safety Accident/Incident Reporting

All accidents and incidents that occur on-site during any field activity will be promptly reported to the SSHO and the immediate supervisor in accordance with SH&E 201, *Incident Reporting*. In addition, all work-related injury/illness must be promptly reported to your BNSF Project Representative.

If any AECOM employee is injured and requires medical treatment, the Site Supervisor will contact the **Regional Safety Manager, AECOM's Incident Reporting Line at (800) 348-5046, and the applicable Account Manager immediately**. The Site Supervisor will initiate a written report, using the ***Supervisor's Report of Incident*** form (see SH&E 201). The Site Supervisor will support the PM in the completion of the Supervisor's Report of Incident. The report will then be provided to the Account SH&E Manager before the end of the following shift.

If any employee of a subcontractor is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures; however, copies of all documentation must be provided to the SSHO within 24 hours after the accident has occurred.

All accidents/incidents will be investigated in accordance with SH&E 204, *Incident Investigation and Review*. Copies of all subcontractor accident investigations, whether accomplished in accordance with their own procedures or SH&E 204, will be provided to the SSHO within five (5) days of the accident/incident.

9.1.5 Environmental Spill/Release Reporting

All environmental spills or releases of hazardous materials (e.g., fuels, solvents, etc.), whether in excess of the Reportable Quantity or not, will be reported according to the sequence identified in the *Site-Specific Spill Reporting Card*. In determining whether a spill or release must be reported to a regulatory agency, the Site Supervisor will assess the quantity of the spill or release and evaluate the reporting criteria against the state-specific reporting requirements, your applicable regulatory permit, and/or BNSF-specific reporting procedures.

BNSF-specific spill/release reporting procedures are differentiated on a two-tier hazard rating scale:

1. <u>Low-Level Hazard:</u> Report the spill/release to the BNSF Resource Operations Center at (800) 832-5452 and clean-up as directed by the products MSDS.
2. <u>High Hazard:</u> Report the spill/release to the BNSF Resource Operations Center at (800) 832-5452 and keep the area secured until responders arrive. Be prepared to provide the following information:
    a. Spill/release location
    b. Material and amount of spill/release
    c. Time spill/release discovered
    d. Estimated distance to the nearest public waters

e. Actions taken to contain the spill/release

Notify the BNSF Project Representative as soon as the spill or release situation is stabilized. This applies even in situations where a spill or release did not result out of your work activities.

In order to support the Site Supervisor and expedite the decision to report to a state regulatory agency, a site-specific Spill Reporting Card will be developed (Attachment D). **If reporting to a state or Federal regulatory agency is required, AECOM has 15 minutes from the time that the spill/release is determined to be in excess of the RQ to officially report it; however, do not report to any regulatory agency without the knowledge of and approval from BNSF.**

Chemical-specific Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Reportable Quantities for the known chemicals onsite are shown in Table 9-2.

Table 9-2: CERCLA Reportable Quantities

Hazardous Substance	Regulatory Synonyms	Final RQ (lbs)
Benzene	N/A	10
Toluene	N/A	1,000
Ethyl Benzene	N/A	1,000
Xylene	N/A	100
Mercury	N/A	1
Lead	N/A	10
Arsenic	N/A	1
Chromium	N/A	5,000
Nickel	N/A	100
Cadmium	N/A	10
Selenium	N/A	100
Trichloroethylene	Trichloroethene, TCE	100
Tetrachloroethylene	Perchloroethylene, PCE	100
Carbon Tetrachloride	N/A	10
Methyl Ethyl Ketone	MEK	5,000
1,1,1-Trichloroethane	TCA	1,000

CERCLA RQs can be found at: http://www.epa.gov/superfund/programs/er/triggers/haztrigs/302table01.pdf.

Table 9-3: Emergency Contacts

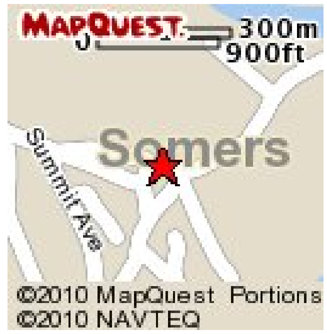
Emergency Coordinators / Key Personnel			
Name	**Title/Workstation**	**Telephone Number**	**Mobile Phone**
Dave Smith	BNSF Representative	(406) 256-4046	(303) 809-8050
Steve Haverl, PE	Account Manager	(303) 804-2359	
Leslie Alexander	Client Service Manager	(970) 493-8878	
Shelly Young	Project Manager	(406) 896-4582	(406) 855-0945
Nancy Gilliland	Site Supervisor/SSO	(406) 671-3176	(406) 671-3176
Angelia Winn	District SH&E Manager	(970) 530-3348	(970) 222-6825
Dan Schillings	Account SH&E Manager	(210) 253-7567	(210) 601-4129
J. Bart Dawson, CIH	Regional Safety Manager	(210) 253-7552 (Office)	(210) 240-3898
		(210) 372-1362 (Home)	
Incident Reporting	**Incident Reporting Line**	**(800) 348-5046**	
Nancy Gilliland	Emergency Coordinator (EC)	(406) 671-3176	(406) 671-3176
Travis Gwin	DOT/IATA Shipping Expert	(303) 804-2312	(303) 694-4410

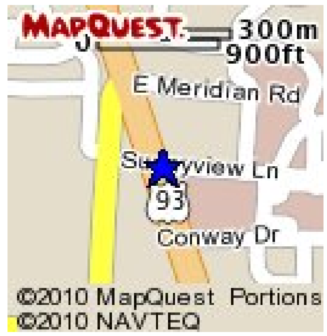
Organization / Agency	
Name	**Telephone Number**
Police Department (local)	911
Fire Department (local)	911
Ambulance Service ***(EMT will determine appropriate hospital for treatment)***	911
Non-Emergency Clinic ***(Use by site personnel is only for non-emergency cases)***	
Tracy Hand and Occupational Therapy	(406) 752-7581
111 Sunnyview Lane, Ste C	
Kalispell, Montana 59901	
Non-Emergency Clinic Route: See Figure 9-1; Emergency Clinic Route: See Figure 9-2	
WorkCare: 24-hr On-Call Occupational Nurse (*minor First Aid assistance only*)	(800) 455-6155
Poison Control Center	(800) 222-1222
Pollution Emergency	(800) 292-4706
National Response Center	(800) 424-8802
INFOTRAC (*AECOM's account number 74984)*	(800) 535-5053
Tier II or SARA Title III Hot Line	(800) 424-9346
BNSF Resource Operations Center	(800) 832-5452
Common Ground Alliance Nationwide *Call Before You Dig*	811

Utility Clearance	
Name	**Telephone Number**
BNSF's Communications Network Control Center	(800) 533-2891

Figure 9-1: Non-Emergency Occupational Medicine Clinic Route/Detail Map

Tracy Hand and Occupational Therapy
111 Sunnyview Lane, Ste C
Kalispell, Montana 59901
(406) 752-7581





Driving Directions	
From: **401 Somers Road Somers, MT 59932**	To: **111 Sunnyview Ln Ste C Kalispell, MT 59901**
Start out going WEST on SOMERS RD toward BATTLE HOLLOW AVE.	0.36 mi
Turn RIGHT onto US-93 N.	10.66 mi
Turn RIGHT onto SUNNYVIEW LN.	53 ft
Estimated driving time: 16 minutes	**11.03 mi**

Figure 9-2: Emergency Care Hospital Route/Detail Map

Kalispell Regional Medical Center
310 Sunnyview Lane
Kalispell, Montana 59901
(406) 752-5111

Driving Directions	
From: **401 Somers Road** **Somers, MT 59932** To: **310 Sunnyview Ln** **Kalispell, MT 59901**	
Start out going WEST on SOMERS RD toward BATTLE HOLLOW AVE.	0.36 mi
Turn RIGHT onto US-93 N.	10.66 mi
Turn RIGHT onto SUNNYVIEW LN.	0.19 mi
Estimated driving time: 17 minutes	**11.21 mi**

10.0 PERSONNEL ACKNOWLEDGEMENT

By signing below, the undersigned acknowledges that he/she has read and reviewed the AECOM Health and Safety Plan for the BNSF Tie Treatment Plant site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein.

PRINT NAME	SIGNATURE	ORGANIZATION	DATE

Attachment A

Task Hazard/Job Safety Analyses

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Hand Auger Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE
LIST ONE STEP OF THE JOB FOR EACH LINE. (*ATTACH ADDITIONAL JOB EVENT SEQUENCE FORM(S) AS NECESSARY*) PAGE 1 OF 2

1. Tailgate Safety Briefing	6. Inspect hand auger
2. Determine sampling area	7. Correct any equipment deficiencies
3. Verify utility clearance for sampling location	8. Position hand auger in front of you/establish footing
4. Assemble sample collection media, tools and supplies	9. Insert hand auger into soil and slowly turn
5. Don appropriate PPE	10. Remove hand auger from ground and set on plastic sheeting

CHEMICAL HAZARDS

☐ Asbestos	☐ Bunker fuel/oil
☐ Acids	☐ Explosives (TNT)
☐ Caustics	☒ Dust
☐ Chlorinated hydrocarbons (TCE)	☐ Dioxins
☐ Lead	☐ Pesticides/Herbicides
☐ Gasoline or diesel fuel	☐ MTBE
☐ BTEX	☐ Methylene chloride
☐ Jet fuel (JP-4, JP-5, JP-8)	☐ Waste oil
☐ PCBs	☐ Hydraulic fluid
☐ Cadmium	☒ Petroleum hydrocarbons
☐ Compressed gases/asphyxiants	
☒ PAHs	
☐ Welding fumes	
☐ Hydrogen sulfide	
☒ Other metals	

PHYSICAL HAZARDS

☐ Electricity/High voltage	☐ Ionizing radiation
☐ Elevated work areas (fall hazard)	☒ Eye hazards (impact, light, etc.)
☒ Non-ionizing radiation (RF/UV/IR)	☒ Slips, trips, and falls
☒ Biological Hazards	☒ Hazardous noise
☒ Hand tool usage	☒ Heat or cold stress
☐ Power tool usage	☐ Oxygen-deficient atmosphere
☐ Heavy equipment operations	☐ Oxygen-enriched atmosphere
☐ Drill rig (HSA, DP, Air Rotary)	☐ Explosive atmosphere
☐ Excavations (engulfment/collapse)	☐ Powder-actuated tools
☐ Confined space entry	☒ Vehicular traffic

Other Chemical/Physical Hazards (*List*): Animals/insects/poisonous plants, lifting / back strain, cuts / contusions / abrasions, biological hazards, Naphthalene's, Creosote (Coal Tar Pitch)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
☐ Rubber (safety-toe)
☒ Leather (safety-toe)

General:
☐ Coveralls Tyvek®______(*type*)
☒ Hearing protection (plugs/muffs)
☐ FF APR _________(*cartridges*)
☐ ½-face APR ______(*cartridges*)
☐ Safety harness & lanyard
☒ ANSI-approved Hard hat

Eye Protection:
☐ Faceshield
☒ Safety glasses or goggles
☐ Welder's helmet/goggles

Gloves:
☒ Chemically-protective
Nitrile gloves for samples (*type*)
☒ Leather/cloth
☐ Welder's
☐ Electrical safety _______(*volts*)

Other (*List* Traffic Safety Vest, sleeved shirts

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

☒ Fire ext. 1A:10B:C:D (*rating*)	☒ Portable eyewash
☒ First-aid kit	☐ Fire watch
☐ Dust control/mitigation	☐ Traffic control measures

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
PPE	PPE-specific
Clearing Equipment	Equipment-Specific

APPLICABLE SOPs (SEE HASP/SSHP/APP)	**TRAINING REQUIREMENTS**
SH&E 102, SH&E 201, SH&E 501, SH&E 502, SH&E 607, SH&E 610, SH&E 617, SH&E 701, SH&E 710, SH&E 716	40-hr HAZWOPER, FA/CPR, HAZCOM, PPE specific, DOT Level I shippers training, BNSF Contractor, On-Track

ACCEPTED SIGNATURES

Site/Field Supervisor:	**SSO/SH&E:**
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

ADMINISTRATIVE INFORMATION

Job/Task Name: Hand Auger Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE (CONT'D)

LIST ONE STEP OF THE JOB FOR EACH LINE.

11. Use hand trowel to collect soil at bottom of hole and record sampling depth
12. Place soil sample(s) collected with the hand trowel into sample media and seal
13. Decontaminate sampling tools and impervious supplies
14. Collect IDW for characterization and disposal determination
15. Prepare samples for shipment to designated laboratory

MONITORING PROCEDURES (AS NEEDED)

Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
VOCs (total by PID)	Breathing Zone, every 30 minutes during sampling activities	< 10 units	Continue work in required PPE and continue monitoring.
		10-25 units (sustained for more than 5 minutes)	Continue work in required PPE, continue monitoring, and use benzene detector tubes
		25-50 units (sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridge).
		> 50 units (sustained for more than 5 minutes)	Cease work, exit, and contact the H&SP and PM.
VOCs (total by PID)	Edge of Exclusion Zones, every 30 minutes during sampling activities	< 10 units	Continue work in required PPE, monitor air, and implement engineering controls.
		> 10 units (sustained for more than 5 minutes)	Continue mitigation measures and contact the DSHM
Hydrocarbons (Total by PID)	Every 30 minutes in the worker's breathing zone or in the immediate work area.	< 5 ppm	Continue Level D or Modified Level D work and continue monitoring.
		>5 ppm – 10 ppm	Periodically monitor with benzene-specific detector tubes. Contact the SSO or SH&E Manager, implement mitigation measures, and continue work in Level D/Modified Level D (unless otherwise indicated by benzene results).
		>10 ppm – 100 ppm	Upgrade to Level C PPE (minimum full-face APR with GMA cartridges or equivalent). Continue environmental monitoring.
		≥ 100 ppm	Cease work, exit the area, contact the SSO or SH&E Manager for guidance.
Benzene (by colorimetric Tube)	Breathing zone, where indicated by VOC readings	No color change	Continue work activities
		Noticeable color change up to 10 ppm	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridges)
		> 10 ppm	Cease work, exit the area, and contact the RHSM and PM

ACCEPTED SIGNATURES

Site/Field Supervisor:	**SSO/SH&E:**
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Hand Auger Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

AECOM
BNSF Tie Treatment Plant, Somers, Montana
Task Hazard Analysis Form

Administrative Information	
Job/Task Name: Direct Push Drilling/Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

Job Event Sequence

List one step of the job for each line. (*Attach additional Job Event Sequence Form(s) as necessary*) Page 1 of 2

1. Daily tailgate safety briefing	6. Position rig over intended drilling/sampling location
2. Don applicable PPE	7. Ensure that all push rods are racked
3. Verify subsurface utility clearances were completed	8. Initiate direct push sampling
4. Inspect direct push rig/complete inspection checklist	9. Remove rods and rack them upon removal
5. Correct any identified deficiencies from inspection	10. Decontaminate rods – pressure washer and lifting safety

Chemical Hazards

- ☐ Asbestos
- ☐ Acids
- ☐ Caustics
- ☐ Chlorinated hydrocarbons (TCE)
- ☐ Lead
- ☐ Gasoline or diesel fuel
- ☐ BTEX
- ☐ Jet fuel (JP-4, JP-5, JP-8)
- ☐ PCBs
- ☐ Cadmium
- ☐ Compressed gases/asphyxiants
- ☒ PAHs
- ☐ Welding fumes
- ☐ Hydrogen sulfide
- ☒ Other metals
- ☐ Bunker fuel/oil
- ☐ Explosives (TNT)
- ☒ Dust
- ☐ Dioxins
- ☐ Pesticides/Herbicides
- ☐ MTBE
- ☐ Methylene chloride
- ☐ Waste oil
- ☐ Hydraulic fluid
- ☒ Petroleum hydrocarbons

Physical Hazards

- ☐ Electricity/High voltage
- ☒ Elevated work areas (fall hazard)
- ☒ Manual materials handling/Back
- ☒ Biological Hazards
- ☒ Hand tool usage
- ☐ Power tool usage
- ☐ Heavy equipment operations
- ☒ Drill rig (HSA, DP, Air Rotary)
- ☐ Excavations (engulfment/collapse)
- ☐ Confined space entry
- ☐ Ionizing radiation
- ☒ Eye hazards (impact, light, etc.)
- ☒ Slips, trips, and falls
- ☒ Hazardous noise
- ☒ Heat or cold stress
- ☐ Oxygen-deficient atmosphere
- ☐ Oxygen-enriched atmosphere
- ☐ Explosive atmosphere
- ☐ Powder-actuated tools
- ☒ Vehicular traffic

Other Chemical/Physical Hazards (*List*): Manual lifting, crush/pinch, cuts/abrasions, lifting / back strain, cuts / contusions / abrasions, Naphthalene's, Creosote (Coal Tar Pitch), pressure washer operation

Personal Protective Equipment (PPE) Required

Boots:
- ☐ Rubber (safety-toe)
- ☒ Leather (safety-toe)

General:
- ☐ Coveralls ____________(*type*)
- ☒ Hearing protection (plugs/muffs)
- ☐ FF APR _________(*cartridges*)
- ☐ ½-face APR ______(*cartridges*)
- ☐ Safety harness & lanyard
- ☒ ANSI-approved Hard hat

Eye Protection:
- ☐ Faceshield
- ☒ Safety glasses or goggles
- ☐ Welder's helmet/goggles

Gloves:
- ☒ Chemically-protective
  Nitrile gloves for samples (*type*)
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _______(*volts*)

Other (*List*): Reflective traffic safety vest, sleeved shirts

Other Safety Equipment/Considerations

- ☒ Fire ext. 1A:10B:C (*rating*)
- ☒ First-aid kit
- ☐ Dust control/mitigation
- ☒ Portable eyewash
- ☐ Fire watch
- ☒ Traffic control measures

Other (*List*): Traffic control measures req'd if working in/adjacent to traffic

Inspect/Permit Requirements	Equipment to be Used
PPE	PPE-specific
Hand tools prior to use	Tool specific
Direct push rig prior to use	Direct push rig

Applicable SOPs (See HASP/SSHP/APP)

SH&E 102, SH&E 201, SH&E 501/502, SH&E 509, SH&E 607, SH&E 610, SH&E 617, SH&E 701, SH&E 710, SH&E 716

Training Requirements

40-hr HAZWOPER, 8-hr Supervisor, First Aid, CPR, PPE-specific, drill rig operator, DOT Level I Shipper or Haz Mat Shipper, BNSF Contractor, On-Track

Accepted Signatures

Site/Field Supervisor:	SSO/SH&E:
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM (CONT'D)

ADMINISTRATIVE INFORMATION	
Job/Task Name: Direct Push Drilling/Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE (CONT'D)

LIST ONE STEP OF THE JOB FOR EACH LINE. PAGE 2 OF 2

11. Collect rinsate
12. Wipe off rods and dispose of non-IDW trash
13. Daily housekeeping around the site
14.

MONITORING PROCEDURES (AS NEEDED)

Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
VOCs (total by PID)	Breathing Zone, every 30 minutes during sampling activities	< 10 units	Continue work in required PPE and continue monitoring.
		10-25 units (sustained for more than 5 minutes)	Continue work in required PPE, continue monitoring, and use benzene detector tubes
		25-50 units (sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridge).
		> 50 units (sustained for more than 5 minutes)	Cease work, exit, and contact the H&SP and PM.
VOCs (total by PID)	Edge of Exclusion Zones, every 30 minutes during sampling activities	< 10 units	Continue work in required PPE, monitor air, and implement engineering controls.
		> 10 units (sustained for more than 5 minutes)	Continue mitigation measures and contact the DSHM
Hydrocarbons (Total by PID)	Every 30 minutes in the worker's breathing zone or in the immediate work area.	< 5 ppm	Continue Level D or Modified Level D work and continue monitoring.
		>5 ppm – 10 ppm	Periodically monitor with benzene-specific detector tubes. Contact the SSO or SH&E Manager, implement mitigation measures, and continue work in Level D/Modified Level D (unless otherwise indicated by benzene results).
		>10 ppm – 100 ppm	Upgrade to Level C PPE (minimum full-face APR with GMA cartridges or equivalent). Continue environmental monitoring.
		≥ 100 ppm	Cease work, exit the area, contact the SSO or SH&E Manager for guidance.
Benzene (by colorimetric Tube)	Breathing zone, where indicated by VOC readings	No color change	Continue work activities
		Noticeable color change up to 10 ppm	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridges)
		> 10 ppm	Cease work, exit the area, and contact the DHSM and PM

ACCEPTED SIGNATURES

Site/Field Supervisor:	SSO/SH&E:
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Direct Push Drilling/Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

AECOM
BNSF Tie Treatment Plant, Somers, Montana
Task Hazard Analysis Form

Administrative Information	
Job/Task Name: Ground Water Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

Job Event Sequence
List one step of the job for each line. (*Attach additional Job Event Sequence Form(s) as necessary*) Page 1 of 2

1. Tailgate safety briefing	6. Install temporary pump or peristaltic pump tubing
2. Inspect PPE/don PPE	7. Purge required volume of groundwater
3. Prepare sample containers	8. Containerize purge water in 5 gallon bucket
4. Drive to well site	9. Collect groundwater samples
5. Open well head and allow to ventilate for 15 minutes	10. Place samples in iced cooler for transportation to lab

Chemical Hazards		Physical Hazards	
☐ Asbestos	☐ Bunker fuel/oil	☐ Electricity/High voltage	☐ Ionizing radiation
☒ Acids	☐ Explosives (TNT)	☐ Elevated work areas (fall hazard)	☒ Eye hazards (impact, light, etc.)
☐ Caustics	☐ Dust	☒ Non-ionizing Radiation (RF/UV/IR)	☒ Slips, trips, and falls
☐ Chlorinated hydrocarbons (TCE)	☐ Dioxins	☒ Biological Hazards	☒ Hazardous noise
☐ Lead	☐ Pesticides/Herbicides	☒ Hand tool usage	☒ Heat or cold stress
☐ Gasoline or diesel fuel	☐ MTBE	☐ Power tool usage	☐ Oxygen-deficient atmosphere
☒ BTEX	☐ Methylene chloride	☐ Heavy equipment operations	☐ Oxygen-enriched atmosphere
☐ Jet fuel (JP-4, JP-5, JP-8)	☐ Waste oil	☐ Drill rig (HSA, DP, Air Rotary)	☐ Explosive atmosphere
☐ PCBs	☐ Hydraulic fluid	☐ Excavations (engulfment/collapse)	☐ Powder-actuated tools
☐ Cadmium	☒ Petroleum hydrocarbons	☐ Confined space entry	☐ Vehicular traffic
☐ Compressed gases/asphyxiants			
☐ PAHs			
☐ Welding fumes			
☐ Hydrogen sulfide			
☐ Other metals			

Other Chemical/Physical Hazards (*List*): Solvents/Manual lifting, crush/pinch, cuts/abrasions, lifting/back strain Vinyl Chlorides, Naphthalene's, Creosote (Coal Tar Pitch), Aliphatic Halogens

Personal Protective Equipment (PPE) Required

Boots:
☐ Rubber (safety-toe)
☒ Leather (safety-toe)

General:
☐ Coveralls ____________ (*type*)
☒ Hearing protection (plugs/muffs)
☐ FF APR _________ (*cartridges*)
☐ ½-face APR ______ (*cartridges*)
☐ Safety harness & lanyard
☒ ANSI-approved Hard hat

Eye Protection:
☐ Faceshield
☒ Safety glasses or goggles
☐ Welder's helmet/goggles

Gloves:
☒ Chemically-protective
N-Dex nitrile rubber (*type*)
☐ Leather/cloth
☐ Welder's
☐ Electrical safety _______ (*volts*)

Other (*List*): ANSI Type II reflective traffic safety vest

Other Safety Equipment/Considerations

☒ Fire ext. 1A:10B:C (*rating*)
☒ First-aid kit
☐ Dust control/mitigation
☒ Portable eyewash
☐ Fire watch
☒ Traffic control measures

Other (*List*): SPF 30+

Inspect/Permit Requirements	Equipment to be Used
Prior to use	PPE-specific, tools
Daily calibration of monitors	CGI and PID

Applicable SOPs (See HASP/SSHP/APP)	Training Requirements
SH&E 113, SH&E 114, SH&E 115, SH&E 201, SH&E 509, SH&E 607, SH&E 610. SH&E 710, SH&E 716	40-hr HAZWOPER, 8-hr Supervisor, FA/CPR, PPE-specific, tool-Specific, BNSF Contractor, On-Track

Accepted Signatures

Site/Field Supervisor:	SSO/SH&E:
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM (CONT'D)

ADMINISTRATIVE INFORMATION	
Job/Task Name: Ground Water Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE (CONT'D)

LIST ONE STEP OF THE JOB FOR EACH LINE. **PAGE 2 OF 2**

11. Complete documentation
12. Remove temporary pump installation or tubing
13. Decontaminate temporary pump
14. Place lid securely on 5 gallon bucket of purge water
15. Inspect 55-gallon drums for structural integrity prior to transferring purge water
16. Transport purge water to 55-gallon purge water drum residing atop a pallet
17. Site housekeeping
18. Move to next sample location, repeat steps 3-18
19. End of the day housekeeping

MONITORING PROCEDURES (AS NEEDED)

Parameter	Zone Location and Monitoring Interval	Response Level (Above Background)	Response Activity
VOCs (total by PID)	Breathing Zone, every 30 minutes during sampling activities	< 10 units	Continue work in required PPE and continue monitoring.
		10-25 units (sustained for more than 5 minutes)	Continue work in required PPE, continue monitoring, and use VC detector tubes
		25-50 units (sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridge).
		> 50 units (sustained for more than 5 minutes)	Cease work, exit, and contact the H&SP and PM.

ACCEPTED SIGNATURES

Site/Field Supervisor:	SSO/SH&E:
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Ground Water Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Hollow-stem Auger Drilling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE
LIST ONE STEP OF THE JOB FOR EACH LINE. (*ATTACH ADDITIONAL JOB EVENT SEQUENCE FORM(S) AS NECESSARY*) PAGE 1 OF 2

1. Tailgate Safety Briefing	6. Inspect PPE
2. Verify locations/anomalies to be drilled	7. Don appropriate PPE
3. Verify subsurface utility clearances and overhead utilities	8. Commence drilling operations
4. Complete drill rig safety inspection checklist	9. Conduct air monitoring using established procedures
5. Correct any deficiencies identified during inspection	10. Collect soil samples and log results

CHEMICAL HAZARDS		**PHYSICAL HAZARDS**	
☐ Asbestos	☐ Bunker fuel/oil	☐ Electricity/High voltage	☒ Ionizing radiation
☐ Acids	☐ Explosives (TNT)	☒ Elevated work areas (fall hazard)	☒ Eye hazards (impact, light, etc.)
☐ Caustics	☒ Dust	☒ Manual materials handling/Back	☒ Slips, trips, and falls
☐ Chlorinated hydrocarbons (TCE)	☐ Dioxins	☒ Biological	☒ Hazardous noise
☐ Lead	☐ Pesticides/Herbicides	☒ Hand tool usage	☒ Heat or cold stress
☐ Gasoline or diesel fuel	☐ MTBE	☒ Power tool usage	☐ Oxygen-deficient atmosphere
☐ BTEX	☐ Methylene chloride	☐ Heavy equipment operations	☐ Oxygen-enriched atmosphere
☐ Jet fuel (JP-4, JP-5, JP-8)	☐ Waste oil	☒ Drill rig (HSA, DP, Air Rotary)	☐ Explosive atmosphere
☐ PCBs	☐ Hydraulic fluid	☐ Excavations (engulfment/collapse)	☐ Powder-actuated tools
☐ Cadmium	☒ Petroleum hydrocarbons	☐ Confined space entry	☒ Vehicular traffic
☐ Compressed gases/asphyxiants			
☒ PAHs			
☐ Welding fumes			
☐ Hydrogen sulfide			
☒ Other metals			

Other Chemical/Physical Hazards (*List*): Manual lifting, crush/pinch, cuts/abrasions, lifting / back strain, cuts / contusions / abrasions, Naphthalene's, Creosote (Coal Tar Pitch)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED		**OTHER SAFETY EQUIPMENT/CONSIDERATIONS**	
Boots:	**Eye Protection:**	☒ Fire ext. 1A:10B:C (*rating*)	☒ Portable eyewash
☐ Rubber (safety-toe)	☐ Faceshield	☒ First-aid kit	☐ Fire watch
☒ Leather (safety-toe)	☒ Safety glasses or goggles	☐ Dust control/mitigation	☒ Traffic control measures
	☐ Welder's helmet/goggles		
General:		**Other (*List*):**	
☐ Coveralls ____(*type*)	**Gloves:**		
☒ Hearing protection (plugs/muffs)	☒ Chemically-protective		
☐ FF APR ____(*cartridges*)	Nitrile for samples ____(*type*)	**INSPECT/PERMIT REQUIREMENTS**	**EQUIPMENT TO BE USED**
☐ ½-face APR ____(*cartridges*)	☒ Leather/cloth	PPE	PPE-specific
☐ Safety harness & lanyard	☐ Welder's	Hand tools prior to use	Tool specific
☒ ANSI-approved Hard hat	☐ Electrical safety ____(*volts*)	Hollow stem rig prior to use	Hollow stem rig

Other (*List*): Reflective safety vest, sleeved shirts

APPLICABLE SOPS (SEE HASP/SSHP/APP)	**TRAINING REQUIREMENTS**
SH&E 102, SH&E 201, SH&E 501/502, SH&E 509, SH&E 607, SH&E 610, SH&E 617, SH&E 701, SH&E 710, SH&E 716	40-hr HAZWOPER, 8-hr Supervisor, First Aid/CPR, PPE-specific, drill rig operator, DOT Level I shipper, BNSF Contractor, On-Track

ACCEPTED SIGNATURES	
Site/Field Supervisor:	**SSO/SH&E:**
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

ADMINISTRATIVE INFORMATION	
Job/Task Name: Hollow-stem Auger Drilling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE (CONT'D)

LIST ONE STEP OF THE JOB FOR EACH LINE. PAGE 2 OF 2

11. General housekeeping, IDW management, and move to he next location
12. Repeat steps 2-11
13.
14.

MONITORING PROCEDURES (AS NEEDED)

Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
VOCs (total by PID)	Breathing Zone, every 30 minutes during sampling activities	< 10 units	Continue work in required PPE and continue monitoring.
		10-25 units (sustained for more than 5 minutes)	Continue work in required PPE, continue monitoring, and use benzene detector tubes
		25-50 units (sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridge).
		> 50 units (sustained for more than 5 minutes)	Cease work, exit, and contact the H&SP and PM.
VOCs (total by PID)	Edge of Exclusion Zones, every 30 minutes during sampling activities	< 10 units	Continue work in required PPE, monitor air, and implement engineering controls.
		> 10 units (sustained for more than 5 minutes)	Continue mitigation measures and contact the DSHM
Hydrocarbons (Total by PID)	Every 30 minutes in the worker's breathing zone or in the immediate work area.	< 5 ppm	Continue Level D or Modified Level D work and continue monitoring.
		>5 ppm – 10 ppm	Periodically monitor with benzene-specific detector tubes. Contact the SSO or SH&E Manager, implement mitigation measures, and continue work in Level D/Modified Level D (unless otherwise indicated by benzene results).
		>10 ppm – 100 ppm	Upgrade to Level C PPE (minimum full-face APR with GMA cartridges or equivalent). Continue environmental monitoring.
		≥ 100 ppm	Cease work, exit the area, contact the SSO or SH&E Manager for guidance.
Benzene (by colorimetric Tube)	Breathing zone, where indicated by VOC readings	No color change	Continue work activities
		Noticeable color change up to 10 ppm	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridges)
		> 10 ppm	Cease work, exit the area, and contact the RHSM and PM

ACCEPTED SIGNATURES

Site/Field Supervisor:	SSO/SH&E:
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Hollow-stem Auger Drilling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Mobilization and Demobilization	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE
LIST ONE STEP OF THE JOB FOR EACH LINE. (*ATTACH ADDITIONAL JOB EVENT SEQUENCE FORM(S) AS NECESSARY*) PAGE 1 OF 2

1. Tailgate Safety Briefing	6. Ensure all project supplies are suitable for transportation.
2. Brief and follow local safety criteria for the site visiting	7. Ensure that equipment, materials, chemicals, etc. have been secured for transportation
3. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.	8. DO NOT overload trucks, trailers, etc. If more room is needed, or loads are to large, obtain additional transportation.
4. Use spotters when loading/unloading heavy equipment, forklifts, etc. Stand clear of these operations.	9. Inspect Equipment / complete equip. inspection forms
5. Wear seatbelt when operating vehicle.	10. Correct any deficiency

CHEMICAL HAZARDS		PHYSICAL HAZARDS	
☐ Asbestos	☐ Bunker fuel/oil	☐ Electricity/High voltage	☐ Ionizing radiation
☐ Acids	☐ Explosives (TNT)	☐ Elevated work areas (fall hazard)	☒ Eye hazards (impact, light, etc.)
☐ Caustics	☒ Dust	☒ Non-ionizing radiation (RF/UV/IR)	☒ Slips, trips, and falls
☐ Chlorinated hydrocarbons (TCE)	☐ Dioxins	☒ Biological Hazards	☒ Hazardous noise
☐ Lead	☐ Pesticides/Herbicides	☒ Hand tool usage	☒ Heat or cold stress
☐ Gasoline or diesel fuel	☐ MTBE	☐ Power tool usage	☐ Oxygen-deficient atmosphere
☐ BTEX	☐ Methylene chloride	☐ Heavy equipment operations	☐ Oxygen-enriched atmosphere
☐ Jet fuel (JP-4, JP-5, JP-8)	☐ Waste oil	☒ Drill rig (HSA, DP, Air Rotary)	☐ Explosive atmosphere
☐ PCBs	☐ Hydraulic fluid	☐ Excavations (engulfment/collapse)	☐ Powder-actuated tools
☐ Cadmium	☒ Petroleum hydrocarbons	☐ Confined space entry	☒ Vehicular traffic
☐ Compressed gases/asphyxiants	**Other Chemical/Physical Hazards (*List*):** Animals/insects/poisonous plants, lifting / back strain, cuts / contusions / abrasions, protruding sharp objects		
☒ PAHs			
☐ Welding fumes			
☐ Hydrogen sulfide			
☒ Other metals			

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED		OTHER SAFETY EQUIPMENT/CONSIDERATIONS	
Boots:	**Eye Protection:**	☒ Fire ext. 1A:10B:C:D (*rating*)	☒ Portable eyewash
☐ Rubber (safety-toe)	☐ Faceshield	☒ First-aid kit	☐ Fire watch
☒ Leather (safety-toe)	☒ Safety glasses or goggles	☐ Dust control/mitigation	☐ Traffic control measures
General:	☐ Welder's helmet/goggles	**Other (*List*):**	
☐ Coveralls Tyvek® ______(*type*)	**Gloves:**		
☐ Hearing protection (plugs/muffs)	☐ Chemically-protective		
☐ FF APR ________(*cartridges*)	See below ____________(*type*)	**INSPECT/PERMIT REQUIREMENTS**	**EQUIPMENT TO BE USED**
☐ ½-face APR ______(*cartridges*)	☒ Leather/cloth	PPE	PPE-specific
☐ Safety harness & lanyard	☐ Welder's		
☒ ANSI-approved Hard hat	☐ Electrical safety _______(*volts*)		
Other (*List*) Reflective traffic safety vest where required			

APPLICABLE SOPs (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
SH&E 103, SH&E 113, SH&E 115, SH&E 201, SH&E 307 , SH&E 404, SH&E 506, SH&E 508, SH&E 610	BNSF Contractor, On-Track

ACCEPTED SIGNATURES	
Site/Field Supervisor: Nancy Gilliland	**SSO/SH&E:** Angelia Winn, DHSM Daniel Schillings for

ADMINISTRATIVE INFORMATION	
Job/Task Name: Mobilization and Demobilization	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE (CONT'D)

LIST ONE STEP OF THE JOB FOR EACH LINE.

11. Perform any additional safety briefings:
12. a.) Biological and/or Physical Hazards
13. b.) Maximum speed of 15 mph on dirt/gravel roads unless posted differently
14. Appropriate equipment for site, calibrated and field checked
15. Appropriate supplies for equipment
16. Follow buddy system and allow for good communications

MONITORING PROCEDURES

No monitoring required

ACCEPTED SIGNATURES

Site/Field Supervisor:	SSO/SH&E:
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Mobilization and Demobilization	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Soil Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE
LIST ONE STEP OF THE JOB FOR EACH LINE. (*ATTACH ADDITIONAL JOB EVENT SEQUENCE FORM(S) AS NECESSARY*) PAGE 1 OF 3

1. Tailgate Safety Briefing	5. Don appropriate PPE (after visual inspection)
2. Determine sampling locations to characterize soils	6. Collect soil samples, log sampling collection points and field measurements
3. Ensure sample collection media, tools and supplies are readily available	7. Decontaminate sampling tools and impervious supplies
4. Determine sampling locations to characterize soils	8. Disposable task related waste, i.e., rinsate, Tyvek® suit, leather gloves, etc.

CHEMICAL HAZARDS		PHYSICAL HAZARDS	
☐ Asbestos	☐ Bunker fuel/oil	☐ Electricity/High voltage	☐ Ionizing radiation
☐ Acids	☐ Explosives (TNT)	☐ Elevated work areas (fall hazard)	☒ Eye hazards (impact, light, etc.)
☐ Caustics	☒ Dust	☒ Non-ionizing radiation (RF/UV/IR)	☒ Slips, trips, and falls
☐ Chlorinated hydrocarbons (TCE)	☐ Dioxins	☒ Biological Hazards	☒ Hazardous noise
☐ Lead	☐ Pesticides/Herbicides	☒ Hand tool usage	☒ Heat or cold stress
☐ Gasoline or diesel fuel	☐ MTBE	☒ Power tool usage	☐ Oxygen-deficient atmosphere
☐ BTEX	☐ Methylene chloride	☐ Heavy equipment operations	☐ Oxygen-enriched atmosphere
☐ Jet fuel (JP-4, JP-5, JP-8)	☐ Waste oil	☒ Drill rig (HSA, DP, Air Rotary)	☐ Explosive atmosphere
☐ PCBs	☐ Hydraulic fluid	☐ Excavations (engulfment/collapse)	☐ Powder-actuated tools
☐ Cadmium	☒ Petroleum hydrocarbons	☐ Confined space entry	☒ Vehicular traffic
☐ Compressed gases/asphyxiants			
☒ PAHs			
☐ Welding fumes			
☐ Hydrogen sulfide			
☒ Other metals			

Other Chemical/Physical Hazards (*List*): Animals/insects/poisonous plants, lifting / back strain, cuts / contusions / abrasions, Naphthalene's, Creosote (Coal Tar Pitch)

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED

Boots:
☐ Rubber (safety-toe)
☒ Leather (safety-toe)

General:
☐ Coveralls ____________(*type*)
☒ Hearing protection (plugs/muffs)
☐ FF APR ________(*cartridges*)
☐ ½-face APR ______(*cartridges*)
☐ Safety harness & lanyard
☒ ANSI-approved Hard hat

Eye Protection:
☐ Faceshield
☒ Safety glasses or goggles
☐ Welder's helmet/goggles

Gloves:
☒ Chemically-protective
Nitrile gloves for samples (*type*)
☒ Leather/cloth
☐ Welder's
☐ Electrical safety _______(*volts*)

Other (*List*): Sleeved shirts

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

☒ Fire ext. 1A:10B:C (*rating*)
☒ First-aid kit
☐ Dust control/mitigation
☒ Portable eyewash
☐ Fire watch
☒ Traffic control measures

Other (*List*):

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
PPE	PPE-specific
Hand tools prior to use	Tool- specific

APPLICABLE SOPS (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
SH&E 103, SH&E 107, SH&E 115, SH&E 307, SH&E 509, SH7E 607, SH&E 610, SH&E 615, SH&E 701, SH&E 726	40-hr HAZWOPER, FA/CPR, HAZCOM, lead awareness, PPE-specific, DOT Level I shipper, BNSF Contractor, On-Track

ACCEPTED SIGNATURES

Site/Field Supervisor:	SSO/SH&E:
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

ADMINISTRATIVE INFORMATION	
Job/Task Name: Soil Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE (CONT'D)

LIST ONE STEP OF THE JOB FOR EACH LINE. PAGE 2 OF 3

9. Prepare samples for shipping to designated laboratory
10.
11.
12.
13.

MONITORING PROCEDURES (AS NEEDED)

Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
VOCs (total by PID)	Breathing Zone, every 30 minutes during sampling activities	< 10 units	Continue work in required PPE and continue monitoring.
		10-25 units (sustained for more than 5 minutes)	Continue work in required PPE, continue monitoring, and use benzene detector tubes
		25-50 units (sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridge).
		> 50 units (sustained for more than 5 minutes)	Cease work, exit, and contact the H&SP and PM.
VOCs (total by PID)	Edge of Exclusion Zones, every 30 minutes during sampling activities	< 10 units	Continue work in required PPE, monitor air, and implement engineering controls.
		> 10 units (sustained for more than 5 minutes)	Continue mitigation measures and contact the DSHM
Hydrocarbons (Total by PID)	Every 30 minutes in the worker's breathing zone or in the immediate work area.	< 5 ppm	Continue Level D or Modified Level D work and continue monitoring.
		>5 ppm – 10 ppm	Periodically monitor with benzene-specific detector tubes. Contact the SSO or SH&E Manager, implement mitigation measures, and continue work in Level D/Modified Level D (unless otherwise indicated by benzene results).
		>10 ppm – 100 ppm	Upgrade to Level C PPE (minimum full-face APR with GMA cartridges or equivalent). Continue environmental monitoring.
		≥ 100 ppm	Cease work, exit the area, contact the SSO or SH&E Manager for guidance.
Benzene (by colorimetric Tube)	Breathing zone, where indicated by VOC readings	No color change	Continue work activities
		Noticeable color change up to 10 ppm	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridges)
		> 10 ppm	Cease work, exit the area, and contact the RHSM and PM

ACCEPTED SIGNATURES

Site/Field Supervisor:	SSO/SH&E:
Nancy Gilliland	Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Soil Sampling	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Utility Clearances	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE LIST ONE STEP OF THE JOB FOR EACH LINE. (*ATTACH ADDITIONAL JOB EVENT SEQUENCE FORM(S) AS NECESSARY*) PAGE 1 OF 1	
1. Tailgate Safety Briefing	6. Prior to digging probe area at least 3' down (if required)
2. Verify with Montana One-Call System & property owners	7. Probing area is to verify utility checks were correct.
3. Complete paper verification and mark areas	8.
4. Don applicable PPE	9.
5. Preview your walking path for hazards	10.

CHEMICAL HAZARDS		PHYSICAL HAZARDS	
☐ Asbestos	☐ Bunker fuel/oil	☒ Electricity/High voltage	☐ Ionizing radiation
☐ Acids	☐ Explosives (TNT)	☐ Elevated work areas (fall hazard)	☒ Eye hazards (impact, light, etc.)
☐ Caustics	☐ Dust	☒ Non-ionizing radiation (RF/UV/IR)	☒ Slips, trips, and falls
☐ Chlorinated hydrocarbons (TCE)	☐ Dioxins	☒ Biological Hazards	☒ Hazardous noise
☐ Lead	☐ Pesticides/Herbicides	☒ Hand tool usage	☒ Heat or cold stress
☐ Gasoline or diesel fuel	☐ MTBE	☐ Power tool usage	☐ Oxygen-deficient atmosphere
☐ BTEX	☐ Methylene chloride	☐ Heavy equipment operations	☐ Oxygen-enriched atmosphere
☐ Jet fuel (JP-4, JP-5, JP-8)	☐ Waste oil	☐ Drill rig (HSA, DP, Air Rotary)	☐ Explosive atmosphere
☐ PCBs	☐ Hydraulic fluid	☐ Excavations (engulfment/collapse)	☐ Powder-actuated tools
☐ Cadmium	☒ Petroleum hydrocarbons	☐ Confined space entry	☒ Vehicular traffic
☐ Compressed gases/asphyxiants	**Other Chemical/Physical Hazards (*List*): Animals/insects/poisonous plants, lifting/back strain**		
☒ PAHs			
☐ Welding fumes			
☐ Hydrogen sulfide			
☒ Other metals			

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED		OTHER SAFETY EQUIPMENT/CONSIDERATIONS	
Boots:	**Eye Protection:**	☒ Fire ext. 1A:10B:C (*rating*)	☒ Portable eyewash
☐ Rubber (safety-toe)	☐ Faceshield	☒ First-aid kit	☐ Fire watch
☒ Leather (safety-toe)	☒ Safety glasses or goggles	☐ Dust control/mitigation	☐ Traffic control measures
General:	☐ Welder's helmet/goggles		
☐ Coveralls ______ (*type*)	**Gloves:**	**Other (*List*): SPF 15, Heat Stress**	
☐ Hearing protection (plugs/muffs)	☐ Chemically-protective ______ (*type*)	**INSPECT/PERMIT REQUIREMENTS**	**EQUIPMENT TO BE USED**
☐ FF APR ______ (*cartridges*)	☒ Leather/cloth	Paper work signatures prior to work.	None
☐ ½-face APR ______ (*cartridges*)	☐ Welder's		
☐ Safety harness & lanyard	☐ Electrical safety ______ (*volts*)		
☒ ANSI-approved Hard hat			
Other (*List*): Reflective traffic safety vest			

APPLICABLE SOPs (SEE HASP/SSHP/APP)	TRAINING REQUIREMENTS
SH&E 103, SH&E 114, SH&E 601, SH&E 610, SH&E 616, SH&E 617, SH&E 710, SH&E 712, SH&E 726	40-hr HAZWOPER, 8-hr HAZWOPER Supervisor (onsite), FA/CPR, BNSF Contractor, On-Track

ACCEPTED SIGNATURES	
Site/Field Supervisor: Nancy Gilliland	**SSO/SH&E:** Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM (CONT'D)

ADMINISTRATIVE INFORMATION	
Job/Task Name: Utility Clearances	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

JOB EVENT SEQUENCE (CONT'D) LIST ONE STEP OF THE JOB FOR EACH LINE. PAGE ____ OF ____
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.

MONITORING PROCEDURES
No monitoring required.

ACCEPTED SIGNATURES	
Site/Field Supervisor: Nancy Gilliland	**SSO/SH&E:** Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Utility Clearances	
Project Name: BNSF Tie Treatment Plant	Project Location: Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: May 2010 thru May 2011	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Nancy Gilliland

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

Attachment B

Material Safety Data Sheets

TRSm

TRENTON CREOSOTE OIL

A Wood Preservative for the Preservation of Unpainted Lumber Against Decay, Rot and Wood Borers.

Material Safety Data Sheet

For sale to and use only by certified applicators or by persons under their direct supervision and only for those uses covered by the certified applicator's certification.

A. GENERAL INFORMATION

TRADE NAME (COMMON NAME): Creosote	[X] C.A.S. No. 8001-58-9
CHEMICAL NAME AND/OR SYNONYM: 2, 3 and 4 ringed polynuclear aromatic hydrocarbons including some substituted compounds.	
FORMULA: Mixture of organic compounds.	MOLECULAR WEIGHT: 130 - 210

ADDRESS (No., STREET, CITY, STATE AND ZIP CODE)

2646 South Loop West 713/666-1130
Suite 445 TELEX: 272074
Houston, Texas 77054 FAX: 713/668-4289

CONTACT	PHONE NUMBER	LAST ISSUE DATE	CURRENT ISSUE DATE
Manager, Houston Office	713-666-1130	October, 1990	April, 1991

B. FIRST AID MEASURES

EMERGENCY PHONE NUMBER: 1-800-424-9300

INHALATION: Remove to fresh air. If not breathing, give artificial respiration; preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT: Wash thoroughly with soap and water. Avoid solvents.

EYE CONTACT: Flush eyes immediately with large amounts of water or mineral oil for at least 15 minutes. Call a physician.

INGESTION: If conscious, first induce vomiting, then take 2 tablespoons of activated charcoal - USP (drug grade) in wate Get immediate medical assistance.

C. HAZARDS INFORMATION

HEALTH

INHALATION

Overexposure to vapor may result in irritation to respiratory tract. Prolonged exposure in significant excess of permissible air concentrations can result in acute toxic effects, such as respiratory difficulty, convulsions and possible cardiovascular collapse.

INGESTION

Irritation of the gastrointestinal tract followed by nausea and vomiting, abdominal discomfort, rapid pulse, etc. Cardiovascular collapse may occur. Fatal dose is approximately 1.7 g/kg of body weight (rats).

SKIN

Contact with skin can result in irritation which when not washed off or when accentuated by sunlight, can result in minor burns.

EYES

Overexposure to product vapors can result in irritation. Eye contact with product will result in irritation, which in the absence of recommended first aid can result in minor burns to the eyes.

PERMISSIBLE CONCENTRATION: AIR (SEE SECTION J) — BIOLOGICAL

OSHA exposure limit — Coal Tar Pitch volatiles as benzene solubles. TWA: 8 hours is 0.2 mg/m³ (PPAH) [ACGIH TLV: same] — N.D.

UNUSUAL CHRONIC TOXICITY

NTP — Carcinogenic. Prolonged and repeated skin exposure over many years in the absence of recommended hygiene prac tices may lead to changes in skin pigmentation, benign skin growths and may in some cases, result in skin cancer. Additionally, inhalation may present a lung cancer hazard.

C. HAZARDS (Cont.)

FIRE AND EXPLOSION

FLASH POINT	AUTO IGNITION TEMPERATURE °C	FLAMMABLE LIMITS IN AIR (% BY VOL.)	
70°C ☐ OPEN CUP ☒ CLOSED CUP	N.D.	LOWER — N.D.	UPPER — N.D.

FIRE AND EXPLOSION HAZARDS

Water/fog can control unconfined fires, but water may cause frothing or eruption in closed tanks.
When heated to elevated temperatures, it emits lower molecular weight hydrocarbons.

D. PRECAUTIONS/PROCEDURES

FIRE EXTINGUISHING AGENTS RECOMMENDED

Water/fog, carbon dioxide, foam, dry chemicals, sand, or steam.

FIRE ESTINGUISHING AGENTS TO AVOID

See: Special Fire Fighting Precautions.

SPECIAL FIRE FIGHTING PRECAUTIONS

Water/fog is recommended for the control of unconfined oil fires, but water may cause frothing or eruption in closed tank.

VENTILATION

Avoid breathing vapors, ventilate work area, wear respirator, goggles, or face shield.

NORMAL HANDLING

Wear clothing closed at the neck, long sleeves and non-porous type gloves.

STORAGE

Recommended temperature for storage is about 140°F.

SPILL OR LEAK (ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT — SECTION E)

Avoid breathing vapors and contact with skin and eyes. Avoid sources of ignition (sparks or open flame).
Contain the spill or leak with solids, such as sand, earth, etc., dispose of in approved facilities, e.g. burn in approved incinerator.
See Sections I & K for specific waste management directions.

SPECIAL PRECAUTIONS/PROCEDURES/LABEL INSTRUCTIONS   SIGNAL WORD - DANGER!

Self-contained breathing apparatus and full protective clothing should be worn when fumes and/or smoke are present.
A complete soap and water shower should be taken at thet end of each working day.

E. PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION

Use a NIOSH-approved respirator with suitable organic vapor cartridge as necessary to control exposures above the TLV or PEL reported in Section J.

EYES AND FACE

Safety glasses, goggles or face shield.

HANDS, ARMS, AND BODY

Long-sleeved clothing closed at the neck and non-porous gloves.
For exposed skin, use approved creams (e.g. Pro-Tek, Fend A-2, Kerodex, Safeticote Skin Protector No. 83734).

OTHER CLOTHING AND EQUIPMENT

A complete change of work clothes should be used each day if contaminated.

F. PHYSICAL DATA

MATERIAL IS (AT NORMAL CONDITIONS): [X] LIQUID [ ] SOLID [ ] GAS [ ]	APPEARANCE AND ODOR: Dark brown liquid with a penetrating smokey odor and a burning caustic taste.	
BOILING POINT 210 - 425°C MELTING POINT °C	SPECIFIC GRAVITY (H_2O = 1): 1.03 - 1 18 (Avg: 9.1 lbs./gal)	VAPOR DENSITY (AIR = 1): < 1
SOLUBILITY IN WATER (% by Weight): Insoluble.	pH: N.D.	VAPOR PRESSURE (mm Hg at) [X] (PSIG) [ ]: 100°C — 80 MM; 125°C — 225 MM; 150°C — 370 MM
EVAPORATION RATE (Butyl Acetate = 1) [X] (Ether = 1) [ ]: < 1	% VOLATILES BY VOLUME (At 20°C): N.D.	

G. REACTIVITY DATA

STABILITY: [ ] UNSTABLE [X] STABLE	CONDITIONS TO AVOID: None known.

INCOMPATIBILITY (MATERIALS TO AVOID)

None known.

HAZARDOUS DECOMPOSITION PRODUCTS

Material does not decompose.

HAZARDOUS POLYMERIZATION: [ ] MAY OCCUR [X] WILL NOT OCCUR	CONDITIONS TO AVOID: N.A.

H. HAZARDOUS INGREDIENTS (Mixtures Only)

MATERIAL OR COMPONENT / C.A.S. #

Hazard information found in Section C is for Creosote, a mixture of many materials. Compounds which have been identified are found on the accompanying Creosote Compound Index.

SARA — TITLE III (40 CFR 300)

1. THIS PRODUCT CONTAINS THE FOLLOWING EXTREMELY HAZARDOUS SUBSTANCE(S) (SECTIONS 302 and 304):

COMPONENT	TPQ (LBS)	RQ (LBS)
None Listed	NA	NA

2. THIS PRODUCT CONTAINS THE FOLLOWING CERCLA HAZARDOUS SUBSTANCE(S) (SECTIONS 302 and 304):

NOTE: THE INFORMATION PROVIDED IN SECTIONS 1 AND 2 IS REQUIRED FOR EMERGENCY RESPONSE REPORTING.

COMPONENT	WT %	RQ (LBS)
Anthracene	6.0	5000
Benzene	.002	10
O-Cresol	<0.1	1000
M&P-Cresol	<0.3	1000
Naphthalene	4.8	[illegible]
Phenol	<0.1	[illegible]
Quinoline	1.8	[illegible]
Toluene	0.01	[illegible]
Xylene	0.01	[illegible]
Acenapthalene	6.0	[illegible]
Phenanthrene	16.0	5000
Fluorene	5.0	5000

3. THIS PRODUCT HAS THE FOLLOWING HAZARDS (SECTIONS 311 AND 312):

	YES	NO
IMMEDIATE	X	
DELAYED	X	
FIRE	X	
PRESSURE		X
REACTIVE		X

4. THIS PRODUCT CONTAINS THE FOLLOWING TOXIC CHEMICALS (SECTION 313):

COMPONENT	CAS #	[illegible] %
Creosote	8001-58-9	100

Date: 12-04-90

* = PROPRIETARY — TRADE SE

I. ENVIRONMENTAL

OCTANOL/WATER PARTITION COEFFICIENT: N.D.

DEGRADABILITY/AQUATIC TOXICITY

Due to its low vapor pressure and extremely low evaporation rate, the volatility rate at 20°C is almost zero. Upon heating, at extremely high temperatures, hydrocarbons will be emitted and some degradation will take place.

EPA HAZARDOUS SUBSTANCES? (CLEAN WATER ACT SECT. 311) ☐ YES ☒ NO IF SO, REPORTABLE QUANTITY: ______ 40 CFR 116-117

WASTE DISPOSAL METHODS (DISPOSER MUST COMPLY WITH FEDERAL, STATE AND LOCAL DISPOSAL OR DISCHARGE LAWS)

Incineration is recommended. Since there may be more than one applicable waste code for waste with creosote constituents, the disposal requirements for each should be evaluated.

RCRA STATUS OF UNUSED MATERIAL IF DISCARDED

Hazardous Waste. (See Section K for other pertinent waste designations).

HAZARDOUS WASTE NUMBER: (IF APPLICABLE) U 051 — 40 CFR 261

J. REFERENCES

PERMISSIBLE CONCENTRATION REFERENCES

ACGIH "Threshold Limit Values . . ." 1989/90.
OSHA General Industry 29 CFR 1910 Coal Tar Pitch Volatiles (CTPV).
(Refer to Section C for exposure limits).

REGULATORY STANDARDS

D.O.T. CLASSIFICATION: Combustible Liquid. — 49 CFR 173

NIOSH Criteria Document — Coal Tar Products
DOT CFR 49 Parts 100 - 199
USEPA 40 CFR 112

GENERAL

National Fire Prevention Association, Fire Protection Hand Book, NFPA 325 M, NFPA 491 M.
Encyclopedia of Occupational Health and Safety, Vol. I, McGraw Hill.

K. ADDITIONAL INFORMATION

See attached Technical Data Report (PC - 7) "Using Coal Tar Products With Safety".

A CERCLA (Superfund) release of one (1) pound of creosote requires National Response Center notification. The Reportable Quantity is one (1) pound for creosote.

Other waste code designations for creosote containing wastes appear in the December 6, 1990 Federal Register as F034: Wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol. Please consult with appropriate state regulatory authorities to determine when the F034 designation is effective in the given state.

Creosote-containing wastes may also be characteristic hazardous wastes even if not meeting the U051, K001, or F034 waste code designations.

MATERIAL SAFETY DATA SHEET

KOPPERS

PERS COMPANY, INC.
4) SEVENTH AVENUE
PI(TSBURGH, PA. 15219

MEDICAL EMERGENCIES: 800-553-5631
(IN PENNSYLVANIA CALL: 800-323-6571
CHEMTREC ASSISTANCE: 800-424-9300
CUSTOMER SERVICE: 800-556-7737

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: CRUDE COKE OVEN TAR Coal Tar

SYNONYM: NONE

CHEMICAL FAMILY: POLYNUCLEAR AROMATIC HYDROCARBONS

FORMULA: COMPLEX MIXTURE OF HYDROCARBONS

CAS NUMBER: 65996-89-6

DOT PROPER SHIPPING NAME: NONE

DOT HAZARD CLASS: NONE

UN/NA NUMBER: NONE

SECTION II - HEALTH/SAFETY ALERT

CHRONIC OVEREXPOSURE (AS DEFINED BY OSHA RECOMMENDED STANDARDS)
MAY CAUSE CANCER
WARNING
HARMFUL TO THE SKIN, OR IF INHALED OR SWALLOWED
CAUSES EYE AND SKIN IRRITATION
AVOID PROLONGED AND/OR REPEATED CONTACT
OBSERVE GOOD HYGIENE AND SAFETY PRACTICES WHEN HANDLING THIS PRODUCT
DO NOT USE THIS PRODUCT UNTIL MSDS HAS BEEN READ AND UNDERSTOOD

SECTION III - HEALTH HAZARD INFORMATION

EYE: OVEREXPOSURE TO VAPOR CAN RESULT IN IRRITATION AND/OR CORNEAL CHANGES. DIRECT EYE CONTACT MAY CAUSE IRRITATION. CONTACT WITH HEATED MATERIAL MAY CAUS THERMAL BURNS.

SKIN: CONTACT WITH SKIN CAN RESULT IN IRRITATION WHICH WHEN ACCENTUATED BY SUNLIGHT MAY RESULT IN A PHOTOTOXIC SKIN REACTION. REPEATED AND/OR PROLONGED CONTACT MAY CAUSE MORE SERIOUS SKIN DISORDERS INCLUDING CANCER. CONTACT WITH HEATED MATERIAL MAY CAUSE THERMAL BURNS.

INHALATION: OVEREXPOSURE TO VAPOR MAY RESULT IN RESPIRATORY TRACT IRRITATION. REPEATED AND/OR PROLONGED CONTACT TO HIGH CONCENTRATIONS OF VAPOR MAY RESULT I RESPIRATORY DIFFICULTIES, CENTRAL NERVOUS SYSTEM (CNS) EFFECTS AND POSSIBLE CARDIOVASCULAR COLLAPSE.

INGESTION: INGESTION OF MATERIAL MAY CAUSE GASTROINTESTINAL DISTURBANCES INCLUDING IRRITATION, NAUSEA, VOMITING, ABDOMINAL PAIN AND IN EXTREME CASES ' DIOVASCULAR INVOLVEMENT.

OTHER: SEE SECTION XII (COMMENTS) FOR ADDITIONAL INFORMATION ON HEALTH EFFECTS

SECTION IV - EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT: IMMEDIATELY FLUSH WITH LARGE AMOUNTS OF WATER FOR 15 MINUTES. IMMEDIATELY SEEK MEDICAL AID.

SKIN CONTACT: WASH THOROUGHLY WITH WATERLESS HAND CLEANER. FOR CONTACT WITH MOLTEN PRODUCT, DO NOT REMOVE CONTAMINATED CLOTHING. FLUSH SKIN IMMEDIATELY WITH LARGE AMOUNTS OF COLD WATER. IF POSSIBLE, SUBMERGE AREA IN COLD WATER. PACK WITH ICE. SEEK MEDICAL AID.

INHALATION: REMOVE FROM EXPOSURE. IF BREATHING HAS STOPPED OR IS DIFFICULT, ADMINISTER ARTIFICIAL RESPIRATION OR OXYGEN AS INDICATED. SEEK MEDICAL AID.

SECTION V - FIRE AND EXPLOSION HAZARD INFORMATION

FLASH POINT & METHOD: >65C (>150F) PMCC   AUTOIGNITION TEMP: ND

FLAMMABLE LIMITS (% BY VOLUME/AIR):   LOWER: ND   UPPER: ND

EXTINGUISHING MEDIA: USE DRY CHEMICAL, CARBON DIOXIDE, FOAM OR WATER SPRAY. WATER OR FOAM MAY CAUSE FROTHING.

FIRE-FIGHTING PROCEDURES: WEAR COMPLETE FIRE SERVICE PROTECTIVE EQUIPMENT, INCLUDING FULL-FACE MSHA/NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS. US WATER TO COOL FIRE-EXPOSED CONTAINERS/STRUCTURES/PROTECT PERSONNEL TOXIC VAPOR MAY BE GIVEN OFF IN A FIRE.

FIRE AND EXPLOSION HAZARDS: WHEN HEATED (FIRE CONDITIONS), VAPORS/DECOMPOSITIO ODUCTS MAY BE RELEASED FORMING FLAMMABLE/EXPLOSIVE MIXTURES IN AIR. CLOSED C TAINERS MAY EXPLODE WHEN EXPOSED TO EXTREME HEAT(FIRE).

SECTION VI - SPILL, LEAK AND DISPOSAL INFORMATION

SPILL OR LEAK PROCEDURES: STOP LEAK IF NO RISK INVOLVED. STAY UPWIND. SOLIDIFIED SPILLS: SHOVEL INTO DRY CONTAINERS AND COVER. FLUSH AREA WITH WATER SMALL WET SPILLS: TAKE UP WITH SAND OR OTHER NONCOMBUSTIBLE ABSORBENT MATERIAL FLUSH AREA WITH WATER. DIKE LARGE SPILLS FOR LATER DISPOSAL. CONTAIN RUNOFF FROM FIRE CONTROL AND DILUTION WATER.

WASTE DISPOSAL: THIS PRODUCT IS NOT DEFINED AS A US EPA HAZARDOUS WASTE, BUT SHOULD BE DISPOSED OF AS ONE. DISPOSE OF AS A HAZARDOUS WASTE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS. PLACE IN TIGHTLY SEALED LABELED CONTAINERS.

SECTION VII - RECOMMENDED EXPOSURE LIMIT/HAZARDOUS INGREDIENTS

EXPOSURE LIMIT (PRODUCT): *FOR COAL TAR PITCH VOLATILES, OSHA-PEL IS 0.2MG/M3 VERAGED OVER AN 8 HOUR WORK SHIFT, BENZENE SOLUBLE FRACTION. THE ACGIH-TLV IS MG/M3.

HAZARDOUS INGREDIENTS	CAS NUMBER	PERCENT	EXPOSURE LIMIT (PPM;MG/M
COAL TAR PITCH			*

SECTION VIII - PERSONAL PROTECTION INFORMATION

EYE PROTECTION: INDUSTRIAL SAFETY GLASSES, MINIMUM. AS NECESSARY TO COMPLY WIT 29 CFR 1910.133 AND WORK AREA CONDITIONS; USE SIDE SHIELDS, GOGGLES OR FACE SHIELD TO COMPLY WITH ANSI STANDARD Z87.1.

SKIN PROTECTION: AS REQUIRED, INDUSTRIAL RESISTANT FLEXIBLE-TYPE GLOVES. DEPENDING ON WORKING CONDITIONS, I.E., CONTACT POTENTIAL, WEAR IMPERVIOUS PROTECTIVE GARMENTS SUCH AS HEAD/NECK COVER, APRONS, JACKETS, PANTS, COVERALLS BOOTS, ETC. SEE "GUIDELINES" NOTED PREVIOUSLY.

RESPIRATORY PROTECTION: NOT REQUIRED UNDER NORMAL USE CONDITIONS. IF VENTILATION DOES NOT MAINTAIN INHALATION EXPOSURES BELOW TLV(PEL), USE MSHA/NIOSH APPROVED UNITS AS PER CURRENT 29CFR1910.134 AND MANUFACTURERS' "INSTRUCTIONS" AND "WARNINGS". COMBINATION FILTER/ORGANIC VAPOR CARTRIDGES OR CANISTERS MAY BE USED.

VENTILATION: PROVIDE SUFFICIENT GENERAL AREA/LOCAL EXHAUST VENT. IN TTERN/VOLUME TO CONTROL INHALATION EXPOSURES BELOW CURRENT EXPOSURE LIMITS ..D AREAS BELOW FLAMMABLE VAPOR CONCENTRATIONS.

SECTION IX - PERSONAL HANDLING INSTRUCTIONS

HANDLING: AVOID PROLONGED OR REPEATED BREATHING OF VAPORS, MISTS OR FUMES. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN OR EYES. OBSERVE GOOD PERSONAL HYGIENE PRACTICES AND RECOMMENDED PROCEDURES. APPLICATION OF CERTAIN PROTECTIV CREAMS (SUN SCREENS FOR COAL TAR PRODUCTS) BEFORE WORKING/SEVERAL TIMES DURING WORK MAY BE BENEFICIAL.

STORAGE: STORE IN AREAS/BUILDINGS DESIGNED TO COMPLY WITH OSHA 1910.106. KEEP IN A CLOSED, LABELED CONTAINER WITHIN A COOL (WELL SHADED), DRY -VENTILATED AREA. PROTECT FROM PHYSICAL DAMAGE. KEEP CONTAINERS CLOSED WHEN MATERIAL IS N(IN USE. MAINTAIN GOOD HOUSEKEEPING.

OTHER: NOT FOR USE OR STORAGE IN OR AROUND THE HOME. DO NOT TAKE INTERNALLY. NOT USE UNTIL MANUFACTURER'S PRECAUTIONS HAVE BEEN READ/UNDERSTOOD. WASH EXPOSED AREAS PROMPTLY AND THOROUGHLY AFTER SKIN CONTACT AND BEFORE EATING, DRINKING, USING TOBACCO PRODUCTS OR REST ROOMS.

SECTION X - REACTIVITY DATA

CONDITIONS CONTRIBUTING TO INSTABILITY: NONE KNOWN

INCOMPATABILITY: NONE KNOWN

HAZARDOUS REACTIONS/DECOMPOSITION PRODUCTS: TOXIC FUMES MAY BE EMITTED WHEN BURNED.

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION: NONE

SECTION XI - PHYSICAL DATA

BOILING POINT: >100C (>212F) IBP

SPECIFIC GRAVITY: >1.050

MELTING POINT: NA

% VOLATILE BY VOL: NEGLIG.

VAPOR PRESSURE: <5MM HG

EVAPORATION RATE(ETHER=1): <1 BUTYLACETATE=

VAPOR DENSITY(AIR=1):>1

VISCOSITY: ND

SOLUBILITY: NEGLIGIBLE

PH: ND

APPEARANCE/ODOR: BLACK VISCOUS LIQUID WITH AROMATIC ODOR.

SECTION XII - COMMENTS

THIS PRODUCT CONTAINS COAL TAR PITCH. VOLUME 35 OF THE IARC MONOGRAPHS NOTE THAT THERE IS SUFFICIENT EVIDENCE THAT COAL TAR PITCHES ARE CARCINOGENIC IN HUMANS. ADDITIONALLY, THERE IS SUFFICIENT EVIDENCE THAT OCCUPATIONAL EXPOSURE TO COAL TARS AS IT OCCURS DURING THE DESTRUCTIVE DISTILLATION OF COAL IS CAUSALLY ASSOCIATED WITH THE OCCURRENCE OF SKIN CANCERS IN HUMANS.

PERSONS WITH A HISTORY OF LIVER, KIDNEY, SKIN OR RESPIRATORY DISEASE OR EXPOSURE TO MATERIALS HARMFUL TO THESE SYSTEMS ARE AT A GREATER THAN NORMAL RISK OF DEVELOPING ADVERSE HEALTH EFFECTS WHEN WORKING WITH THIS PRODUCT.

DO NOT WEAR CONTACT LENS WITHOUT PROPER EYE PROTECTION WHEN USING THIS PRODUCT.

NAPHTHALENE
NAPHTHALENE
NAPHTHALENE

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY CONTACTS
GASTON L. PILLORI
(201) 796-7100

DATE   09/04/87
PO NBR: 87-029956
ACCT: 695038-01
INDEX: 44872440131
CAT NO: N134500

SUBSTANCE IDENTIFICATION

CAS-NUMBER 91-20-3

SUBSTANCE: **NAPHTHALENE**

TRADE NAMES/SYNONYMS:
NAPHTHALIN; TAR CAMPHOR; WHITE TAR; NAPHTHENE; MOTH BALLS; MOTH FLAKES; NAPHTHALINE; NAPHTHALEN; ALBOCARBON; CAMPHOR TAR; UN 1334; N-7; N-134; N-136; ACC16120

CHEMICAL FAMILY:
HYDROCARBON, POLYNUCLEAR

MOLECULAR FORMULA: C10-H8   MOL WT: 128

CERCLA RATINGS (SCALE 0-3): HEALTH=2 FIRE=2 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=2 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: NAPHTHALENE   PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
10 PPM (50 MG/M3) OSHA TWA
10 PPM ACGIH TWA; 15 PPM ACGIH STEL

PHYSICAL DATA

DESCRIPTION: WHITE CRYSTALLINE, VOLATILE FLAKES; ODOR OF MOTH BALLS. ODOR TAKEN WITH THE IRRITANT PROPERTIES IS A SATISFACTORY WARNING PROPERTY.   BOILING POINT: 424 F (218 C)

MELTING POINT: 176 F (80 C)   SPECIFIC GRAVITY: 1.1

VAPOR PRESSURE: 0.05 MMHG @ 20 C   EVAPORATION RATE: (BU ACETATE=1) >1.0

SOLUBILITY IN WATER: .033   VAPOR DENSITY: 4.4

SOLVENT SOLUBILITY: ALCOHOL, BENZENE, CCL4, FIXED & VOLATILE OILS.

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
MODERATE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME, AND A MODERATE EXPLOSION HAZARD IN THE FORM OF DUST AT 176 F. REACTIONS WITH INCOMPATIBLE SUBSTANCES MAY CAUSE FIRES AND EXPLOSIONS. VAPOR FORMS EXPLOSIVE MIXTURES WITH AIR.

FLASH POINT: 174 F (79 C)   UPPER EXPLOSIVE LIMIT: 5.9%

LOWER EXPLOSIVE LIMIT: 0.9%   AUTOIGNITION TEMP.: 979 F (526 C)

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY

FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM (1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FIREFIGHTING:
WEAR PERSONAL PROTECTIVE EQUIPMENT (RESPIRATORY AND EYE). MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAME WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT.

TOXICITY

100 MG/KG ORAL-CHILD LDLO; 1250 MG/KG ORAL-RAT LD50; 400 MG/KG ORAL-DOG LDLO; 533 MG/KG ORAL-MOUSE LD50; 150 MG/KG INTRAPERITONEAL-MOUSE LD50; 100 MG/KG INTRAVENOUS-MOUSE LD50; MUTATION DATA (RTECS); REPRODUCITVE EFFECTS DATA (RTECS); CARCINOGEN STATUS: NONE.
NAPHTHALENE IS A SKIN SENSITIZER AND A DEFICIENCY OF GLUCOSE-6-PHOSPHATE DEHYDROGENASE ARE MORE SUSCEPTIBLE TO THE HEMOLYTIC EFFECTS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
HEMOLYTIC AGENT.
500 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- CAUSES CENTRAL NERVOUS SYSTEM DEPRESSION, WITH HEADACHE, CONFUSION, EXCITEMENT, NAUSEA, VOMITING, SWEATING, DYSURIA, HEMATURIA, HEMOLYSIS AND CONVULSIONS. OPTIC NEURITIS IS RARE. PAROTID GLAND ENLARGEMENT IS POSSIBLE. HEPATIC NECROSIS MAY OCCUR. SEE ALSO INGESTION.

CHRONIC EXPOSURE- HEMOLYTIC EFFECTS IN SUSCEPTIBLE POPULATIONS (GLUCOSE-G-PHOSPHATE DEHYDROGENASE DEFICIENCY). SEE MUTAGENIC DATA, ANIMAL REPRODUCTIVE DATA AND ANIMAL TUMORIGENIC DATA REFERENCES IN TOXICITY SECTION.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST.

GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
IRRITANT/SENSITIZER.
ACUTE EXPOSURE- MAY CAUSE IRRITATION AND, IN SENSITIZED INDIVIDUALS, SEVERE DERMATITIS. POISONING MAY OCCUR BY SKIN ABSORPTION.

CHRONIC EXPOSURE- ITCHING, REDNESS, SCALING, WEEPING, AND CRUSTING OF THE SKIN. MAY PRODUCE SENSITIZATION DERMATITIS FOLLOWING REPEATED CONTACT. SEE MUTAGENIC DATA, ANIMAL REPRODUCTIVE EFFECTS DATA AND ANIMAL TUMORIGENIC DATA REFERENCES IN TOXICITY SECTION.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
IRRITANT.
ACUTE EXPOSURE- 15 PPM OF VAPOR IS IRRITATING. VAPOR OR MIST MAY CAUSE SUPERFICIAL INJURY, CONJUNCTIVITIS, AND VISUAL DISTURBANCES.

CHRONIC EXPOSURE- WORKERS EXPOSED TO HIGH CONCENTRATIONS HAVE DEVELOPED CATARACTS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
HEMOLYTIC AGENT.
ACUTE EXPOSURE- INGESTION MAY CAUSE INTRAVASCULAR HEMOLYSIS. INITIAL SYMPTOMS MAY INCLUDE HEADACHE, CONFUSION, EXCITEMENT, MALAISE, PROFUSE SWEATING, NAUSEA, VOMITING, ABDOMINAL PAIN, AND IRRITATION OF THE BLADDER. THERE MAY BE PROGRESSIVE JAUNDICE, HEMATURIA, HEMOGLOBINURIA, RENAL TUBULAR BLOCKAGE, AND ACUTE RENAL SHUTDOWN.

FIRST AID- IF VICTIM IS CONSCIOUS AND NOT CONVULSIVE, IMMEDIATELY GIVE 2 TO 4 GLASSES OF WATER. INDUCE VOMITING BY TOUCHING FINGER TO BACK OF THROAT. GET MEDICAL ATTENTION IMMEDIATELY.

REACTIVITY

REACTIVITY:
STABLE AT ORDINARY PRESSURES UP TO THE BOILING POINT, 218 C.

INCOMPATIBILITIES:
OXIDIZERS AND OTHER MATERIALS, EXAMPLES FOLLOW:

NAPHTHALENE:
CHROMIC ANHYDRIDE: VIOLENT REACTION.
ALUMINUM TRICHLORIDE + BENXOYL CHLORIDE MIXTURE: VIOLENT REACTION.
STRONG OXIDIZERS: VIOLENT REACTION.
DINITROGEN PENTAOXIDE: POSSIBLE EXPLOSION.
PLASTICS: MELTED FORM WILL ATTACK.
RUBBER: MELTED FORM WILL ATTACK.

COATINGS: MELTED FORM WILL ATTACK.

DECOMPOSITION:
COMBUSTION PREDICTED TO CAUSE EMISSION OF CARBON MONOXIDE AND CARBON DIOXIDE AND POSSIBLY OTHER HAZARDOUS ORGANICS AS WELL AS SMOKE.

POLYMERIZATION:
WILL NOT OCCUR.

****

CONDITIONS TO AVOID

AVOID HEATING TO THE FLASH POINT, 79 C, UNLESS UNDER CAREFULLY ENGINEERED CONDITIONS. AVOID CONTACT WITH OR STORAGE WITH INCOMPATIBLE MATERIALS, INCLUDING THOSE LISTED IN THE REACTIVITY SECTION.

****

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
SHUT OFF IGNITION SOURCES. FOR SMALL SPILLS, WITH CLEAN SHOVEL, PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; MOVE CONTAINERS FROM SPILL AREA. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY. KEEP OUT OF SEWERS, WATERWAYS AND OTHER WATER SOURCES.

WHEN MATERIAL NOT INVOLVED IN FIRE:
- KEEP OPEN FLAMES, SPARKS AND OTHER IGNITION SOURCES AWAY.
- DO NOT ALLOW MATERIAL TO CONTAMINATE SEWERS AND WATER SOURCES.
- BUILD DIKES FOR CONTAINMENT OF SPILL FLOW.

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST VENTILATION SYSTEM TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
EXPOSURE LIMIT TO 100 PPM-
- CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE WITH A FULL FACEPIECE AND A DUST FILTER.
- TYPE C SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE OR WITH A FULL FACEPIECE, HELMET OR HOOD OPERATED IN CONTINUOUS FLOW MODE.
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE, OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

250 PPM-
- GAS MASK WITH AN ORGANIC VAPOR CANISTER (CHIN-STYLE, FRONT- OR BACK-MOUNTED CANISTER) WITH A FULL FACEPIECE.
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

>250 PPM, INCLUDING THE IDLH LEVEL, 500 PPM
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE, OR USE EQUIVALENT RESPIRATOR.

CLOTHING:
PROTECTIVE CLOTHING NOT REQUIRED. AVOID REPEATED OR PROLONGED CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT REPEATED OR PROLONGED CONTACT WITH THIS SUBSTANCE. PREFERRED MATERIALS: PVA AND VITON PLASTICS.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF SAFETY GOGGLES WHENEVER THERE IS REASONABLE PROBABILITY OF EYE CONTACT WITH THIS SOLUTION. DO NOT WEAR CONTACT LENSES WHEN WORKING WITH CHEMICALS.

WHEN THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHALL PROVIDE AN EYE-WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
CREATION DATE: 01/11/85 REVISION DATE: 10/15/86

-ADDITIONAL INFORMATION-

MSDS for ZINC Page 1

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1 - PRODUCT IDENTIFICATION

PRODUCT NAME: ZINC
FORMULA: ZN
FORMULA WT: 65.37
CAS NO.: 7440-66-6
NIOSH/RTECS NO.: ZG8600000
COMMON SYNONYMS: BLUE POWDER
PRODUCT CODES: 4244,4290,4240,4252,4260,4248,4274,5828,4264,4270
EFFECTIVE: 06/25/86
REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	0	NONE
FLAMMABILITY	-	1	SLIGHT
REACTIVITY	-	2	MODERATE
CONTACT	-	0	NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

WARNING
CAUSES IRRITATION

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

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2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
ZINC	90-100	7440-66-6

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3 - PHYSICAL DATA

BOILING POINT: 908 C (1666 F)
VAPOR PRESSURE(MM HG): 1

MELTING POINT: 420 C (788 F)
VAPOR DENSITY(AIR=1): N/A

SPECIFIC GRAVITY: 7.14
(H2O=1)

EVAPORATION RATE: N/A
(BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: BLUISH-WHITE ODORLESS SOLID.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

UNUSUAL FIRE & EXPLOSION HAZARDS
REACTS VIOLENTLY WITH WATER LIBERATING AND IGNITING HYDROGEN.

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 10 MG/M3 (PPM)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE
CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS.
INHALATION OF DUST MAY CAUSE IRRITATION TO UPPER RESPIRATORY TRACT.
PROLONGED EXPOSURE MAY CAUSE DERMATITIS.
NOTE: PRODUCT IS A SOLID MASS; HOWEVER, WARNINGS ARE BASED ON INHALATION DUST, MIST OR FUME EMISSIONS THAT ARE POSSIBLE DURING MANUFACTURING OR CHEMICAL REACTIONS.

TARGET ORGANS
NONE IDENTIFIED

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
NONE INDICATED

EMERGENCY AND FIRST AID PROCEDURES
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
WASH CLOTHING BEFORE RE-USE.

6 - REACTIVITY DATA

STABILITY: UNSTABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE

INCOMPATIBLES: STRONG ACIDS, STRONG BASES, STRONG OXIDIZING AGENTS, ALKALI METALS, HALOGENATED HYDROCARBONS

DECOMPOSITION PRODUCTS: OXIDES OF ZINC

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND REMOVE.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO KEEP FUME OR DUST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS HIGH, USE AN APPROPRIATE RESPIRATOR OR DUST MASK.

EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, PROPER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	ZINC
HAZARD CLASS	ORM-E
LABELS	NONE
REPORTABLE QUANTITY	1000 LBS.

MSDS for ZINC Page 4

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

MSDS Number: **Z2280** * * * * * *Effective Date:* ***04/02/04*** * * * * * *Supercedes:* ***09/12/03***

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ZINC CHLORIDE

1. Product Identification

Synonyms: Zinc Chloride, Zinc Dichloride, Zinc Butter
CAS No.: 7646-85-7
Molecular Weight: 136.30
Chemical Formula: $ZnCl_2$
Product Codes:
J.T. Baker: 4320, 4321, 4322, 4324, 4326
Mallinckrodt: 8772, 8780

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Zinc Chloride	7646-85-7	97 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. CAUSES BURNS TO ANY AREA OF CONTACT. HARMFUL IF SWALLOWED OR INHALED. AFFECTS THE CARDIOVASCULAR SYSTEM.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.
Ingestion:
Toxic. May cause irritation or corrosion to the gastrointestinal tract with abdominal pain, nausea, and vomiting. May cause delayed death occurring from strictures of the esophagus and pylorus.
Skin Contact:
May cause severe irritation, skin burns and ulcerations. Solutions are corrosive. Symptoms include redness and pain.
Eye Contact:
May cause redness, pain, and blurred vision. Splashes from solutions may cause eye damage.
Chronic Exposure:
Repeated skin contact can cause varying degrees of problems ranging from dermatitis to ulcerations. Repeated Inhalation can cause occupational asthma.
Aggravation of Pre-existing Conditions:
Dermatitis, cardiac and respiratory disorders.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids

occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
Use protective clothing and breathing equipment appropriate for the surrounding fire.

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Avoid release to the environment. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a well closed container stored under cold to warm conditions, 2 to 40 C, (36 to 104F). Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Zinc chloride:
OSHA Permissible Exposure Limit (PEL):
1 mg/m3 (TWA) 8H, as fume.
ACGIH Threshold Limit Value (TLV):
1 mg/m3 (TWA); 2 mg/m3 (STEL) for fume
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the

contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with dust/mist filter may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
White crystalline granules.
Odor:
Odorless.
Solubility:
423 g/100 g water @ 25C (77F)
Density:
2.91
pH:
ca. 4 Aqueous solution
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
732C (1350F)
Melting Point:
290C (554F)
Vapor Density (Air=1):
Not applicable.
Vapor Pressure (mm Hg):
1 @ 428C (802F)
Evaporation Rate (BuAc=1):
Not applicable.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
When heated to decomposition it emits toxic fumes of chlorine and zinc oxide.

Hazardous Polymerization:
Will not occur.
Incompatibilities:
Cyanides and sulfides, powdered zinc. When mixed with potassium, a weak explosion will occur on impact.
Conditions to Avoid:
Incompatibles.

11. Toxicological Information

Oral rat LD50: 350 mg/kg. Investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\--

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Zinc Chloride (7646-85-7)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
Dangerous to the environment. Very toxic to aquatic organisms; may cause long term adverse effects in the aquatic environment.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ZINC CHLORIDE, ANHYDROUS
Hazard Class: 8
UN/NA: UN2331
Packing Group: III

Information reported for product/size: 50KG

International (Water, I.M.O.)

Proper Shipping Name: ZINC CHLORIDE, ANHYDROUS
Hazard Class: 8
UN/NA: UN2331
Packing Group: III
Information reported for product/size: 50KG

International (Air, I.C.A.O.)

Proper Shipping Name: ZINC CHLORIDE, ANHYDROUS
Hazard Class: 8
UN/NA: UN2331
Packing Group: III
Information reported for product/size: 50KG

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Zinc Chloride (7646-85-7)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	--Canada-- NDSL	Phil.
Zinc Chloride (7646-85-7)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	-SARA 302- TPQ	-------SARA 313------ List	-------SARA 313------ Chemical Catg.
Zinc Chloride (7646-85-7)	No	No	No	Zinc compoun

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Zinc Chloride (7646-85-7)	1000	No	No

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Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
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Australian Hazchem Code: 2X
Poison Schedule: S6

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. CAUSES BURNS TO ANY AREA OF CONTACT. HARMFUL IF SWALLOWED OR INHALED. AFFECTS THE CARDIOVASCULAR SYSTEM.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3, 6, 12.
Disclaimer:

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MATERIAL SAFETY DATA SHEET: SIMPLE GREEN®

I. PRODUCT & COMPANY INFORMATION

PRODUCT NAME: **SIMPLE GREEN® CLEANER / DEGREASER / DEODORIZER**

COMPANY NAME: **SUNSHINE MAKERS, INC.**
15922 Pacific Coast Highway
Huntington Harbour, CA 92649 USA
Telephone: 800-228-0709 • 562-795-6000
Fax: 562-592-3034
Website: www.simplegreen.com

Version No. 1008
Issue Date: January, 2003

For 24-hour emergency, call Chem-Tel, Inc.: 800-255-3924

USE OF PRODUCT: An all purpose cleaner and degreaser used undiluted or diluted in water for direct, spray, and dip tank procedures.

II. INGREDIENT INFORMATION

The only ingredient of Simple Green® with established exposure limits is undiluted 2-butoxyethanol (<6%) (Butyl Cellosolve; CAS No. 111-76-2): the OSHA PEL and ACGIH TLV is 25 ppm (skin). Note, however, that Butyl Cellosolve is only one of the raw material ingredients that undergo processing and dilution during the manufacture of Simple Green®. Upon completion of the manufacturing process, Simple Green® does not possess the occupational health risks associated with exposure to undiluted Butyl Cellosolve. Verification of this is contained in the independent test results detailed under "Toxicological Information" on Page 3 of this MSDS.

The Butyl Cellosolve in Simple Green® is part of a chemical category (glycol ethers) regulated by the Emergency Planning and Community Right-to-Know Act (SARA, Title III, section 313); therefore, a reporting requirement exists. Based upon chemical analysis, Simple Green® contains no known EPA priority pollutants, heavy metals, or chemicals listed under RCRA, CERCLA, or CWA. Analysis by TCLP (Toxicity Characteristic Leaching Procedure) according to RCRA revealed no toxic organic or inorganic constituents.

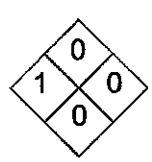
All components of Simple Green® are listed on the TSCA Chemical Substance Inventory.

III. HAZARDS IDENTIFICATION

UN Number:	Not required
Dangerous Goods Class:	Nonhazardous

Hazard Rating (NFPA/HMIS)

Health = 1* Reactivity = 0
Fire = 0 Special = 0



Rating Scale

0 = minimal 1 = slight
2 = moderate 3 = serious
4 = severe

*Mild eye irritant, non-mutagenic and non-carcinogenic. **None of the ingredients in Simple Green® are regulated or listed as potential cancer agents by Federal OSHA, NTP, or IARC.**

IV. FIRST AID MEASURES

SYMPTOMS OF OVEREXPOSURE AND FIRST AID TREATMENT

Eye contact: Reddening may develop. Immediately rinse the eye with large quantities of cool water; continue 10-15 minutes or until the material has been removed; be sure to remove contact lenses, if present, and to lift upper and lower lids during rinsing. Get medical attention if irritation persists.

Skin contact: Minimal effects, if any; rinse skin with water, rinse shoes and launder clothing before reuse. Reversible reddening may occur in some dermal-sensitive users; thoroughly rinse area and get medical attention if reaction persists.

Swallowing: Essentially non-toxic. Give several glasses of water to dilute; do not induce vomiting. If stomach upset occurs, consult physician.

Inhalation: Non-toxic. Exposures to concentrate-mist may cause mild irritation of nasal passages or throat; remove to fresh air. Get medical attention if irritation persists.

V. FIRE FIGHTING MEASURES

Simple Green® is stable, not flammable, and will not burn.

Flash Point/Auto-Ignition:	Not flammable.
Flammability Limits:	Not flammable.
Extinguishing Media:	Not flammable/nonexplosive. No special procedures required.
Special Fire Fighting Procedures:	None required.

VI. ACCIDENTAL RELEASE MEASURES

Recover usable material by convenient method; residual may be removed by wipe or wet mop. If necessary, unrecoverable material may be washed to drain with large quantities of water.

VII. HANDLING, STORAGE & TRANSPORT INFORMATION

No special precautions are required. **This product is non-hazardous for storage and transport according to the U.S. Department of Transportation Regulations.** Simple Green® requires no special labeling or placarding to meet U.S. Department of Transportation requirements.

UN Number: Not required　　　Dangerous Goods Class: Non-hazardous

VIII. EXPOSURE CONTROLS

Exposure Limits: The Simple Green® formulation presents no health hazards to the user when used according to label directions for its intended purposes. Mild skin and eye irritation is possible (please see Eye contact and Skin contact in Section IV.).

Ventilation: No special ventilation is required during use.

Human Health Effects or Risks from Exposure: Adverse effects on human health are not expected from Simple Green®, based upon twenty years of use without reported adverse health incidence in diverse population groups, including extensive use by inmates of U.S. Federal prisons in cleaning operations.

Simple Green® is a mild eye irritant; mucous membranes may become irritated by concentrate-mist.

Simple Green® is not likely to irritate the skin in the majority of users. Repeated daily application to the skin without rinsing, or continuous contact of Simple Green® on the skin may lead to temporary, but reversible, irritation.

Medical Conditions Aggravated by Exposure: No aggravation of existing medical conditions is expected; dermal sensitive users may react to dermal contact by Simple Green®.

IX. PERSONAL PROTECTION

Precautionary Measures:	No special requirements under normal use conditions.
Eye Protection:	**Caution, including reasonable eye protection, should always be used to avoid eye contact where splashing may occur.**
Skin Protection:	No special precautions required; rinse completely from skin after contact.
Respiratory Protection:	No special precautions required.
Work and Hygienic Practices:	No special requirements. Wash or rinse hands before touching eyes or contact lenses.

X. PHYSICAL AND CHEMICAL PROPERTIES

Appearance/odor:	Translucent green liquid with characteristic sassafras odor.		
Specific Gravity:	1.0257	**Vapor Pressure:**	17 mm Hg @ 20 °C; 22 mm Hg @ 25 °C
pH of concentrate:	9.5	**Vapor Density:**	1.3 (air = 1)
Evaporation:	>1 (butyl acetate = 1)	**Density:**	8.5 lbs./gallon
Boiling Point:	110 °C (231 °F)		
Freezing Point:	-9 °C (16 °F) If product freezes, it will reconstitute without loss of efficacy when brought back to room temperature and agitated.		

VOC Composite Partial Pressure: 0.006 mm Hg @ 20 °C
Volatile Organic Compounds (VOCs): 7.96 g/L per ASTM Method 3960-90. Per California AQMD's VOC test method, product must be diluted at least 4 parts of water to 1 part Simple Green® in order to meet SCAQMD Rule 1171 & Rule 1122 and BAAQMD Regulation 8-16 VOC requirements for solvent cleaning operations.
Water Solubility: Completely soluble in water. The higher salt concentrations in marine ecosystems will lead to complexes with Simple Green® that may become visible at ratios above one part Simple Green® to 99 parts seawater.
Ash Content: At 600 °F: 1.86% by weight.
Nutrient Content: Nitrogen: <1.0% by weight (fusion and qualitative test for ammonia).
Phosphorus: 0.3% by formula.
Sulfur: 0.6% by weight (barium chloride precipitation method).

Detection: Simple Green® has a characteristic sassafras odor that is not indicative of any hazardous situation.

XI. STABILITY AND REACTIVITY INFORMATION

Nonreactive. Simple Green® is stable, even under fire conditions, and will not react with water or oxidizers. Hazardous polymerization will not occur.

XII. TOXICOLOGICAL INFORMATION

Nonhuman Toxicity

Acute Mortality Studies:
Oral LD_{50} (rat): >5.0 g/kg body weight // Dermal LD_{50} (rabbit): >2.0 g/kg body weight

Dermal Irritation: Only mild, but reversible, irritation was found in a standard 72-hr test on rabbits. A value of 0.2 (non-irritating) was found on a scale of 8.

Eye Irritation: With or without rinsing with water, the irritation scores in rabbits at 24 hours did not exceed 15 (mild irritant) on a scale of 110.

Subchronic dermal effects: No adverse effects, except reversible dermal irritation, were found in rabbits exposed to Simple Green® (up to 2.0 g/kg/day for 13 weeks) applied to the skin of 25 males and 25 females. Only female body weight gain was affected. Detailed microscopic examination of all major tissues showed no adverse changes.

Fertility Assessment by Continuous Breeding: The Simple Green® formulation had no adverse effect on fertility and reproduction in CD-1 mice with continuous administration for 18 weeks, and had no adverse effect on the reproductive performance of their offspring.

XIII. BIODEGRADABILITY AND ENVIRONMENTAL TOXICITY INFORMATION

Biodegradability:
Simple Green® is readily decomposed by naturally occurring microorganisms. The biological oxygen demand (BOD), as a percentage of the chemical oxygen demand (COD), after 4, 7, and 11 days was 56%, 60%, and 70%, respectively. Per OECD Closed Bottle Test, Simple Green® meets OECD and EPA recommendations for ready biodegradability.
In a standard biodegradation test with soils from three different countries, Butyl Cellosolve reached 50% degradation in 6 to 23 days, depending upon soil type, and exceeded the rate of degradation for glucose which was used as a control for comparison.

Environmental Toxicity Information:
Simple Green® is considered practically non-toxic per EPA's aquatic toxicity scale. Simple Green® is non-lethal to any of the marine and estuarine test animals listed in the following table at concentrations below 200 mg/L (0.02%). This table shows the Simple Green® concentrations that are likely to be lethal to 50% of the exposed organisms.

	LC_{50} in mg/L (ppm)	
	48-hour	**96-hour**
Marine Fish:		
Mud minnow *(Fundulus heteroclitus)*	1690	1574
Whitebait *(Galaxias maculatus)*	210	210
Marine/Estuarine Invertebrates:		
Brine Shrimp *(Artemia salina)*	610	399
Grass Shrimp *(Palaemonetes pugio)*	270	220
Green-lipped Mussel *(Perna canaliculus)*	220	220
Mud Snail *(Potamopyrgus estuarinus)*	410	350

XIV. DISPOSAL CONSIDERATIONS

Simple Green® is fully water soluble and biodegradable and will not harm sewage-treatment microorganisms if disposal by sewer or drain is necessary. Dispose of in accordance with all applicable local, state, and federal laws.

XV. OTHER INFORMATION

Containers:	Simple Green® residues can be completely removed by rinsing with water; the container may be recycled or applied to other uses.
Electrical Wiring Compatibility:	Polyimide insulated wiring is not affected by exposure to Simple Green®. After immersion in Simple Green® for 14 days at 74°F, the 61 cm piece of polyimide insulated wire passed a one minute dielectric proof test at 2500 volts (ASTM D-149).
Contact Point:	Sunshine Makers, Inc., Research and Development Division: 562-795-6000.

***** NOTICE *****

All information appearing herein is based upon data obtained by the manufacturer and recognized technical sources. Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of this information, Sunshine Makers, Inc. or its distributors extends no warranties, makes no representations and assumes no responsibility as to the suitability of such information for application to purchaser's intended purposes or for consequences of its use.

WD-40®

MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

Manufacturer:	WD-40 Company
Address:	1061 Cudahy Place (92110) P.O. Box 80607 San Diego, California 92138-0607

Telephone:	
Emergency Only:	1 (800) 424-9300 (CHEMTREC)
Information:	(619) 275-1400
Chemical Name:	Organic Mixture
Trade Name:	WD-40 Aerosol
Item No.	10002, 10005, 10008, 10011, 10013, 10016, 10023

II. HAZARDOUS INGREDIENTS

Chemical Name	CAS Number	%	Exposure Limit ACGIH/OSHA	
Aliphatic Petroleum Distillates	8052-41-3	60-70	100 ppm	PEL
Petroleum Base Oil	64742-65-0	15-25	5 mg/M³	TWA (mist)
Carbon Dioxide	124-38-9	2-3	5000 ppm	PEL
Non-hazardous Ingredients		<10		

III. PHYSICAL DATA

Boiling Point:	NA	Evaporation Rate:	Not determined
Vapor Density (air = 1):	Greater than 1	Vapor Pressure:	110 ±5 PSI @ 70°F
Solubility in Water:	Insoluble	Appearance:	Light amber
Specific Gravity (H_20 = 1):	0.816 @ 70°F	Odor:	Characteristic odor
Percent Volatile (volume):	70%		

IV. FIRE AND EXPLOSION

Flash Point:	Tag Open Cup 110°F (minimum)
Flammable Limits:	(Solvent Portion) [Lel] 1.0% [Uel] 6.0%
Extinguishing Media:	CO_2, Dry Chemical, Foam
Special Fire Fighting Procedures:	Contents Under Pressure
Unusual Fire and Explosion Hazards:	FLAMMABLE – U.F.C. level 3 AEROSOL

V. HEALTH HAZARD / ROUTE(S) OF ENTRY

Threshold Limit Value

Aliphatic Petroleum Distillates (Stoddard solvent) lowest TLV (ACGIH 100 ppm.)

Symptoms of Overexposure

Inhalation (Breathing):	May cause anesthesia, headache, dizziness, nausea and upper respiratory irritation.
Skin Contact:	May cause drying of skin and/or irritation.
Eye Contact:	May cause irritation, tearing and redness.
Ingestion (Swallowed):	May cause irritation, nausea, vomiting and diarrhea.

First Aid Emergency Procedures

Ingestion (Swallowed):	Do not induce vomiting, seek medical attention.
Eye Contact:	Immediately flush eyes with large amounts of water for 15 minutes.
Skin Contact:	Wash with soap and water.
Inhalation (Breathing):	Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

Pre-existing medical conditions such as eye, skin and respiratory disorders may be aggravated by exposure.

DANGER!

Aspiration Hazard: If swallowed, can enter lungs and may cause chemical pneumonitis. Do not induce vomiting. Call Physician immediately.

Suspected Cancer Agent

Yes ______ No __X__

The components in this mixture have been found to be noncarcinogenic by NTP, IARC and OSHA.

VI. REACTIVITY DATA

Stability:	Stable X	Unstable ___
Conditions to avoid:	NA	
Incompatibility:	Strong oxidizing materials	
Hazardous decomposition products:	Thermal decomposition may yield carbon monoxide and/or carbon dioxide.	
Hazardous polymerization:	May occur ___	Will not occur X

VII. SPILL OR LEAK PROCEDURES

Spill Response Procedures
Spill unlikely from aerosol cans. Leaking cans should be placed in plastic bag or open pail until pressure has dissipated.

Waste Disposal Method
Empty aerosol cans should not be punctured or incinerated; bury in land fill. Liquid should be incinerated or buried in land fill. Dispose of in accordance with local, state and federal regulations.

VIII. SPECIAL HANDLING INFORMATION

Ventilation:	Sufficient to keep solvent vapor less than TLV.
Respiratory Protection:	Advised when concentrations exceed TLV.
Protective Gloves:	Advised to prevent possible skin irritation.
Eye Protection:	Approved eye protection to safeguard against potential eye contact, irritation or injury.
Other Protective Equipment:	None required.

IX. SPECIAL PRECAUTIONS

Keep from sources of ignition. Avoid excessive inhalation of spray particles, do not take internally. Do not puncture, incinerate or store container above 120°F. Exposure to heat may cause bursting. Keep can away from electrical current or battery terminals. Electrical arcing can cause burn-through (puncture) which may result in flash fire, causing serious injury. Keep from children.

X. TRANSPORTATION DATA (49 CFR 172.101)

Domestic Surface

Description:	Consumer Commodity
Hazard Class:	ORM-D
ID No.:	NONE
Label Required:	Consumer Commodity (ORM-D)

Domestic Air

Description:	Consumer Commodity (Non-Flammable Gas -- Aerosol)
Hazard Class:	ORM-D
ID No.:	NONE
Label Required:	Consumer Commodity (ORM-D-AIR)

XI. REGULATORY INFORMATION

All ingredients for this product are listed on the TSCA inventory.

SARA Title III chemicals:	None
California Prop 65 chemicals:	None
CERCLA reportable quantity:	None
RCRA hazardous waste no.:	D001 (Ignitable)

SIGNATURE: R Wile TITLE: Technical Director

REVISION DATE: March 1998 SUPERSEDES: June 1996

NA = Not applicable NDA = No data available < = Less than > = More than

SECTION 1:Chemical Product and Company Identification

Manufacturer: Cumberland Swan
One Swan Drive
Smyrna, TN 37167

Date: March 2000

Product: Isopropyl Alcohol (IPA)

50%, 70%, 91% and 99% IPA

Telephone: (615) 459-8900
24hr Emergency: (615) 459-8900 ext. 5270

SECTION 2: Composition/Information on Ingredients

Name: Isopropanol, IPA, 2-Propanol, Dimethyl Carbinol CAS#: 67-63-0

SECTION 3: Hazards Identification

Colorless, volatile liquid with the odor of rubbing alcohol. Isopropyl Alcohol is a dangerous fire risk. Prolonged exposure to elevated concentrations of vapors may result in irritation of the eyes, nose, and throat and central nervous system (CNS) depression. Prolonged dermal exposure can result in dry, cracking skin.

Potential Routes of Exposure: Ingestion, inhalation, dermal contact, eye contact

Target Organs: Eyes, skin, respiratory system

Symptoms of Overexposure:

Inhalation:	Mild irritation of eyes, nose and throat.
Ingestion:	Drowsiness, headache
Dermal Contact:	Dry, cracking skin
Acute Effects:	Irritation of skin and/or upper respiratory tract as noted above. Acute CNS depression may be manifested as giddiness, headache, dizziness and/or nausea.
Chronic Effects:	Chronic exposure can result in skin irritation and contact dermititus Pre-existing disorders of the skin, eyes, and respiratory tract may be exacerbated by exposure to isopropyl alcohol.

HMIS: H=1, F=3, R=0 See Section 8 for PPE information

SECTION 4: First Aid Measures

Eye:	Flush eyes with copious amount of water for at least 15 minutes
Skin:	Flush with water. If irritation persists, seek medical attention.
Ingestion:	Do not induce vomiting if victim is unconscious or drowsy. Seek medical attention or contact the poison control center.
Inhalation:	Remove victim to fresh air and provided oxygen if breathing is difficult. Seek Medical attention if breathing continues to be difficult.

SECTION 5: Fire Fighting Measures

Extinguishing Media:	Use water fog, alcohol foam, dry chemical or CO2
Unusual Fire or Explosion Hazards:	Containers exposed to intense heat from fires should be cooled with large amounts of water to prevent buildup of internal pressure due to vapor generation which could result in container rupture.
Recommendations:	Clear area of unprotected personnel. Wear complete turnout gear. Cool containers exposed to fire with water.

SECTION 6: Accidental Release Measures

Large Spills:	Eliminate all ignition sources. Equipment must be grounded to prevent sparking. Evacuate the area of unprotected personnel. Contain source of spill. Dike or otherwise confine spilled product. Uncontrolled releases to air, land, or water may be reportable to the National Response Center (1-800-424-8802).
Small Spills:	Take up with absorbent material and place in non-leaking container; seal tightly. Dispose of absorbent (see section 13)

SECTION 7: Handling and Storage

Storage Requirements:	Store in tightly closed containers in a cool, dry area away from heat and other possible ignition sources.
Handling precautions:	Use non-sparking tools to open containers. Maintain appropriate class of fire extinguishers nearby in case of fire.

SECTION 8: Exposure Controls / Personal Protection

OSHA PEL=400ppm OSHA STEL=500ppm IDLH=12,000ppm

Recommended Engineering Controls: Use explosion-proof ventilation equipment as necessary to maintain airborne concentrations below the PEL. Ground all containers to prevent static sparks during fluid transfers.

Recommended Admin Controls: Train employees on the hazards of Isopropyl Alcohol

PPE: Goggles, gloves, NIOSH approved respiratory protection required when above PEL/TWA

Recommended Hygiene Practices: Clean PPE and work clothing contaminated prior to reuse. After working with this product, be sure to wash before eating, smoking, drinking, or applying cosmetics.

SECTION 9: Physical and Chemical Properties

Appearance: Colorless Liquid UEL: 12% LEL: 2%

Odor: Mild Rubbing Alcohol Odor Threshold: 43ppm Water solubility: Miscible

	50% IPA	70%IPA	91%IPA	99%IPA
Vapor Pressure (@ 68^0F) approx.	29mm	23mm	33mm	33mm
Specific Gravity	.929	.878	.790	.790
Boiling Point	176 ^{0} F	176 ^{0} F	180 ^{0} F	181 ^{0} F
Flash Point (TAG Open Cup)	74.5 ^{0} F	70.5 ^{0} F	54 ^{0} F	53 ^{0} F
Freezing Point	-32--50 ^{0} C	-32--50 ^{0} C	-32--50 ^{0} C	-127 ^{0} F
Molecular Weight	47.5	47.5	47.5	60.1
Auto Ignition Temperature	No Data	No Data	No Data	750 ^{0} F

SECTION 10: Stability and Reactivity

Stability:	Stable
Polymerization:	Will not occur
Incompatible Chem:	Strong oxidizers, acetaldehyde, chlorine, ethylene oxide, acids, isocyanates
Conditions to avoid:	Heat, sparks, and open flame. Do Not store in aluminum > 120 ^{0} F
Hazardous Products:	CO and unidentified organic compounds may be formed of Decomposition

SECTION 11: Toxicological Information

LD50: 5,840 mg/kg (acute oral - rat); 13,000 mg/kg (acute dermal - rabbit)
LD50: 16,000 ppm/8hr (inhalation - rat) **Mutagenicity:** Not Indicated
LD_{lo} : 5,000 mg/kg (oral - rabbit) **Reproductive Effects**: Not Indicated

Carcinogenicity: Not identified as a carcinogen by OSHO, IARC, or NTP

SECTION 12: Ecological Information

Ecotoxicity: N/A **Environmental Fate:** N/A
Soil Absorption/Mobility: Highly Mobile
Environmental Degradation: Should be removed readily from soils and water by volatilization and biodegradation.

SECTION 13: Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations.
Disposal regulatory Requirements: Follow applicable Federal, state, and local regulations. Consider fuels blending as an alternative to incineration.

SECTION 14: Transport Information

DOT Shipping Name: Isopropanol
DOT Hazard Class: 3
UN ID#: UN 1219
DOT Packing Group: II
DOT Label: Flammable Liquid

SECTION 15: Regulatory Information

RCRA Hazardous Waste Number/ Classification:D001 CERCLA Substance: N/A
HAZARDOUS AIR POLUTANT (CAA): No SARA 311/312 Codes: N/A
SARA Toxic Chemical: Yes, (Strong manufacturing only)
CERCLA Reportable Quantity: 10,000 lbs (Default)

SECTION 16: Other Information

Prepared by: Cumberland Swan
Sources of Information: 29 CFR1910.1000; NIOSH Pocket Guide to Chemical Hazards (1993); Occupational Health Guidelines for Chemical Hazards; NFPA Guide to Hazardous Materials - 10th Edition.

Disclaimer: While reasonable care has been taken to ensure the accuracy and completeness of the information regarding the material described herein, it is the purchaser's responsibility to ensure the suitability of such information as it applies to the purchaser's intended use of the material.

OFF! INSECT REPELLENT II

Date Issued: 27Jan2005 **Supersedes: 03Dec2002**

US MANUFACTURER:
S.C. Johnson & Son, Inc.
Phone: (800) 725-6737
Racine, Wisconsin 53403-2236
Emergency Phone: (866) 231-5406
International Emergency Phone:
(952) 852-4647

CANADIAN MANUFACTURER:
S.C. Johnson and Son, Limited
Phone: (800) 725-6737
1 Webster Street
Brantford, Ontario N3T 5R1
Transportation Emergency:
CANUTEC (collect) (613) 996-6666
Poison Control: (866) 231-5406

HAZARD RATING	HMIS	HAZARD	NFPA
4-Very High	2	Health	2
3-High	4	Flammability	4
2-Moderate	0	Reactivity	0
1-Slight		Special	
0-Insignificant			

DISTRIBUTED IN CANADA BY:
S.C. Johnson and Son, Limited
Phone: (800) 725-6737
1 Webster Street
Brantford, Ontario N3T 5R1

SECTION 1 - PRODUCT IDENTIFICATION

PRODUCT NAME........... OFF! INSECT REPELLENT II
PRODUCT USE............ Insect repellent

UPC	SCJ CODE	QUANTITY	US SIZE	CANADIAN SIZE
62300 01910	1255	12		170 GM

SECTION 2 - INGREDIENT INFORMATION

INGREDIENT	WEIGHT%	EXPOSURE LIMIT/TOXICITY
Butane (CAS# 106-97-8)........................	1-5	800 ppm ACGIH/OSHA TWA
Propane (CAS# 74-98-6)........................	1-5	1000 ppm OSHA PEL , 2500 ppm ACGIH TWA
Isobutane (CAS# 75-28-5)......................	1-5	NOT ESTABLISHED
N,N-Diethyl-m-toluamide (CAS# 134-62-3).......	10-30	NOT ESTABLISHED
Ethanol (CAS# 64-17-5)........................	70-80	1000 ppm ACGIH/OSHA TWA

SECTION 3 - HEALTH HAZARDS IDENTIFICATION (Also See Section 11)

ROUTE(S) OF ENTRY...... Skin contact. Eye contact. Inhalation.
EFFECTS OF ACUTE EXPOSURE:
EYE.................. May cause: Moderate eye irritation.
SKIN................. May cause skin reactions in rare cases.
INHALATION........... None known.
INGESTION............ None known.
MEDICAL CONDITIONS..... None known.
GENERALLY RECOGNIZED
AS BEING AGGRAVATED
BY EXPOSURE

SECTION 4 - FIRST AID MEASURES

EYE CONTACT........... Rinse with plenty of water. If irritation persists, get medical attention.
SKIN CONTACT.......... If reaction occurs, wash skin and seek medical attention.

SECTION 4 - FIRST AID MEASURES (continued)

INHALATION	No special requirements.
INGESTION	Contact nearest poison control center.

SECTION 5 - FIRE AND EXPLOSION INFORMATION

FLASH POINT	< 20°F (< -7°C) (TCC) (propellant)
FLAMMABLE LIMITS	Not available.
AUTOIGNITION TEMPERATURE	Not available.
EXTINGUISHING MEDIA	Foam. CO2. Dry chemical. Water fog.
SPECIAL FIREFIGHTING PROCEDURES	Fight fire from maximum distance or protected area. Cool and use caution when approaching or handling fire-exposed containers. Fire fighters should wear self-contained breathing apparatus and protective clothing.
UNUSUAL FIRE AND EXPLOSION HAZARDS	Aerosol product - Containers may rocket or explode in heat of fire.

SECTION 6 - PREVENTIVE RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Eliminate all ignition sources. Dike large spills. Absorb with oil-dri or similar inert material. Sweep or scrape up and containerize.

SECTION 7 - HANDLING AND STORAGE

PRECAUTIONARY INFORMATION	WARNING: Harmful if swallowed. Avoid contact with eyes and lips. Do not allow children to rub eyes if hands have been treated . FLAMMABLE: CONTENTS UNDER PRESSURE. Do not use near open fire, flames or heat. Do not puncture or incinerate. Do not store at temperatures above 120 °F (50 °C).
OTHER HANDLING AND STORAGE CONDITIONS	Keep out of reach of children.

SECTION 8 - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION	No special requirements under normal use conditions.
VENTILATION	Not applicable.
PROTECTIVE GLOVES	No special requirements under normal use conditions.
EYE PROTECTION	No special requirements under normal use conditions.
OTHER PROTECTIVE MEASURES	No special requirements.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

COLOR	Clear
PRODUCT STATE	Dispensed as a spray mist.
ODOR	Fragrant
pH	Not applicable.
ODOR THRESHOLD	Not available.
SOLUBILITY IN WATER	Appreciable
SPECIFIC GRAVITY (H2O=1)	0.78
VAPOR DENSITY (AIR=1)	Not available.
EVAPORATION RATE (BUTYL ACETATE=1)	Not available.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES (continued)

VAPOR PRESSURE (mm HG).	Not available.
BOILING POINT..........	Not available.
FREEZING POINT.........	Not available.
COEFFICIENT OF......... WATER/OIL	Not available.
PERCENT VOLATILE BY.... VOLUME (%)	Not available.
VOLATILE ORGANIC....... COMPOUND (VOC)	Not available.
THEORETICAL VOC........ (LB/GAL)	Not available.

SECTION 10 - STABILITY AND REACTIVITY

STABILITY..............	Stable
STABILITY - CONDITIONS. TO AVOID	Excessive heat.
INCOMPATIBILITY........	Avoid contact with: Rubber, Plastic.
HAZARDOUS DECOMPOSITION PRODUCTS	When exposed to fire: Produces normal products of combustion.
HAZARDOUS.............. POLYMERIZATION	Will not occur.
HAZARDOUS.............. POLYMERIZATION - CONDITIONS TO AVOID	Not applicable.

SECTION 11 - TOXICOLOGY INFORMATION (Also See Section 3)

LD50 (ACUTE ORAL TOX)..	Not available.
LD50 (ACUTE DERMAL TOX)	Not available.
LC50 (ACUTE INHALATION. TOX)	Not available.
EFFECTS OF CHRONIC..... EXPOSURE	None known.
SENSITIZATION..........	None known.
CARCINOGENICITY........	None known.
REPRODUCTIVE TOXICITY..	None known.
TERATOGENICITY.........	None known.
MUTAGENICITY...........	None known.

SECTION 12 - ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA.....	Not available.

SECTION 13 - DISPOSAL CONSIDERATIONS

WASTE DISPOSAL......... INFORMATION	If possible, recycle empty aerosol can to nearest steel recycling center. Use up package or give to someone who can.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT INFORMATION.....	Not applicable.

OFF! INSECT REPELLENT II

Date Issued: 27Jan2005 **Supersedes: 03Dec2002**

SECTION 14 - TRANSPORTATION INFORMATION (continued)

CANADIAN SHIPPING NAME.	OFF! INSECT REPELLENT II
TDG CLASSIFICATION.....	Not applicable.
PIN/NIP................	Not applicable.
PACKING GROUP..........	Not applicable.
EXEMPTION NAME.........	Consumer commodity

SECTION 15 - REGULATORY INFORMATION

WHMIS CLASSIFICATION...	Non-regulated.

All ingredients of this product are listed or are excluded from listing on the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

All ingredients in this product comply with the New Substances Notification requirements under the Canadian Environmental Protection Act (CEPA).

This product is not subject to the reporting requirements under California's Proposition 65.

SECTION 16 - OTHER INFORMATION

ADDITIONAL INFORMATION.	NFPA 30B Level 2 Aerosol. PCP NO. 22708
EPA REGISTRATION #.....	4822-380

PREPARATION INFORMATION

PREPARED BY...........	Manufacturer's Technical Support Department. Refer to page 1 (Manufacturer) for contact information.

PRINT DATE: 13Oct2005

Attachment C

Equipment Safety Cards

SAFETY NOW
NO OTHER WAY

AECOM

SAFETY CARD

COMPRESSORS

Objective / Overview:

Compressors should be used with extreme caution in order to prevent personal injury. When using a compressor it's important to follow the manufacturer's instructions to avoid injuring someone or damaging your compressor. Allow only trained, authorized personnel to operate the compressor. Along with training, other safety measures include: proper maintenance of equipment and personal protective equipment.

Safe Operating Guidelines:

Follow manufactures recommended operating instructions, every compressor is not the same. Maintain adequate ventilation. Gas and Diesel powered generators emit carbon monoxide (CO). Never operate a fuel-powered compressor in an enclosed building without proper ventilation. Turn the compressor off to refuel. Gasoline and its vapors may ignite if they come into contact with hot components or an electrical spark, store fuel in a properly designed container in a secure location. Operators shall perform a pre-operational check of all air hoses, couplings, and connections to determine if leakage or other damage exists. Tag unsafe equipment and take out of service immediately. Decompress air from the compressor prior to removing any caps or air equipment attachments such as jackhammers, drills, etc. Keep oil and flammable material clear of air fittings and joints. Make sure connections are secure to avoid a hose coming loose during use. To avoid a shock, make sure that your hands are dry and you're standing in a dry place whenever you operate the compressor. Use only UL-listed, three-prong extension cords. Be sure the extension cord is the proper size (wire-gauge) to handle the electric load that will be plugged into it.

Potential Hazards:

- Burns from contact with the hot muffler or engine
- Shocks/electrocution
- Noise exposure
- Inhaling exhaust gases, CO
- Contact with pressurized air

Training Requirements:

- Review of Applicable SOPs (SH&E 611, *Electrical Safety-Portable Electrical Equipment* & SH&E 618, *Compressed Gasses*
- Demonstrated knowledge on the use of the compressor
- Review of manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Leather Gloves
- Hearing Protection
- Long Sleeve Shirt (e.g., to shield from burns, etc.)

Other Safety Tips:

- Have a Class A:B:C fire extinguisher readily available at all times.

SAFETY CARD

GENERATOR

Objective / Overview:

Portable generators should be used with extreme caution in order to prevent personal injury. When using a portable generator it's important to follow the manufacturer's instructions to avoid injuring someone or damaging your generator or appliances. Allow only trained, authorized personnel to operate the generator. Along with training, other safety measures include: proper maintenance of equipment and personal protective equipment.

Safe Operating Guidelines:

Follow manufacturer's recommended operating instructions, every generator is not the same. Maintain adequate ventilation. Generators emit carbon monoxide (CO). Never operate a generator in an enclosed building without proper ventilation. Turn the generator off to refuel. Gasoline and its vapors may ignite if they come into contact with hot components or an electrical spark, store fuel in a properly designed container in a secure location. To avoid a shock, make sure that your hands are dry and you're standing in a dry place whenever you operate the generator. Turn off equipment and lights supplied by the generator until it is running. Use the right extension cord. Use only UL-listed, three-prong extension cords. Be sure the extension cord is the proper size (wire-gauge) to handle the electric load that will be plugged into it. Make sure the generator is properly grounded prior to each use. If you intend on using a portable generator to tie into the wiring of an existing structure this shall be done only by a licensed electrician.

Potential Hazards:

- Burns from contact with the hot muffler or engine
- Shocks/electrocution
- Noise exposure
- Inhaling exhaust gases, CO

Training Requirements:

- Review of Applicable SOPs (SH&E 611, *Electrical Safety-Portable Electrical Equipment*)
- Demonstrated knowledge on the use of a generator
- Review of manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Leather Gloves
- Hearing Protection
- Long Sleeve Shirt (i.e., to shield from burns, etc.)

Other Safety Tips:

- Have a Class A:B:C fire extinguisher readily available at all times.

SAFETY NOW
NO OTHER WAY

AECOM

SAFETY CARD

PRESSURE WASHERS

Objective / Overview:

High pressure washers can operate up to pressures of 5,000 psi and come in a variety of types ranging from gas operated to electrical. If not used correctly and safely, pressure washers can be a dangerous piece of work equipment. Earth Tech only allows trained, authorized personnel to operate the high pressure washers. Along with training, other safety measures include: reviewing the manufacturers instructional booklet, proper maintenance of equipment, and personal protective equipment.

Safe Operating Guidelines:

The gun valve must always be pointed at the work area, NEVER point the gun valve at yourself or another person. High pressure washers shall be used to clean or decontaminate equipment, surfaces or structures only. High pressure washers WILL NOT be used to clean or decontaminate workers or personal protective equipment while it is being worn. Always set the tripper safety lock when the gun valve is not in use.

Potential Hazards:

- Kickback – Sudden and violent reverse movement of the gun
- Flying debris
- Slips and trips on wet surfaces and hoses
- Exhaust fumes/carbon monoxide (CO) in enclosed spaces
- Severe cuts

Training Requirements:

- Review of Applicable SOPs (SH&E 613, *Pressure Washers*)
- Demonstrated knowledge on the use of a pressure washer
- Review of manufacturers operating guidelines

Personal Protective Equipment (Level D PPE) and:

- Hard hat with faceshield
- Heavy gloves
- Hearing protection
- PVC (or equivalent) rain suit

Other Safety Tips:

- Never fill a pressure washer fuel tank with fuel while the engine is running or if the engine is still hot
- Non-operators must remain a minimum of 25 feet from the operator
- High pressure washing equipment should be cleaned often to avoid dirt buildup, especially around the trigger and guard area
- Always set the trigger safety lock when the gun valve is not in use
- Relieve the pressure in the system before coupling and uncoupling hoses
- Visually inspect the full length of high pressure discharge hose and inspect other high pressure fluid-handling components for abrasions or cuts, damage caused by exposure to chemicals and for damage caused by kinks in the hose

SAFETY NOW NO OTHER WAY

AECOM

SAFETY CARD

UTILITY KNIVES / RAZORS

Objective / Overview:

Utility knives serve a variety of purposes at worksites, and can be a useful tool, when used safely and correctly. Learning proper positioning and correctly using a utility knife will drastically reduce the potential of cut related injuries.

Safe Operating Guidelines:

Always be sure that knives are sharp and not dull. A dull blade will require more force to cut, increasing the likelihood of slipping. Be sure to blade is seated in the frame of the knife correctly, closed, and fastened together properly. Always keep body parts away from the cut line, (e.g., fingers), and ensure that the material being cut is on firm ground and not against a body part (cutting rope against your leg). Always pull the knife, never push the knife (the blade may break, and momentum could cause the body to come into contact with broken blade). Always retract the blade when not in use.

Potential Hazards:

- Lacerations from direct contact with the blade
- Lacerations from blade breaking or shattering
- Ergonomics

Training Requirements:

- Review of Applicable SOPs (SH&E 610, *Hand and Power Tools*)
- Demonstrated knowledge on the safe use of a utility knives
- Review and follow manufacturers operating guidelines for specialized or unusual knives.

Personal Protective Equipment (Level D PPE) and:

- Cut resistant gloves (Kevlar, thick leather, etc.).

Other Safety Tips:

- Purchase safety equipped utility knives with guarding or automatically retracting blades
- Replace dull blades – When knife begins to tear rather than cut, it is a good indicator the blade is dull.
- Always wear a cut resistant glove on your free hand.
- Always use the right tool for the job – NEVER use the blade as a screwdriver or prying tool.
- When using a knife to cut thicker materials, use several passes. Increased force on the blade can cause it to stray from the intended cut path, or break the blade.
- When changing blades, always handle from the non-sharp side. Cover blade with duct tape and dispose.
- Use an alternate tool when possible (scissors, wire cutters, etc.)

Utility Knives with Gaurding

Attachment D

Site-Specific Spill Reporting Card

ENVIRONMENTAL RELEASE/SPILL EMERGENCY PROCEDURES

In the event of an environmental release or spill (REGARDLESS OF QUANTITY), the following procedures will be followed:

1. Secure the area and contain the release or spill, if possible.
2. If emergency services are required, call appropriate emergency services numbers to report the quantity and contents of the release or spill.
3. Contact the AECOM Project Manager, Shelly Young, at (406) 896-4582 (office) or (406) 855-0945 (cell) to report the details of the incident.
4. Notify the Site Supervisor/Site Safety Officer, Nancy Gilliland, at (406) 857-2121 (office) or (406) 671-3176 (**cell**) to report the contents and quantity of the release or spill.
5. Notification of the BNSF Representative Dave Smith at (406) 447-2307 (office) or (406) 809-8050 (cell) to report the contents and quantity of the release or spill.
6. Call the AECOM Incident Reporting Line at 800-348-5046 and Dan Schillings at 210-601-4129 to report the incident.
7. If the release or spill meets state, federal or local reporting requirements and AECOM is directed by the BNSF team leaders or the facility team leaders, report the release or spill to the appropriate regulatory agencies (see other side).
8. Provide a written statement summarizing the incident to your Supervisor to be included in the Supervisor's Report of Incident.

REGULATORY AGENCY CONTACT NUMBERS FOR REPORTING CHEMICAL SPILLS AND RELEASES

When a chemical spill or release occurs in Montana, there are a number of reporting and notification requirements that must be followed by the agency or individual responsible for the spill. Therefore, prior to notifying a regulatory agency(s) of a release or spill, the appropriate regulations should be consulted to determine reportable quantities, reporting requirements, scenarios, notification timelines, required documentation and/or agencies to contact. In some cases, reporting or notification of a spill or release to a regulatory agency(s) may not be required.

A list of regulatory agencies and contact numbers is provided below, but is not inclusive of all release or spill scenarios, such as transportation accidents involving hazardous substances, releases to air or releases from oil and gas wells or pipelines. In some cases, several regulations overlap requiring notification to multiple agencies. However, in all cases, the BNSF team leaders or the facility team leaders should be consulted first prior to notification of a regulatory agency.

Agency	Phone #	Examples of When To Call
National Response Center (NRC)	1-800-424-8802	• Releases from a fixed facility that exceed the RQ for that specific chemical (per SARA Title III List of Lists); immediate verbal notification • Releases of petroleum products and certain hazardous substances listed under the Federal Clean Water Act (40CFR Part 116) • Releases of hazardous substances from regulated storage tanks in excess of RQ (40 CFR Part 302.6); report within 24 hours
Montana Department of Environmental Quality (MDEQ) 24-hr Emergency Response Phone Number	406-841-3911	• Releases from a fixed facility that exceeds the RQ for that specific chemical (per SARA Title III List of Lists); immediate verbal notification followed by written • Release of hazardous waste stored in tanks at RCRA permitted facilities and large quantity generators greater than one pound; written notification within 30 days • Releases of any chemical, oil, petroleum product, sewage, etc., no matter how small, which may enter waters of the state (including surface water, ground water and dry gullies or storm sewers leading to surface water); immediate verbal notification; written notification within 5 days • Releases of petroleum products and certain hazardous substances listed under the Federal Clean Water Act (40CFR Part 116)
Glacier County Local Emergency Management Coordinator	406-873-2084 Spill Phone: 911 Mr. Jim King	• Petroleum releases of 25 gallons or more (or that cause a sheen on nearby surface waters) from regulated storage tanks; verbal notification within 24 hours • Releases of hazardous substances from regulated storage tanks in excess of RQ (40 CFR Part 302.6); report within 24 hours • After-hours contact the MDEQ's Emergency Spill Reporting Line
MDEQ Duty Officer:	406-444-0379	

Attachment E

BNSF Safety Checklist

BNSF SAFETY CHECKLIST

Basic RR Training Requirements

- Federal Railroad Administration (FRA) On-Track training
- BNSF Contractor Safety Orientation
- Enrollment in e-RailSafe (unless site is exempted)
- Web-based BNSF MOW/On-Track training (typically provided by AECOM). Additional BNSF training may be required for engineering work or work on the tracks (hi-rail inspections).

Project Managers/Task Managers (before fieldwork)

1. Verify that all subcontractors are approved by AECOM (SQFs, Insurance, etc.).
2. Prepare project-specific Health and Safety Plan (HASP) that includes completed Job Hazard Analysis/Task Hazard Analysis (JHA/THA), auditing program, and BNSF-specific safety protocols (Maintenance of Way {MOW}) as an appendix. MOW can also be maintained at the project site as a separate document.
3. Prepare and submit electronic Safety Action Plan (SAP) at www.contractororientation.com. Print hard copies for file, for field supervisor, and for submittal to the BNSF environmental representative.
4. Confirm who the primary site contact will be (e.g., Roadmaster, Yardmaster, Water Service Foreman) and communicate with that person to discuss track protection needs prior to mobilizing to the site. Track protection shall only be provided by a BNSF Maintenance of Way (MOW) rules-qualified employee.
5. If intrusive drilling or excavation work is planned, arrange a buried utility locate via the state one-call system. Also contact Railroad's Communications Network Control Center at (800) 533-2891, BNSF signal, communications, and water service. Contact the primary BNSF environmental contact and site contact to discuss if others need to be contacted for a subsurface locate.
6. Verify that field supervisor has, and will use on a daily basis, the Field Job Safety Briefing Documentation card. The Project Manager should review the card information with the field supervisor as necessary.
7. Ensure that all AECOM and subcontractor personnel are compliant with FRA and BNSF On-Track training requirements. Client-specific training requirements include:
    - FRA/On-Track training
    - e-RailSafe
    - BNSF Contractor Safety Orientation

Site Supervisors (during fieldwork)

1. Conduct initial project safety meeting by reviewing the HASP and the JHA/THA with all AECOM and subcontractor field personnel assigned to the project. If track protection is being provided by a flagman, then the BNSF Employee in Charge (EIC) must lead the safety discussion regarding track protection. Daily safety meetings may be combined with daily job safety briefings provided by BNSF personnel.
2. Ensure all on-site personnel have the proper personal protective equipment (e.g., steel toed boots, hard hat, safety glasses, and reflective vests meeting ANSI level II or III orange work wear). Confirm with BNSF personnel at the facility any specific requirements on color of hard hat and reflective vest. **Note: new BNSF rules for slip resistant winter boots.**
3. Verify on-site, prior to conducting work that all AECOM and subcontractor personnel have with them proof of having fulfilled the required FRA and BNSF safety training requirements.
4. Attend job briefing presented by the BNSF EIC and ensure all attendees complete their copy of the Field Job Safety Briefing Documentation Card (attached).

Attachment F

Daily Job Briefing Field Documentation Card

DAILY JOB BRIEFING FIELD DOCUMENTATION CARD (MANDATORY)

After a job briefing, these questions regarding FRA On-Track safety must be understood by the entire field crew who will be working within 25 feet of active railroad tracks. The AECOM representative must verify that all field crew members have proof of being current with their FRA and client-specific On-Track training requirements.

1. Who is the Employee-In-Charge (**not us – must be railroad rules qualified**)
   ____
2. What type of On-Track safety/track protection do I have on the tracks I am working on
   ____
3. Is this type of protection appropriate for the type of work that I am performing
   ____
4. If heavy equipment or other personnel are involved in the work, how will it affect my work and safety
   ____
5. What type of On-Track safety do I have, if any, on adjacent tracks
   ____
6. When clearing the track, where is my designated place of safety
   ____
7. What are the track limits of my protection (reference Mile posts, Cross Streets, or Named Tracks)
   ____
8. What is the time limit of my track protection
   ____
9. Where can I find FRA and client-specific On-Track safety rules
   ____
10. Do I understand my On-Track safety and feel that I am adequately protected against trains and on track equipment
    ____
11. What is the speed limit in the authorized work zone (and adjacent tracks, if applicable)
    ____

Speed in MPH	Distance in Feet	Speed in MPH	Distance in Feet
5	110	20	1,100
10	220	55	1,210
15	330	60	1,320
20	440	65	1,430
25	550	70	1,540
30	660	75	1,650
35	770	80	1,760
40	880	85	1,870
45	990	90	1,980

Attachment G

Underground Cable Location & Acknowledgement Form

BNSF Railway
Underground Cable Location & Acknowledge

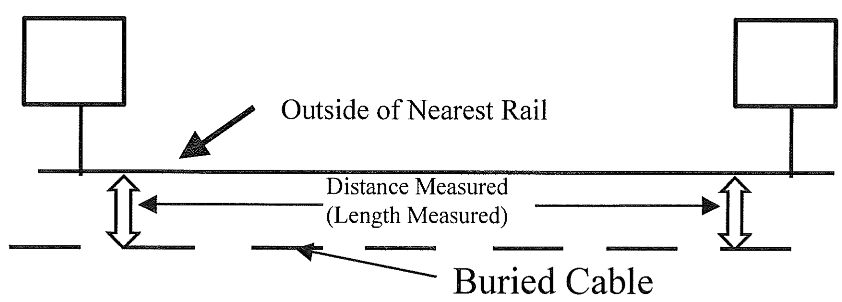
Date: ________________ Project: ________________

Meeting Location: ______________________ Time: _______________

Attendees at proposed work-site (Signature of representative)

- ❑ BNSF Signal ____________________
- ❑ Grading Contractor _______________
- ❑ Project Inspector ____________________
- ❑ Flag person on duty _______________

No grading will be permitted in this area without this completed form in the possession of the above.



To: _________
Next Station

This area has been marked or cleared for grading.

To ________

Notes:

All signal cables must be marked with paint and flags (as ground conditions permit) prior to any grading.

____

____

____

____

____

____

____