Environment

Submitted to:
[Client Name]
[City, State]

Submitted by:
AECOM
Fort Collins, Colorado
60190166
January 21, 2011

Vapor Intrusion Investigation Work Plan
BNSF Former Tie Treatment Plant
Somers, Montana
Final

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Final

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1.0 Introduction

1.1 Project Objectives and Scope of Work

This work plan describes the vapor intrusion sample investigation at the BNSF Railway Company (BNSF) Former Tie Treatment Plan in Somers, Montana. The work plan has been prepared by AECOM Environment (AECOM) on behalf of BNSF. The preparation of this work plan was required by the United States Environmental Protection Agency (USEPA) and Montana Department of Environmental Quality (MDEQ) in a USEPA December 3, 2010 email to BNSF and a subsequent conference call among USEPA, MDEQ, BNSF and AECOM on December 6, 2010. USEPA, in consultation with the Agency for Toxic Substances and Diseases Registry (ATSDR) and MDEQ, provided a recommendation to expeditiously collect vapor intrusion data from five residences located between 512 and 544 Somers Road. ATSDR also recommended that this investigation include the use of field screening instrumentation in the crawl space, basements, and residential space to make real time decisions.

BNSF conducted a soil and groundwater investigation in November 2010 according to the *Final Work Plan for Additional Data Collection*, dated October 22, 2010, prepared for BNSF and approved by USEPA and MDEQ (Agencies) on October 18, 2010. The results from that investigation showed the presence of naphthalene and benzene, toluene, ethyl benzene, xylenes (BTEX) in soil and groundwater collected from borings and wells. During quarterly groundwater monitoring sampling events at the site, methane in groundwater was detected as part of monitored natural attenuation sampling. As a result of these sampling events, the Agencies have requested that a vapor intrusion investigation be conducted at five residences located on Somers Road. The investigation will include collecting air/vapor samples from soil gas, crawl spaces and living spaces.

The purpose of the vapor intrusion investigation is to determine whether contaminants in soil or groundwater may be migrating, as vapors, into the indoor air of the five residences being tested. The process used to evaluate the potential for vapor intrusion and evaluate the indoor air quality will follow the procedures specified in USEPA guidance (USEPA, 2002).

BNSF has asked AECOM to lead the vapor intrusion investigation. AECOM is working closely with GSI and CTEH. As experienced indoor air scientists, GSI will provide input to work plan development and will assist with onsite sampling. CTEH will lead the onsite Hapsite monitoring work.

1.2 Work Plan Organization

This work plan is organized as follows: Chapter 2.0 presents background information related to the proposed investigation. Chapter 3.0 describes field investigations and procedures, including data quality objectives. Chapter 4.0 describes the Quality Assurance Project Plan. Chapter 5.0 presents pertinent Health and Safety information for the investigation. Chapter 6.0 summarizes report preparation, Chapter 7.0 discusses the project schedule and references are located in Chapter 8.0.

2.0 Site Background

2.1 Previous Related Investigations

A series of investigations have been conducted at the Somers Site since 1984, several of these within the area between the former CERCLA lagoon and monitoring wells S-91-2 and S-84-15. These investigations were conducted at the direction of USEPA and the results are summarized in the following sections, along with the results of sampling completed in 2009 and 2010 by consultants retained by nearby landowners.

2.1.1 Phase I, Phase II, and Phase III Remedial Investigations

In March 1984, BNSF initiated a series of remedial investigations at the Somers site at the direction of USEPA. 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 in the area of the former CERCLA lagoon included:

- Additional waste sampling and analysis
- Installation of 15 new groundwater monitoring wells at nine locations
- Three rounds of groundwater sampling

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.

Test pits CTP-2, CTP-3, and CTP-4 as well as monitoring wells S-88-1 and S-88-2 were installed in 1988 downgradient of the CERCLA lagoon and within approximately 100 feet of the five residences located between 512 and 544 Somers Road (**Figure 2-1**). **Table 2-1** summarizes the results collected during the Phase III investigation at these locations. Test pits CTP-5 and CTP-6 and monitoring well S-88-3, also installed in 1988, are included in **Figure 2-1**.

2.1.2 Remedial Design Investigation Results 1991

Investigations were conducted in 1991 at the direction of USEPA as part of the remedial design study conducted for the site in 1991 (RETEC 1991) in part to further characterize the extent of contamination at the site. In 1991, thirteen soil borings were drilled downgradient from the CERCLA lagoon to a depth of 25 to 30 feet below ground surface (ft bgs) and were designated with CB (**Figure 2-1**). Nine piezometers and two wells also were installed and were designated with CP or CW, respectively. The location of these wells and piezometers in the downgradient CERCLA lagoon area also are shown in **Figure 2-1**.

Creosote staining was observed in borings CB-1, CB-3, CB-4, CB-5, and CB-6 from 6 to 11 feet below grade. Creosote odor was noted in borings CB-1 through CB-6 and in CB-8 through CB-11 in this same horizon. This staining and odor was generally associated with a sandy lens. Another area of contamination in which an odor described as resembling a "magic marker" odor was observed (occurred in borings CB-10 through CB-13 from depths of approximately 15 to 22 feet in CB-10, 17 feet in CB-11, 22 to 32 feet in CB-12, and 17 to 30 feet in CB-13). The subsurface soils appeared to become more sandy at these depths between borings CB-9 to CB-13. No staining was observed in this horizon. Samples collected from the borings were analyzed for PAH in the soil with TCLP extract being analyzed on a subset of these samples. A summary of analytical results taken from samples obtained from CB-1 to CB-13 is included in **Table 2-2**.

2.1.3 Abel and Ortiz Investigation Results 2009

Applied Water Consulting, LLC (AWC) installed four direct push borings on behalf of owners (Mr. Ortiz and Mr. and Mrs. Abel) of properties located on Somers Road east of the Somers Site (AWC 2010). Borings were designated with an O or an A (**Figure 2-1**). One soil sample was collected from each borehole within the saturated zone. One groundwater sample also was collected from each borehole by using temporary wells in each borehole. The samples were submitted for extractable petroleum hydrocarbon (EPH) screen analysis; fractionation was performed when the EPH screen result exceeded 200 milligrams per kilogram (mg/kg) for soil or 500 micrograms per liter (µg/L) for groundwater. The samples also were analyzed for semi-volatile organic compounds (SVOCs) by EPA Method 8270C. Sample results (detected compounds only) are included, as reported by AWC in January 2010 (AWC 2010a), in **Table 2-3** (soil) and **Table 2-4** (groundwater).

2.1.4 BNSF Additional Data Collection Results 2010

Additional activities 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 were conducted in October and November 2010 at the direction of USEPA. Activities were conducted per the Work Plan for Additional Data Collection (2010 Work Plan) dated October 22, 2010 (AECOM 2010). Two monitoring well clusters (S-10-1 and S-10-2) were installed as identified in **Figure 2-1**. Three monitoring wells were installed at each location: a shallow well screened across the water table, a deep well screened at the bottom of the boring, and an intermediate depth well installed midway between the shallow and the deep wells. Borings were installed using hollow stem auger (HSA) drilling with the deep borings drilled to 70 and 75 feet below ground surface (ft bgs) for wells S-10-1D and S-10-2D, respectively.

Soil samples were collected continuously from the ground surface to the bottom of the boring. Soil samples from borings S-10-1D and S-10-2D were screened with a PID and sheen tests, and were described using the United Soil Classification System. Soil samples were collected from the intermediate S-10-1I well from 8.5 to 9.5 ft bgs and from 10 to 11 ft bgs based on evidence of creosote impacts (i.e., dark staining or hydrocarbon odors) above the groundwater table. Separate phase product was observed in S-10-1 split spoon soil samples above and below the water table.

Groundwater samples were collected from all six wells following well development. Samples were analyzed for total and carcinogenic polycyclic aromatic hydrocarbons (TPAH and CPAH, respectively) by USEPA Method 8270-SIM, phenols by USEPA Method 8270, and zinc by USEPA Method 6020. Results are shown in **Table 2-5** (soil) and **Table 2-6** (groundwater).

The S-10-1 and S-10-2 series wells also were included in the quarterly sampling event conducted in December 2010. Samples were analyzed for PAH, phenols, and zinc. Samples collected from S-10-1S and S-10-2S also were analyzed for VOC compounds by EPA method 8260. Laboratory analytical reports are included in **Appendix A**. The data have not yet been validated.

2.1.5 Applied Water Samples 2010

AWC was present during the activities conducted under the 2010 Work Plan to represent Mr. Ortiz and Mr. and Mrs. Abel. AWC was provided a sample from well S-10-1S from a depth of 8.5 to 9.5 ft bgs. The sample was submitted for EPH screen and SVOC analysis by EPA Method 8270, zinc by EPA Method 6010, and percent moisture. A summary of the AWC split sample soil results (detected compounds only), as reported in the AWC letter to USEPA dated November 29, 2010 (AWC 2010b), are included in **Table 2-7**. AWC also collected a split groundwater sample from well S-10-1S. The sample was analyzed for EPH screen by EPA Method 8015, EPH fractionation by Massachusetts EPH Method, petroleum hydrocarbons-volatile (VPH) by Massachusetts VPH Method, and SVOCs by EPA Method 8270. A summary of the AWC split sample groundwater results (detected compounds only) as reported by AWC are included in **Table 2-8**.

2.1.6 Groundwater Sampling Results October 2010

At the direction of USEPA, groundwater monitoring has been conducted quarterly following shut-down of the groundwater recovery and treatment system in October 2007 as required in the approved Revised Interim Monitoring Plan submitted to the Agencies in October 2009. Sample results from the October 2010 event were submitted to the Agencies on January 10, 2011 in the Somers Progress Report for September through November 2010 and are provided in this sample collection plan because they represent the most recently reported groundwater sampling results for the site. A summary of the October 2010 event is provided below.

The extraction wells, injection wells, and wells S-88-1, S-88-2, S-88-3, and S-93-5S were gauged for creosote accumulation in the well casings on October 8, 2010. There was no measurable accumulation of creosote in any of the monitored wells. With the exception of one-hundreths of a foot measurement in well S-10-1S on November 8, 2010, no measurable creosote has been measured in any site monitoring wells since shut down of the recovery system in 2007. No measureable creosote was gauged in this well during the December 2010 sampling event. Emulsified creosote has been observed in wells S-88-2 and S-93-5S during past sampling events.

Sitewide groundwater elevations for the October 2010 event were measured on October 4, 2010. **Figure 2-2A** through **Figure 2-2D** present the potentiometric surface maps for December 2009 and March, May, and October 2010, the previous four quarterly monitoring events that have been reported.

Quarterly groundwater samples were collected from plume stability and natural attenuation network wells on October 6 and 7, 2010, and were sent to Pace Analytical Services, Inc. in Minneapolis, Minnesota, or to Microseeps in Pittsburgh, Pennsylvania, for analysis. Analytical results from the plume stability wells are presented in **Table 2-9**. **Table 2-10** includes analytical results for the natural attenuation wells. **Table 2-11** includes the field parameters measured during sample collection. Analytical data were validated and the tables have been amended with data qualifiers based on data validation results. Compounds identified in samples below the practical quantitation limit, or reporting limit, of the analytical method are reported as estimated and flagged with a “J” due to uncertainty in the reported concentrations.

2.1.6.1 Plume Stability Parameters

Samples collected from both the plume stability network and the natural attenuation network were analyzed for the constituents of concern (COC) for the site which includes phenols, PAH compounds, and zinc. Wells also were sampled for total suspended solids. The plume stability network includes one well near the former recovery area (S-88-1), six wells located downgradient of the former recovery area (S-84-15, S-84-16, S-85-6a, S-85-6b, S-88-3, and S-91-2), and two wells that monitor the proposed small technical impracticability (TI) area (S-85-5a and S-85-5b). Downgradient well S-6, near the northern corner of the proposed large TI area, was not sampled because the well was dry or contained an insufficient volume of water to sample. Source area well S-88-2 was not sampled due to the presence of emulsified creosote observed in the purge water. Results from downgradient wells showed all concentrations below the cleanup levels. While the results from downgradient wells were below the ROD cleanup levels , concentrations in S-91-2 have exceeded the IMP contingency level (1/2 of the concentration of the ROD cleanup level) established by USEPA which has resulted in resampling this well several times during the IMP.

Three sets of nested wells (S-85-5a and S-85-5b, S-85-6a and S-85-6b, and S-84-15 and S-91-2) are included in the monitoring network to monitor the potential for vertical migration of COCs. Starting in December 2009, wells S-85-5a and S-85-5b have only been sampled for zinc. The other nested wells were non-detect for phenols with the exception of S-88-3 and S-91-2 (total phenols of 668 µg/L and 3,140 µg/L respectively). In nested wells S-85-6a and S-85-6b, PAH compounds were non-detect in the duplicate sample collected from S-85-6b but were reported at a concentration of 0.236 µg/L in S-85-6a and at an estimated concentration of 0.024 µg/L in S-85-6b. In nested wells S-84-15 and S-91-2, PAH compounds were reported at estimated concentrations of 0.057 µg/L and 2.85 µg/L, respectively.

Shallow well versus deeper well concentrations at nested locations were consistent with historic concentrations and indicate no evidence of vertical migration of COCs at the well nests. The phenol detections in S-91-2 are consistent with historical sampling results at this well.

The field blank sample collected from the plume stability network was non-detect for phenolic and PAH compounds.

2.1.7 Natural Attenuation

October 2010 results from the natural attenuation network include three upgradient (S-85-7, S-85-8a, and S-85-8b), two source area (S-93-2S and S-93-2D), and three downgradient wells (S-85-6a, S-85-6b, and S-88-3). Samples were analyzed for natural attenuation parameters including nitrate, sulfate, ferrous iron, methane, and oxygen concentrations. Natural attenuation network wells also were sampled for plume stability parameters; plume stability results are discussed in the preceding section. Field readings of temperature, conductivity, pH, dissolved oxygen (DO), and oxidation/reduction potential (ORP) were recorded during sample collection. Source well S-93-5S was not sampled due to the presence of emulsified creosote in water purged from the well.

In general, geochemical data obtained during the October 2010 sampling event provide evidence that natural attenuation via intrinsic organic contaminant biodegradation is occurring. Observations specifically related to methane are provided below:

- Methane concentrations were lowest in the upgradient wells, ranging from 500 µg/L (S-85-7) to 18,000 µg/L (S-85-8a), with an average concentration of 6,490 µg/L. Concentrations in source area wells ranged from 16,000 µg/L (S-93-2S) to 23,000 µg/L (S-93-2D), with an average concentration of 19,500 µg/L. The downgradient wells exhibited a greater overall methane concentration with individual wells ranging from 25,000 µg/L (S-88-3) to 30,000 µg/L (S-85-6b), with an average concentration of 26,833 µg/L. This pattern is similar to the pattern that has been observed in previous sampling events and indicates significant methanogenic microbial activity within and downgradient of organic constituent source areas. The elevated methane concentrations in the downgradient wells could be the result of methane production due to decaying vegetation near the marshy land north of the lake. The data suggest that methanogenesis is the primary metabolic pathway for intrinsic biodegradation.

2.2 Residential Building Survey

The USEPA and MDEQ conducted an initial survey of the five residences on December 12 and December 13, 2010. The results of this survey were recorded on survey forms located in **Appendix A**. Only one residence (544 Somers) had a full live-in basement with a partial concrete subslab. However, the basement was recently expanded by approximately six feet and the subslab has currently not been poured on the floor of the addition. USEPA and MDEQ have indicated that subslab sampling will not be necessary as no houses have full concrete slab basements.

The remaining four homes are raised wood frame homes with dirt floor crawl spaces below each home. The crawl spaces are all accessible from outside the homes access and are approximately 40 inches deep. Three of these four residences have small “closet-size” cellars between 4 and 6 feet below ground surface that can be accessed through the inside of the home. The home at 528 Somers was recently remodeled and the cellar can no longer be accessed from inside the home. It was not investigated whether a cellar exists in this home or can be accessed through the crawl space.

3.0 Field Investigations and Procedures

3.1 Analytical Methods/Data Quality Objectives

The Data Quality Objective (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. According to USEPA guidance (2000), the DQO process consists of seven steps; the output from each step influences the choices that will be made later in the process. The steps for vapor intrusion sample collection at the Somers site are as follows:

Step 1: State the Problem

Recent investigations 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. These contaminants of concern are not present as a result of surface deposition but are present as a result of contaminant migration with groundwater. Constituents in groundwater, including methane, naphthalene and BTEX compounds (as well as other less volatile creosote constituents) may migrate upward as vapors through the unsaturated zone soil into the crawl spaces and/or the indoor air of houses situated over the groundwater. Based on the above observations, USEPA, in consultation with the ATSDR and MDEQ, provided a recommendation to expeditiously collect vapor intrusion and soil gas data from five residences located between 512 and 544 Somers Road.

Step 2: Identify the Decision

Principal Study Question: Evaluate whether volatile constituents in groundwater, including but not limited to methane, naphthalene and BTEX compounds (as well as other less volatile creosote constituents) may migrate upward as vapors through the unsaturated zone soil into the crawl spaces and/or the indoor air of houses situated over the groundwater. Based on this principal study question, the following alternative actions have been developed:

Alternative Action (1): Recommend that no additional investigation be conducted and that the existing groundwater monitoring network be used to gauge potential migration of volatile constituents in subsurface soils; or

Alternative Action (2): Recommend additional data collection efforts to determine if volatile constituents in groundwater are migrating upward as vapors through the unsaturated zone soil into the crawl spaces and/or the indoor air of houses situated over the groundwater.

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 Vapor Intrusion Investigation Work Plan (2011 Work Plan) are sufficient to evaluate whether volatile constituents in groundwater may migrate upward as vapors through the unsaturated zone soil into the crawl spaces and/or the indoor air of houses situated over the groundwater. Data collected from this study will be incorporated into the larger site dataset and evaluated to determine whether vapor intrusion of volatile contaminants and methane from groundwater exists and, if so, is it a human health and safety concern.

Step 3: Identify the Inputs to the Decision

The data inputs currently include indoor air and soil gas samples (using both Methods TO-15 and TO-17, photo ionization detectors (PID) and the Hapsite portable GC/MS), the concentration of contaminants in

groundwater and subsurface soils, contaminants in ambient air monitoring, the results of the building surveys, and potential additional samples to be collected after the first set of samples.

Step 4: Define the Study Boundaries

The study boundaries include the area surrounding the five residences proposed for indoor air samples as well as the area outside of the residences that will be used to collect ambient upwind and downwind samples. Historical groundwater data are available from the Somers site wells. Lithology and PID measurements also are available from the recently completed well construction logs and depth discrete soil samples were taken during well construction.

Currently, one sampling event is proposed in this work plan. A determination as to whether an additional sampling event is necessary will be made after review of data from the current investigation.

Step 5: Develop a Decision Rule

For this study, indoor air results will be compared with USEPA Region 9 Regional Screening Levels (2010) using 1×10^{-5} or other applicable screening level. To determine whether vapor intrusion of subsurface volatiles is occurring, and if so, is a potential health and safety concern, multiple lines of evidence will be evaluated including:

1. Location of residences relative to groundwater and soil analytical results and field chemistry measurements from historic and future investigations;
2. Distribution of COPCs within the residences (main floor concentrations vs. basements/crawl space indicate indoor or sub-slab source?);
3. Identification of indoor sources of COPC vapors (e.g., consumer chemical products, etc.) based upon chemical product inventory, real-time air monitoring using the HAPSITE device, a PID, indoor air grab samples, and/or emission chamber sampling;
4. Concentrations of COPCs in indoor air compared to soil gas depth interval samples (shallow subsurface vapor levels sufficiently high to explain indoor vapor concentrations?);
5. Composition of COPCs present in indoor air compared to composition of COPCs present in soil gas and groundwater;
6. Concentrations of COPCs in indoor air compared to ambient air (indoor air levels comparable to ambient, suggesting ambient source?);
7. Correlation of fixed gas (oxygen, carbon dioxide, etc.) concentrations to soil gas composition at each depth interval to identify whether biodegradation is occurring (methane and petroleum hydrocarbon vapor concentrations diminishing in proximity to ground surface);
8. Comparison of COPCs in indoor air in living spaces to USEPA Region 9 Regional Screening Levels (RSL) using 1×10^{-5} or other applicable screening level, if there is evidence of vapor intrusion.
9. Comparison of COPC levels detected in indoor air to background indoor air quality distributions reported in national and local surveys of indoor air quality (i.e., indoor air background based on peer-reviewed published literature values).

Related to decision rule number 9, above, EPA (2002) guidance states that “indoor air sampling results can be misleading because it is difficult and sometimes impossible to eliminate or adequately account for contributions from “background” sources. The guidance goes on to state that “it is critical to consider the presence of background concentrations in assessing the vapor intrusion pathway”. EPA guidance recommends that “vapors attributable to background sources be accounted for during the “Site Specific Assessment” to properly assess the potential risks posed by exposures via the vapor intrusion pathway. Likewise, the Interstate Technology Council’s (ITRC, 2007) notes that background contributions of

chemicals can exceed health-based target concentrations. The guidance states that "if measured indoor air concentrations are greater than the screening levels, it is necessary to assess whether the measured chemical concentrations are due to subsurface vapor intrusion, interior background sources, or ambient outdoor air". Therefore, additional investigations will be conducted in 2011 to support future site decisions.

If data collected during the upcoming field investigation indicate that the indoor air quality is affected by the COCs in groundwater, additional indoor air samples may be collected or mitigation measures may be implemented as appropriate to reduce vapor intrusion effects to levels posing no unsafe exposure. If mitigation measures are implemented, additional indoor air samples may be collected to verify the success of the mitigation measures.

If data collected during the upcoming field investigation do not indicate that indoor air quality is affected by COCs in groundwater, additional work may include, but not be limited to follow up vapor intrusion sampling to confirm initial indoor air and soil vapor sampling results.

Step 6: Specify Tolerable Limits on Decision Errors

To mitigate the potential for false and/or false negative errors associated with field sampling, sample collection procedures will be consistent with established Project Operating Procedures and following the calibration and internal quality control procedures specified for methods TO-15 and TO-17. This includes initial and continuing calibration, collection of duplicate samples (and subsequent comparison to primary samples using relative percent difference (RPD) statistics), implementing decontamination procedures, and, for TO-17, the collection of field blanks.

For laboratory analysis of samples, quality assurance/quality control (QA/QC) steps (such as the use of laboratory initial and continuing calibration verification, internal standards, method blanks, control samples, and duplicates) will be consistent with QA/QC procedures specified for methods TO-15 and TO-17 and will be consistent with established and relevant procedures outlined in **Appendix C** of this 2011 Work Plan.

Step 7: Optimize the Design

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 among the Agencies, BNSF and its representatives, and existing data needs.

3.1.1 Chemicals of Potential Concern Identification

USEPA and MDEQ requested that the 16 polycyclic aromatic hydrocarbons specified in the ROD that have a residential indoor air screening level, BTEX, all volatile organic compounds analyzed using the TO-15 method and methane be sampled for analysis. This investigation also includes the use of field screening instrumentation in the crawl space, basements/root cellars, and residential space to make real time decisions.

As discussed with USEPA and MDEQ on December 21, 2010, BNSF plans to sample the full TO-15 list of compounds to evaluate the family of compounds detected in indoor air compared to the compounds that may emanate in vapors from the groundwater table. Method TO-17 also will be used to analyze indoor air, ambient air, crawl space, and soil gas. The list of analytes for TO-17 includes five COPCS of which one (naphthalene) has a RSL (Table 3-3). This work plan proposes to compare the remaining four COPC concentrations analyzed in soil gas and basement air with groundwater concentrations and with other data collected and evaluated according to the Decision Rules listed in Section 3.1.

3.1.2 Analytical Method

Indoor air, crawl space, soil gas, and ambient air samples will be collected by AECOM on behalf of BNSF and analyzed for USEPA Method TO-15 and TO-17. The TO-15 method is reliable for more volatile compounds, and TO-17 is more applicable to the less volatile compounds. TO-15 samples are collected with Summa canisters and TO-17 samples are collected with tubes containing absorbent material. The Summa canisters are prepared prior to arrival at the site with a laboratory-set vacuum for vapor collection. Onsite sampling pumps are used to collect samples for TO-17 analysis. The sample canisters and tubes are then packaged and shipped to the laboratory for GC/MS analysis.

In addition to the collection of samples for laboratory analysis, each sampling location will be field screened for the presence of the aforementioned COPCs and methane gas. Field screening for COPCs will be accomplished by using a Hapsite portable GC/MS. CTEH will provide air monitoring services with assistance from GSI, while AECOM personnel collect indoor air samples.

Survey method (MS only mode) will be used as 1) a screening tool to potentially identify background sources of COPCs; and 2) to aid in the selection of locations where representative air samples will be collected for laboratory analysis. Appendix D contains the Standard Operating Procedure for the Hapsite monitor and includes calibration techniques.

In addition to using the HAPSITE, real-time air monitoring instrumentation will be used to screen for the COPCs. The term “real–time” refers to direct reading instruments that allow nearly instantaneous determinations of airborne chemical concentrations. RAE Systems, Inc. ppbRAE and MultiRAE PIDs will be used to measure indoor airborne concentrations of total volatile organic compounds (VOCs). The MultiRAE will be equipped with chemical sensors for oxygen and methane as the lower explosive limit (LEL). Readings above 100 ppm and/or methane levels above the LEL on a PID field instrument should warrant prompt consultation with the Agencies for mitigative follow-up actions.

3.2 Sample Collection Method/Locations

Indoor air, crawl space, soil gas and ambient air samples will be collected by AECOM and CTEH on behalf of BNSF at five residences along Somers Road. **Table 3-1** presents the air sampling specifications. Proposed RSLs and required reporting limits for Method TO-15 and TO-17 analyses are provided in **Tables 3-2** and 3-3, respectively. Samples will be collected in accordance with the AECOM’s Investigation of Vapor Intrusion Standard Operating Plan and CTEH’s SOP for the Hapsite monitor located in **Appendix D**. A Sample Collection Record Form is provided in **Appendix E**.

The analytical laboratory that will be used for analysis of TO-15 and TO-17 samples is Columbia Analytical Services of Kelso, Washington. The laboratory will provide all necessary Summa canisters and tubes used for sampling. Each six-liter Summa canister will be obtained from the laboratory, individually certified 100 percent clean to the project-specified detection limit, fitted with a vacuum gauge, and evacuated to create a vacuum pressure of 30 inches of mercury (goal of 30 inches corrected to site elevation, or approximately 26 inches of mercury). The prepared canisters will be fitted with laboratory-calibrated flow controllers (with built-in particulate filter) to collect samples at a constant flowrate (<200 milliliters per minute) over a sampling duration of approximately 30 minutes for soil gas samples. For indoor air, basement/crawl space, and ambient air sample collection, sample duration will be 24 hours.

TO-17 samples will be collected using an approximate flow rate of 10-15 ml/min. The pumps will be calibrated in the field. Two pumps are planned to be used to collect time-integrated samples, i.e., one pump will collect a sample over an approximate 12 hour period such that approximately 4 liters of air are collected. A second tube will be set up with a pump timed to collect a sample over the second 12 hour period for another 4 liters of air.

Based on the initial survey of the residences on December 12 and December 13, 2010, conducted by the USEPA and MDEQ (**Appendix B**), the residence located at 544 Somers Road has a basement with a partial concrete floor, and the other four residences (512, 520, 528, and 536 Somers Road) have each been constructed with a crawl space and dirt floor basements. Indoor air samples will be collected from the basement/crawl space and first floors of the five residences. USEPA and MDEQ stated that sub slab samples were not necessary from 544 Somers Road as the basement has only a partial concrete slab.

Prior to collecting vapor intrusion samples, AECOM will conduct a survey of each of the five residences to determine whether there are potential indoor sources of contaminants commonly found in and around a residence, such as gasoline, paints, paint thinners, certain building materials, glues, cleaning products, etc. Contaminants in indoor air may originate from inside the residence/garage or may be located just outside the residence or in the crawl space. Therefore, prior to sampling, a residential building survey will be completed to identify potential household sources found in and around the residence, in addition to details related to the building's construction (i.e., construction characteristics, heating and ventilation systems, basement/crawl space depth, presence of moisture in the crawl spaces/dirt basements, etc.). A residential building survey form is presented in **Appendix E**. More details on the building surveys are provided later in the work plan. The Hapsite monitor will be used to screen the air inside the houses at the same time the building survey is completed to establish locations for the TO-15 and TO-17 sample collection devices.

3.2.1 Indoor Air Sampling Locations

Indoor air sampling will be conducted in each of the five residences. The location of each residence is shown on **Figure 2-1**. Samples will be collected from two sampling locations in each residence (for TO-15 and TO-17 analysis). Attempts will be made to collect one sample from the kitchen area or other common living area and one sample from the bathroom of each residence. The samples will be collected from a typical breathing height which is approximately 3 to 5 feet above the floor. Hapsite GC/MS monitoring and PID measurements also will be used to help further refine sampling locations.

The occupants of the residences will be asked to maintain closed homes and not openly ventilate the home in the 24 hours prior to sampling.

3.2.2 Crawl Space/Dirt Floor Basement Sampling

Crawl space samples will be collected from the four residences with a crawl space over the same period as the indoor air and soil gas samples are collected. Crawl space samples, indoor air samples and soil gas samples will be collected from a single residence on the same day. Crawl space samples will be collected near the center of each building just above the bottom of the floor (approximately 2 to 3 feet from the floor). The air samples from the home with the combined dirt/concrete floor (544 Somers) also will be collected similar to the methods for the living area sampling approach (3 to 5 feet above the floor) in the area of the dirt floor basement with the highest vertical clearance (or lowest elevation) with a sample collected in the basement bedroom as well for a total of two samples.

3.2.3 Soil Gas Sampling

Soil gas samples will be collected during the same period as the other samples are collected. The soil gas vapor probes will be installed on Day 1 and soil gas samples will either be collected on Day 1 or Day 2. The indoor air and crawl space (TO-15 and TO-17) samples will be started on Day 1. On Day 2, the soil gas samples (if collected on Day 2) will be collected immediately following end of the TO-15 and TO-17 sample collection. In addition, fixed gases (oxygen, carbon dioxide, nitrogen and methane) will be collected to evaluate the biodegradation of these compounds from the water table to the crawl space/dirt floor basements. The fixed gases will be collected utilizing a gas chromatography/thermal conductivity detector instrument per ASTM 1946. The soil gas and fixed gas samples will be collected with soil gas probes placed at the center of the building at two depths depending on the depth to groundwater. The first depth will be approximately 2 feet below the bottom of the crawl space and the second depth will be

4 feet below the bottom of the crawl space with the intent of collecting of soil gas sampling points 3 feet and 5 feet above the water table ensuring that the deeper sample is about one foot above the shallow water table capillary fringe (based on the December 2010 groundwater level measurements made in wells near the residences). The purpose of the two soil gas samples is to show how detected COPC concentrations vary with distance above the water table. Depth to groundwater will control the soil gas sample depth below the houses.

The soil gas probe construction will follow the Investigation of Soil Vapor Intrusion Pathway SOP in **Appendix D**. Leak testing will be performed as described in Appendices D and F. Soil gas probes will be driven to final sampling depths with a hammer drill or similar hand tooling. A typical soil gas probe construction consists of a 6-inch long (or less) stainless steel screen. The permanent probes will be attached to 1/8 inch (outside diameter) Teflon or Nylon tubing that will extend to the ground surface. Each screen will be vertically centered within a standard sand pack (20/40). The sand pack will be covered by dry granular bentonite, which will then be covered with hydrated granular bentonite to make a seal. Depths of the soil gas probes may be modified due to site conditions; thicknesses of the bentonite layers may be modified to ensure that the screen is installed in the sand pack and covered by sufficient hydrated bentonite to construct a proper seal (e.g., 6 to 12 inch sand pack followed by hydrated bentonite to ground surface). Each of the soil gas sampling probes will be constructed in separate boreholes. The Teflon or Nylon tubing lines will be clearly marked at the ground surface to denote the corresponding screen interval depth. Each tube will be fitted with a Swagelok cap to seal the top of the tubing at the ground surface to eliminate the potential for barometric pressure fluctuations to induce vapor transport between the subsurface and the atmosphere. The soil gas sample points will be installed approximately 1 to 24 hours prior to soil gas sample collection. Prior to collecting a soil gas sample, the dead volume of air in the Teflon or Nylon tube and the sand pack will be purged using a Summa canister or Tedlar bag dedicated for purging only. The soil gas sampling points will be left in place, pending property owner consent, to allow for later access for sampling, if necessary.

3.2.4 Ambient Air Sampling

To characterize site-specific outdoor air contaminants near the residences and provide an outdoor air quality baseline to which subsurface sources are additive, two ambient air samples will be collected simultaneously with the indoor air and crawl space sampling.

Ambient air samples will be collected from one representative upwind location and one location downwind for each day of indoor air sample collection. The wind direction will be determined at the start of the day. Wind direction also will be monitored throughout the day at approximate 4 hour intervals to track any potential changes in wind direction. The ambient air sampling stations will remain intact for the 24 hour period of indoor air sampling. One duplicate ambient air sample will be collected. All ambient air samples will be located away from wind obstructions as much as possible and located away from resident activities. The samples will be collected from a typical breathing height, approximately 3 to 5 feet above the ground and 5 to 15 feet away from the nearest residence.

The methods for collecting ambient air samples will be consistent with crawl space sampling and indoor air sampling.

3.2.5 Chemical Product Inventory and HAPSITE Monitoring

At each property, an inventory will be prepared of household consumer chemical products (e.g., cleaning solvents, deodorizers, sealants, adhesives and removers, degreasers, lubricants, motor fuels, etc.) that are present within the building or ancillary structures. The name of the product, label information regarding its chemical composition, and its storage location will be noted, and photographs will be taken at each location. For this purpose, the sampling team will require access to interior storage areas, such as closets, cabinets, drawers, etc. See **Appendix E** for the survey form.

Chemical products that are suspected sources of vapor emissions will be tested using the Hapsite real-time air monitor to facilitate collection of an off-gas sample. Based on label information, the products containing either site-specific COCs or more generally identified sources of VOCs (e.g., aromatic hydrocarbons, petroleum distillates, volatile organic compounds, etc.), will be identified as potential sources of site COCs or related chemicals. BNSF will not ask residents to remove products stored in the houses because that would create a condition not representative of the normal condition in the houses. Onsite agency personnel will be consulted for input when determining the final locations of the Summa canisters and sampling tubes.

3.2.6 VOC Groundwater Sample Collection

During a conference call between the Agencies and BNSF, the Agencies requested that two of the newly installed groundwater wells (S-10-1S and S-10-2S) be sampled during the next quarterly sampling event for volatile organic compounds (VOC). The wells were sampled during the week of December 13, 2010, and submitted to the laboratory for VOC analysis by Method 8260. The laboratory analytical results are presented in Appendix A.

3.3 Meteorological Measurements

During all soil gas, crawl space, and ambient air sampling, meteorological data will be obtained. The purpose of collecting meteorological data is to identify atmospheric conditions that could influence sampling results. Meteorological data include: current conditions (i.e., raining, windy, etc.), air temperature, barometric pressure, barometric pressure trend, relative humidity, degree of cloudiness, wind speed and direction, and rainfall information (recent events). Meteorological data will be obtained from the nearest weather station at the Glacier International Airport in Kalispell . Portable hand-held devices also will be used to determine meteorological conditions. In addition, surface soil conditions (presence of standing water, wet soil, irrigation activities, etc.) and groundwater elevations (from the December groundwater sampling event) will be documented.

3.4 Surveying

Detailed field notes will be recorded into a field notebook describing the locations for each sampling point and when appropriate, photographs will be taken of the sampling locations. Appendix D contains an SOP for recording of field data.

4.0 Quality Assurance Project Plan

All samples will be carefully collected and handled to assure that data quality standards are met and that samples collected during the field activities closely represent the actual field conditions. This section discusses the following quality assurance/quality control (QA/QC) requirements:

- Field documentation;
- Decontamination;
- Calibration procedures and frequency;
- QC samples and collection procedures; and
- Sample handling procedures.

4.1 Field Documentation

Information pertinent to the field investigation will be recorded in a bound field logbook. The front of the field logbook will be labeled with the following information:

- Person or organization to whom the book is assigned;
- Project name and number;
- Start date; and
- End date.

Data will be recorded in the field logbook in a legible manner. All logbook entries will contain accurate and detailed documentation of daily project activities. Entries in the logbook will include the following, as applicable:

- Site identification;
- Location and sampling points;
- Description of sampling points;
- References to photographs of the field activities;
- Sample identification number;
- Number of samples collected;
- Date of sample collection;
- Time of sample collection;
- Reference to sample location map;
- Collector's name;
- Field observation;
- Number of QA/QC samples collected;
- Sample distribution (i.e., QA laboratory, agency split, etc.); and
- All field measurements made (i.e., temperature, etc.).

The field logbook will be maintained during all times when any investigation-related field activities are in progress. Photographs may be taken to provide visual evidence of significant items or anomalies

discovered during the investigation. The photographs will be referenced appropriately in the field logbook.

4.2 Decontamination

Any sampling equipment including the soil gas probes will be cleaned using Alconox wash and distilled water rinse prior to use if not received clean from the supplier.

4.3 Calibration Procedures and Frequency

Field-testing equipment to be used for analytical determinations at the site fall into two categories: those calibrated by the manufacturers and those calibrated on a scheduled, periodic basis. Measuring and testing equipment will be calibrated at prescribed intervals and/or prior to use. All field-sampling instrumentation that requires calibration will be calibrated at the beginning of each day and when conditions indicate that more frequent calibration is required. Summa canister calibration procedures are described in **Appendix C**.

Equipment will be calibrated using reference standards or accepted values of natural physical constants. If national standards do not exist, the basis for calibration will be documented. Field equipment calibration will be performed as described in the manufacturer's literature for each instrument. Equipment that fails calibration or becomes inoperable during use will be removed from service and either segregated to prevent inadvertent use or tagged to indicate it is out of calibration.

4.4 Quality Control Samples and Collection Procedures

Field duplicates will be obtained from at least 10 percent of the samples. For Method TO-15, field duplicates will be collected with a splitter and second Summa canister. For Method TO-17, field duplicates will be obtained using a splitter to connect two sampling tubes to one sampling pump. A field blank will also be collected for TO-17 analysis.

4.5 Sampling Handling Procedures

A brief summary of field sample handling procedures, including chain-of-custody, shipping, and laboratories, is presented below. The use of felt-tipped or other potential VOC-containing pens to label the sample containers will be avoided

4.5.1 Chain-of-Custody Procedures

Chain-of-custody records will be completed and enclosed with the appropriate samples. . These will designate the transfer of custody and method of shipment. All pertinent information (e.g. sample identification, sampling date, time and sample volume, etc.,) will be included on the Chain of Custody form that is submitted with the samples.

4.5.2 Sample Shipment

For TO-15 samples, containers will be packed so as to protect from breakage and shipped in their original shipping boxes. Each box will be sealed with chain-of-custody tape so that any opening of the box during shipment will be indicated. For TO-17 samples, sample tubes will be carefully packed in a cooler containing frozen blue ice packs and will be shipped to the laboratory using an overnight courier service. If unable to ship the samples back to the laboratory that day, the samples will be stored in sealed containers at 4 degrees Celsius.

4.5.3 Laboratory

The analytical laboratory that will be used for indoor air, crawl space, soil gas and ambient air sampling using EPA Methods TO-15 and TO-17 is Columbia Analytical Services of Kelso, Washington.

5.0 Health and Safety

A HASP has been developed for the Somers site. The HASP is reviewed annually and updated as needed. The HASP (**Appendix G**) 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) prepared for tasks expected during the vapor intrusion sample activities are included as **Appendix G** to this work plan. A safety briefing will be held at the start of each field day.

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. Orange vests also will be worn when working around moving vehicles or near public roads.

The atmosphere of the crawl spaces and basements will be monitored with a PID and oxygen meter prior to entry. One person will remain at the entry of the crawl spaces and basements to monitor the personnel conducting sampling activities and to monitor the breathing zone of the samplers.

Below is a list of general safety guidelines that will be followed during the 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.
- Access will be arranged with both the property owner and the occupants of the home. Safety issues, such as aggressive dogs, will be discussed and precautions will be taken to allow safe access to the homes during sampling activities
- All personnel are empowered to stop work activities if a deviation from planned activities occurs or if an unsafe condition is present.
- Utility locates will be conducted prior to the installation of the soil gas sampling probes.

5.1 Access Agreements

Owners and occupants of the properties where monitoring will be conducted will be contacted sufficiently in advance to allow time for obtaining access. BNSF and AECOM will use reasonable efforts to obtain written access agreements from the property owners for the purpose of sampling. Agreements shall ensure access for AECOM and their authorized representatives. If AECOM is unable to obtain access within 7 days of approval of this work plan by USEPA, BNSF shall notify USEPA in writing of the failure to obtain access, and the efforts made to obtain it.

If BNSF is unable to obtain access under reasonable terms and conditions where USEPA has determined it to be necessary for carrying out the work under this VI 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.

5.2 Data Collection-Derived Waste Management

Waste material may be generated during the field work including decontamination water, sampling tubing, PPE, or packaging. All generated materials will be removed from the homes. Waste materials generated during field activities are not expected to be hazardous, thus will be disposed of with municipal trash.

6.0 Report Preparation

Following the completion of the field investigation and receipt of the laboratory results, the field and laboratory data will be validated and screened against USEPA's Region 9 RSL for residential air using the 1 x 10^{-5} risk levels or other applicable screening level if an RSL isn't available for a particular COPC.

Upon completion of the data validation and evaluation, the results of this investigation will be presented in a report, which will include:

- Site description
- Field activities and procedures
- Laboratory analytical results
- Evaluation of decision rules:
    1. Location of residences relative to groundwater and soil analytical results and field chemistry measurements from historic and future investigations
    2. Distribution of COPCs within the residences (main floor concentrations vs. basements/crawl space indicate indoor or sub-slab source?);
    3. Identification of indoor sources of COPC vapors (e.g., consumer chemical products, etc.) based upon chemical product inventory, real-time air monitoring using the HAPSITE device, a PID, indoor air grab samples, and/or emission chamber sampling;
    4. Concentrations of COPCs in indoor air compared to soil gas depth interval samples (shallow subsurface vapor levels sufficiently high to explain indoor vapor concentrations?);
    5. Composition of COPCs present in indoor air compared to composition of COPCs present in soil gas and groundwater;
    6. Concentrations of COPCs in indoor air compared to ambient air (indoor air levels comparable to ambient, suggesting ambient source?);
    7. Correlation of fixed gas (oxygen, carbon dioxide, etc.) concentrations to soil gas composition at each depth interval to identify whether biodegradation is occurring (methane and petroleum hydrocarbon vapor concentrations diminishing in proximity to ground surface);
    8. Comparison of COPCs in indoor air in living spaces to USEPA Region 9 Regional Screening Levels using 1 x 10^{-5} or other applicable screening level.
    9. Comparison of COPC levels detected in indoor air to background indoor air quality distributions reported in national and local surveys of indoor air quality (i.e., indoor air background based on peer-reviewed published literature values).

The report will present the above information using tables and figures as appropriate. Supporting documents, such as laboratory analytical reports, sample collection records, HAPSITE monitor results, photographs, etc., also will be included in the report. The draft report will be submitted to the Agencies 30 days after receipt of final laboratory data.

7.0 Schedule

The schedule for vapor intrusion sample collection as described in this plan is as follows:

- Finalize Draft Sample Collection Plan and submit to Agencies on December 23
- Receive comments on plan and revise to Agencies by January 14
- Receive Agency approval on plan
- Mobilize to the site 2 weeks after Agency approval of plan (assuming property access agreements have been obtained prior to agency approval of plan)
- Onsite building surveys and air sampling is expected to require 3 to 4 days to complete.
- Final laboratory data is expected to be received within 3 weeks of submittal of samples to the laboratory.
- A draft report will be submitted to the Agencies within 30 days of receipt of final laboratory data.
- A final report will be submitted to the Agencies within 14 days of receipt and discussion of Agency comments with the Agencies on the draft report.

8.0 References

AECOM. 2010. Final Work Plan for Additional Data Collection, Former Tie Treatment Plant, Somers, Montana, August.

Applied Water Consulting, LLC (AWC). 2010a. Preliminary Subsurface Investigation Report for the Ortiz and Abel Properties in Somers, Montana. Somers, Montana. January 2010.

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ITRC. 2007. Vapor Intrusion Pathway: A Practical Guide. Interstate Technology and Regulatory Council, Vapor Intrusion Team. January.

USEPA. 2010. Region 9. Regional Screening Level Summary Table. Available online at: http://www.epa.gov/region9/superfund/prg/index/html. November.

USEPA. 2002. Draft Guidance for Evaluating Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. November 29, 2002.

USEPA. 2000. Guidance for Data Quality Assessment, Practical Methods for Data Analysis, EPA QA/G9, QA00 Update. July.

Tables

Table 2-1 1988 CERCLA Lagoon (Downgradient) Test Pits and Wells, BNSF Somers Site, Somers, Montana

Boring No.:	CTP-2	CTP-2	CTP-3	CTP-4	CTP-5	CTP-5 Dup	CTP-6	S-88-1	S-88-1	S-88-1	S-88-1	S-88-2	S-88-2 Dup	S-88-2	S-88-2	S-88-2	S-88-2	S-88-3
Sample Depth (ft):	6-8	11-12	9-10	8-9	7-9	8-9	8-10	15-17	19-21	27-29	37-39	11-13	11-13	15-17	23-25	33-35	37-39	53-55
Sample Date:	5/10/1988	5/10/1988	5/10/1988	5/10/1988	5/10/1988	5/10/1988	5/10/1988	5/11/1988	5/11/1988	5/11/1988	5/11/1988	5/12/1988	5/12/1988	5/12/1988	5/12/1988	5/12/1988	5/12/1988	6/11/1988
Soil Concentration (mg/kg)																		
Phenol	< 25	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	5.4	38	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
2-Methylphenol	< 25	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	4.0	J 11	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
4-Methylphenol	< 25	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	13	40	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
2,4-Dimethylphenol	< 25	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	5.2	J 14	< 0.88	1.2	1.8	< 0.84	< 0.89	J 0.75	< 0.88	1.5
Naphthalene	240	2000	J 0.14	730	520	940	460	60	3.4	J 6.9	< 0.88	5.1	1.4	< 0.84	J 0.27	J 0.59	< 0.88	3.7
2-Methylnaphthalene	200	780	< 0.76	420	230	440	210	J 14	J 0.31	< 24	< 0.88	1.9	J 0.38	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Acenaphthylene	< 25	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	< 0.85	< 24	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Acenaphthene	86	360	< 0.76	160	140	240	110	J 7.2	J 0.18	< 24	< 0.88	0.92	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
4-Nitrophenol	J 1.6	< 700	< 3.8	< 240	< 210	< 480	< 150	110	< 4.2	120	< 4.4	< 4.2	< 4.2	< 4.4	< 4.4	< 4.0	< 4.4	< 4.1
Dibenzofuran	46	200	< 0.76	88	80	160	70	J 5.2	< 0.85	< 24	< 0.88	J 0.49	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Fluorene	39	200	< 0.76	83	87	170	68	< 23	< 0.85	< 24	< 0.88	J 0.44	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Phenanthrene	62	360	< 0.76	130	170	300	150	J 12	J 0.29	< 24	< 0.88	0.9	J 0.2	< 0.84	J 0.2	< 0.80	< 0.88	< 0.82
Anthracene	J 15	120	< 0.76	J 39	48	85	37	< 23	< 0.85	< 24	< 0.88	J 0.21	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Fluoranthene	27	140	< 0.76	54	81	140	69	< 23	< 0.85	< 24	< 0.88	J 0.39	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Pyrene	J 20	120	< 0.76	J 42	58	100	48	< 23	< 0.85	< 24	< 0.88	J 0.33	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Benzo(a)anthracene	J 5.7	< 140	< 0.76	< 47	< 42	< 96	J 11	< 23	< 0.85	< 24	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Chrysene	J 6.6	< 140	< 0.76	< 47	< 42	< 96	J 13	< 23	< 0.85	< 24	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Benzo(b)fluoranthene	J 3.7	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	< 0.85	< 24	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Benzo(k)fluoranthene	J 4.3	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	< 0.85	< 24	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Benzo(a)pyrene	< 25	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	< 0.85	< 24	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Indeno(1,2,3-cd)pyrene	< 25	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	< 0.85	< 24	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Dibenz(a,h)anthracene	< 25	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	< 0.85	< 24	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82
Benzo(g,h,i)perylene	< 25	< 140	< 0.76	< 47	< 42	< 96	< 31	< 23	< 0.85	< 24	< 0.88	< 0.84	< 0.85	< 0.84	< 0.89	< 0.80	< 0.88	< 0.82

Notes:

J - Estimated concentration

Values in table obtained from Table 4-1 of the Remedial Investigation and Feasibility Study for the Somers Tie Plant (Remediation Technologies Inc., April 1989)

Table 2-2 May 1991 CERCLA Lagoon (Downgradient) Borings, BNSF Somers Site, Somers, Montana

Boring No.:	CB-1	CB-1	CB-1	CB-2	CB-2	CB-2	CB-3	CB-3	CB-3	CB-4	CB-4	CB-4	CB-5	CB-5
Sample Depth (ft):	5	10	30	5	10	25	10	15	20	5	10	15	10	15
Sample Date:	5/10/1991	5/10/1991	5/10/1991	5/10/1991	5/10/1991	5/13/1991	5/13/1991	5/13/1991	5/13/1991	5/15/1991	5/15/1991	5/15/1991	5/15/1991	5/15/1991
Soil Concentration (mg/kg)														
Naphthalene	0.017	44	0.054	0.021	0.070	0.038	< 120	3.4	0.091	0.024	< 120	11	< 120	15
Acenaphthylene	< 0.027	12	< 0.027	< 0.03	< 0.03	< 0.03	< 170	< 3.0	< 0.03	< 0.03	< 170	< 15	< 170	< 15
Acenaphthene	< 0.020	15	< 0.020	< 0.02	< 0.02	< 0.02	< 300	4.5	< 0.02	< 0.02	< 300	< 10	< 300	< 10
Fluorene	< 0.0021	7.8	< 0.0021	< 0.003	< 0.003	< 0.003	8.0	2.8	< 0.003	J 0.002	17	1.8	17	1.9
Phenanthrene	J 0.006	J 21	J 0.0033	J 0.012	< 0.003	J 0.0044	27	J 6.8	J 0.0047	J 0.019	56	J 5.6	65	J 6.1
Anthracene	< 0.00077	3.8	< 0.00077	0.0015	< 0.001	< 0.001	6.3	1.2	< 0.001	0.0027	7.3	0.77	9.6	0.89
Fluoranthene	0.014	21	0.01	0.028	0.0050	< 0.012	9.3	6.5	< 0.013	0.036	33	4.8	16	5.2
Pyrene	J 0.0092	J 4.7	J 0.0016	J 0.019	J 0.0028	J 0.0012	J 9.3	J 1.6	J 0.0015	J 0.026	J 11	J 1.2	13	1.5
Benzo(a)anthracene	J 0.0022	J 1.1	< 0.0013	J 0.0056	J 0.0026	< 0.002	J 3.0	J 0.36	< 0.002	J 0.0073	< 5	< 1.0	J 2.9	< 1.0
Chrysene	J 0.0059	J 1.6	J 0.0048	J 0.0099	J 0.0035	< 0.0025	J 2.4	0.43	< 0.002	J 0.016	J 2.3	< 1.0	J 2.5	< 1.0
Benzo(b)fluoranthene	J 0.0066	J 0.90	J 0.022	J 0.015	J 0.0077	J 0.029	< 8	J 0.31	J 0.033	J 0.019	< 8	< 1.5	< 8	< 1.5
Benzo(k)fluoranthene	J 0.0027	J 0.60	J 0.0019	J 0.0079	J 0.0041	< 0.001	< 5	J 0.20	< 0.001	J 0.0064	< 5	< 0.5	< 5	< 0.5
Benzo(a)pyrene	J 0.0030	J 0.60	J 0.0011	J 0.0068	J 0.0060	< 0.001	< 5	0.20	< 0.001	J 0.012	< 5	< 0.5	< 5	< 0.5
Dibenz(a,h)anthracene	J 0.0014	< 0.81	< 0.0022	J 0.0021	< 0.003	< 0.003	< 8	< 0.30	< 0.003	< 0.003	< 8	< 1.5	< 8	< 1.5
Benzo(g,h,i)perylene	J 0.0023	< 1.7	< 0.0045	J 0.012	J 0.0051	< 0.008	< 20	< 0.80	< 0.008	J 0.031	< 20	< 4.0	< 20	< 4.0
Indeno(1,2,3-cd)pyrene	J 0.0026	< 1.3	< 0.0034	0.0059	J 0.0032	< 0.005	< 10	< 0.50	< 0.005	0.014	< 10	< 2.5	< 10	< 2.5
TCLP Concentration (mg/l)														
Naphthalene	NA	1.3	NA	NA	NA	0.0022	NA	NA	NA	NA	2.1	NA	NA	NA
Acenaphthylene	NA	0.24	NA	NA	NA	< 0.0005	NA	NA	NA	NA	0.33	NA	NA	NA
Acenaphthene	NA	J 0.34	NA	NA	NA	< 0.001	NA	NA	NA	NA	0.43	NA	NA	NA
Fluorene	NA	0.15	NA	NA	NA	J 0.00008	NA	NA	NA	NA	0.2	NA	NA	NA
Phenanthrene	NA	0.27	NA	NA	NA	0.00025	NA	NA	NA	NA	0.31	NA	NA	NA
Anthracene	NA	0.026	NA	NA	NA	< 0.0001	NA	NA	NA	NA	0.028	NA	NA	NA
Fluoranthene	NA	0.062	NA	NA	NA	0.00024	NA	NA	NA	NA	0.074	NA	NA	NA
Pyrene	NA	J 0.018	NA	NA	NA	J 0.00007	NA	NA	NA	NA	0.024	NA	NA	NA
Benzo(a)anthracene	NA	< 0.005	NA	NA	NA	< 0.0001	NA	NA	NA	NA	< 0.005	NA	NA	NA
Chrysene	NA	< 0.005	NA	NA	NA	< 0.0001	NA	NA	NA	NA	< 0.005	NA	NA	NA
Benzo(b)fluoranthene	NA	< 0.005	NA	NA	NA	< 0.0001	NA	NA	NA	NA	< 0.005	NA	NA	NA
Benzo(k)fluoranthene	NA	< 0.005	NA	NA	NA	< 0.0001	NA	NA	NA	NA	< 0.005	NA	NA	NA
Benzo(a)pyrene	NA	< 0.005	NA	NA	NA	< 0.0001	NA	NA	NA	NA	< 0.005	NA	NA	NA
Dibenz(a,h)anthracene	NA	< 0.005	NA	NA	NA	< 0.0001	NA	NA	NA	NA	< 0.005	NA	NA	NA
Benzo(g,h,i)perylene	NA	< 0.025	NA	NA	NA	< 0.0005	NA	NA	NA	NA	< 0.025	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	< 0.005	NA	NA	NA	< 0.0001	NA	NA	NA	NA	< 0.005	NA	NA	NA

Notes:

J - Estimated concentration

NA - Not Analyzed

Values in table obtained from Appendix A, Table 3-2 of the Remedial Design Investigation Report for the Somers Tie Plant (Remediation Technologies Inc., December 1991)

Table 2-2 (Continued) May 1991 CERCLA Lagoon (Downgradient) Borings, BNSF Somers Site, Somers, Montana

Boring No.:	CB-5	CB-5 Dup	CB-6	CB-6	CB-6	CB-7	CB-7	CB-7	CB-8	CB-8	CB-8	CB-9	CB-9	CB-9
Sample Depth (ft):	20	20	10	15	20	10	15	30	10	15	30	10	15	20
Sample Date:	5/15/1991	5/15/1991	5/15/1991	5/16/1991	5/16/1991	5/16/1991	5/16/1991	5/16/1991	5/17/1991	5/17/1991	5/17/1991	5/16/1991	5/16/1991	5/16/1991
Soil Concentration (mg/kg)														
Naphthalene	0.10	0.13	< 120	0.8	0.024	< 0.015	< 0.015	< 0.015	0.056	< 0.015	< 0.015	0.088	0.74	0.63
Acenaphthylene	< 0.030	< 0.03	< 170	< 0.3	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.035
Acenaphthene	< 0.020	< 0.02	< 300	< 0.2	< 0.02	< 0.02	< 0.03	< 0.02	0.075	< 0.02	0.021	0.26	0.064	0.065
Fluorene	< 0.003	< 0.003	J 0.89	0.46	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.16	0.012	0.003
Phenanthrene	J 0.0046	J 0.0066	J 3.4	J 1.2	J 0.007	J 0.003	J 0.0034	J 0.0038	J 0.037	J 0.0051	J 0.0041	J 0.19	J 0.0057	J 0.0045
Anthracene	< 0.001	< 0.001	< 5	0.20	< 0.001	< 0.001	< 0.001	< 0.001	0.01	< 0.001	< 0.001	0.016	< 0.001	< 0.001
Fluoranthene	< 0.012	0.017	< 10	1.3	< 0.018	< 0.005	< 0.015	< 0.017	0.16	0.016	< 0.015	0.048	0.012	0.015
Pyrene	J 0.0013	J 0.0016	< 5	J 0.38	J 0.0018	J 0.001	J 0.0021	J 0.0023	J 0.097	J 0.0028	J 0.001	J 0.0017	J 0.002	J 0.0016
Benzo(a)anthracene	< 0.002	< 0.002	< 5	J 0.093	< 0.002	< 0.002	< 0.002	< 0.002	J 0.0094	< 0.002	< 0.002	< 0.002	< 0.002	J 0.002
Chrysene	J 0.0022	J 0.0037	< 5	0.10	< 0.002	< 0.0025	J 0.0036	J 0.0036	J 0.018	J 0.0046	J 0.0025	J 0.0017	J 0.0063	J 0.0047
Benzo(b)fluoranthene	J 0.031	J 0.040	< 8	J 0.098	J 0.039	J 0.0066	J 0.031	J 0.027	J 0.0067	J 0.04	J 0.043	J 0.0028	J 0.32	J 0.03
Benzo(k)fluoranthene	< 0.001	< 0.001	< 5	J 0.053	< 0.001	J 0.0011	< 0.001	< 0.001	J 0.0021	< 0.001	< 0.001	J 0.00079	J 0.0017	< 0.001
Benzo(a)pyrene	< 0.001	< 0.001	< 5	0.06	< 0.001	< 0.001	< 0.001	< 0.001	J 0.0025	< 0.001	< 0.001	< 0.001	J 0.0014	< 0.001
Dibenz(a,h)anthracene	< 0.003	< 0.003	< 8	< 0.03	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Benzo(g,h,i)perylene	< 0.008	< 0.008	< 20	< 0.08	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008
Indeno(1,2,3-cd)pyrene	< 0.005	< 0.005	< 10	< 0.05	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TCLP Concentration (mg/l)														
Naphthalene	NA	NA	< 0.005	NA	NA	0.0014	NA	NA	NA	NA	NA	0.0023	NA	NA
Acenaphthylene	NA	NA	0.0075	NA	NA	< 0.0005	NA	NA	NA	NA	NA	< 0.0005	NA	NA
Acenaphthene	NA	NA	0.12	NA	NA	< 0.001	NA	NA	NA	NA	NA	0.0042	NA	NA
Fluorene	NA	NA	0.072	NA	NA	< 0.0001	NA	NA	NA	NA	NA	0.0017	NA	NA
Phenanthrene	NA	NA	0.16	NA	NA	< 0.0001	NA	NA	NA	NA	NA	0.0013	NA	NA
Anthracene	NA	NA	0.014	NA	NA	< 0.0001	NA	NA	NA	NA	NA	J 0.00007	NA	NA
Fluoranthene	NA	NA	0.055	NA	NA	< 0.0001	NA	NA	NA	NA	NA	0.00039	NA	NA
Pyrene	NA	NA	0.022	NA	NA	< 0.0001	NA	NA	NA	NA	NA	< 0.0001	NA	NA
Benzo(a)anthracene	NA	NA	< 0.001	NA	NA	< 0.0001	NA	NA	NA	NA	NA	< 0.0001	NA	NA
Chrysene	NA	NA	< 0.001	NA	NA	< 0.0001	NA	NA	NA	NA	NA	< 0.0001	NA	NA
Benzo(b)fluoranthene	NA	NA	< 0.001	NA	NA	< 0.0001	NA	NA	NA	NA	NA	< 0.0001	NA	NA
Benzo(k)fluoranthene	NA	NA	< 0.001	NA	NA	< 0.0001	NA	NA	NA	NA	NA	< 0.0001	NA	NA
Benzo(a)pyrene	NA	NA	< 0.001	NA	NA	< 0.0001	NA	NA	NA	NA	NA	< 0.0001	NA	NA
Dibenz(a,h)anthracene	NA	NA	< 0.001	NA	NA	< 0.0001	NA	NA	NA	NA	NA	< 0.0001	NA	NA
Benzo(g,h,i)perylene	NA	NA	< 0.005	NA	NA	< 0.0005	NA	NA	NA	NA	NA	< 0.0005	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	< 0.001	NA	NA	< 0.0001	NA	NA	NA	NA	NA	< 0.0001	NA	NA

Notes:

J - Estimated concentration

NA - Not Analyzed

Values in table obtained from Appendix A, Table 3-2 of the Remedial Design Investigation Report for the Somers Tie Plant (Remediation Technologies Inc., December 1991)

Table 2-2 (Continued) May 1991 CERCLA Lagoon (Downgradient) Borings, BNSF Somers Site, Somers, Montana

Boring No.:	CB-10	CB-10	CB-10	CB-11	CB-11	CB-11	CB-12	CB-12	CB-12	CB-12	CB-13	CB-13	CB-13
Sample Depth (ft):	15	20	25	15	20	25	15	25	30	30-Dup	15	30	32
Sample Date:	5/16/1991	5/16/1991	5/16/1991	5/17/1991	5/17/1991	5/17/1991	5/17/1991	5/17/1991	5/17/1991	5/17/1991	5/21/1991	5/21/1991	5/21/1991
Soil Concentration (mg/kg)													
Naphthalene	0.096	0.35	1.0	< 0.015	0.028	0.051	J 0.013	0.018	J 0.014	0.016	< 0.020	0.036	0.05
Acenaphthylene	< 0.03	< 0.03	< 0.035	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.030	< 0.030	< 0.030
Acenaphthene	0.02	< 0.02	< 0.035	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.020	< 0.020	< 0.020
Fluorene	< 0.003	< 0.003	0.0036	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	0.0089	< 0.003
Phenanthrene	J 0.0059	J 0.0044	J 0.011	J 0.0051	J 0.0033	J 0.0047	J 0.0034	J 0.0051	J 0.0043	J 0.0049	< 0.010	J 0.048	J 0.008
Anthracene	< 0.001	< 0.001	< 0.001	J 0.0011	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.0027	< 0.001
Fluoranthene	0.014	0.018	0.022	0.095	J 0.01	0.014	0.0088	J 0.016	0.013	0.017	0.014	0.052	0.021
Pyrene	J 0.0011	J 0.0016	J 0.0019	J 0.0017	J 0.0011	< 0.001	< 0.001	J 0.0019	J 0.0015	J 0.0017	< 0.005	J 0.017	J 0.0036
Benzo(a)anthracene	< 0.002	< 0.002	< 0.002	< 0.003	< 0.002	< 0.002	< 0.002	J 0.0025	< 0.002	< 0.002	< 0.003	J 0.0045	< 0.003
Chrysene	< 0.002	J 0.007	J 0.0079	< 0.002	J 0.0032	J 0.0034	J 0.003	J 0.0081	J 0.0035	J 0.0043	< 0.003	J 0.01	< 0.009
Benzo(b)fluoranthene	J 0.0055	J 0.034	J 0.047	J 0.0031	J 0.019	J 0.03	J 0.0055	J 0.019	J 0.026	J 0.05	0.018	J 0.054	J 0.043
Benzo(k)fluoranthene	J 0.0011	< 0.002	< 0.002	< 0.001	J 0.0012	J 0.0018	< 0.001	< 0.001	J 0.0015	J 0.0019	< 0.001	J 0.0024	J 0.0012
Benzo(a)pyrene	J 0.0008	< 0.002	< 0.002	< 0.001	< 0.001	J 0.0017	< 0.001	< 0.001	J 0.0014	J 0.0027	< 0.003	J 0.0038	J 0.0021
Dibenz(a,h)anthracene	< 0.003	< 0.003	< 0.003	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.003	< 0.003	< 0.005	< 0.005	< 0.005
Benzo(g,h,i)perylene	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.008	< 0.015	< 0.015	< 0.015
Indeno(1,2,3-cd)pyrene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
TCLP Concentration (mg/l)													
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0004	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0005	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.001	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0001	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0001	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.00005	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0001	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0001	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.00005	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.00005	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0001	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.00005	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.00005	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0001	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0005	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	< 0.0001	NA	NA	NA

Notes:

J - Estimated concentration

NA - Not Analyzed

Values in table obtained from Appendix A, Table 3-2 of the Remedial Design Investigation Report for the Somers Tie Plant (Remediation Technologies Inc., December 1991)

Table 2-3 July 2009 Abel and Ortiz Investigation Soil EPH Analytical Results, Somers, Montana

Sample Location: Sample Depth: Collection Date:	O-GP-1 14.5-15.0 7/31/2009	O-GP-2 11.0-12.0 7/31/2009	O-GP-3 15.0-16.0 7/31/2009	A-GP-1 19.0-20.0 7/31/2009	Soil Screening Levels	
EPH (mg/kg)						
EPH Screen	418	27	ND	ND	200	1
C9-C18 Aliphatics	26	NA	NA	NA	1,000	1
C19-C36 Aliphatics	20	NA	NA	NA	5,000	1
C11-C22 Aromatics	202	NA	NA	NA	400	1
TEH	275	NA	NA	NA	5,000	1
SVOC Method 8270C (mg/kg)						
1-Methylnapthalene	8.1	0.7	ND	ND	22	2
2,4-Dimethylphenol	1.7	1.8	0.77	0.49	1,200	2
2-Methylnapthalene	13	1.2	J 0.083	ND	310	2
Acenaphthene	6.1	J 0.3	ND	ND	3,400	2
Acenaphthylene	J 0.14	ND	ND	ND	--	2
Anthracene	1.6	ND	ND	ND	17,000	2
Benzo(a)anthracene	**0.57**	ND	ND	ND	0.15	2
Benzo(a)pyrene	**J 0.18**	ND	ND	ND	0.015	2
Benzo(b)fluoranthene	**J 0.27**	ND	ND	ND	0.15	2
Benzo(k)fluoranthene	J 0.13	ND	ND	ND	1.5	2
Chrysene	J 0.42	ND	ND	ND	150	2
Fluoranthene	3	ND	ND	ND	2,300	2
Fluorene	3.7	ND	ND	ND	2,300	2
Indeno(1,2,3,-cd)pyrene	J 0.08	ND	ND	ND	0.15	2
m+p-Cresol	1.6	0.97	ND	ND	310	2
Napthalene	**31**	**4.3**	1.2	J 0.23	3.9	2
o-Cresol	0.98	J 0.2	ND	ND	3,100	2
Phenanthrene	6.4	ND	ND	ND	--	2
Phenol	J 0.31	ND	ND	ND	18,000	2
Pyrene	2.1	ND	ND	ND	1,700	2
Pyridine	J 0.2	ND	ND	ND	1,500	2

Notes:

TEH - Total extractable hydrocarbons after fractionation
J - estimated value; the analyte was present but less than the reporting limit.
ND - not detected at the reporting limit
NA - not analyzed
1 - DEQ Tier 1 RBSLs for subsurface soil , < 10 ft to groundwater (October 2007).
2 - Regional Screening Level - EPA Region 9 (April 2009).
RBSL - Risk Based Screening Levels
Bold values exceed the exceeds the soil screening level.

Table has been reproduced from January 2010 Applied Water Consulting report.

Table 2-4 July 2009 Abel and Ortiz Investigation Groundwater Analytical Results, Somers, Montana

Sample Location: Collection Date:	O-GP-1 7/31/2009	O-GP-2 7/31/2009	O-GP-3 7/31/2009	A-GP-1 7/31/2009	Groundwater Action Levels	GRC
EPH (ug/L)						
EPH Screen	**196,000**	**49,100**	**3,660**	**3,340**	500 [1]	--
C9-C18 Aliphatics	**16,100**	ND	ND	ND	500 [1]	--
C19-C36 Aliphatics	**7,900**	ND	ND	ND	1,000 [1]	--
C11-C22 Aromatics	**95,100**	**6,940**	563	268	1,000 [1]	--
TEH	**139,000**	**123,000**	**1,260**	956	1,000 [1]	--
SVOC Method 8270C (ug/L)						
1-Methylnapthalene	1,440	109	J 5.7	ND	--	--
2,4-Dimethylphenol	3,160	6,300	212	163	--	--
2-Methylnapthalene	3,260	263	J 1.9	ND	--	--
Acenaphthene	**949**	**J 42**	J 2.1	ND	670 [2]	20
Anthracene	**291**	ND	ND	ND	2,100 [2]	--
Benzo(a)anthracene	**J 92**	ND	ND	ND	0.5 [2]	--
Benzo(a)pyrene	**J 27**	ND	ND	ND	0.05 [2]	--
Benzo(b)fluoranthene	**J 43**	ND	ND	ND	0.05 [2]	--
Benzo(k)fluoranthene	**J 37**	ND	ND	ND	5 [2]	--
Chrysene	**J 74**	ND	ND	ND	50 [2]	--
Fluoranthene	**459**	ND	ND	ND	130 [2]	42
Fluorene	553	ND	ND	ND	1,100 [2]	--
m+p-Cresol	2,200	2,180	89	56	--	--
Napthalene	**14,700**	**5,900**	**269**	92	100 [1]	620
o-Cresol	1,230	205	J 7.9	ND	--	--
Phenanthrene	1,050	ND	ND	ND	--	--
Phenol	202	ND	ND	ND	300 [2]	3,500
Pyrene	337	ND	ND	ND	830 [2]	--
Pyridine	255	ND	ND	ND	--	--

Notes:

Groundwater samples were analyzed for extractable petroleum hydrocarbons (EPH) using the MDEP
TEH - Total extractable hydrocarbons after fractionation
J - estimated value; the analyte was present but less than the reporting limit.
ND - not detected at the reporting limit
NA - not analyzed
ug/L - Micrograms per Liter (parts per billion)
1 - DEQ Tier 1 Risk Based Screening Levels for Groundwater Action Levels (October 2007)
2 - Maximum contaminant level per Circular DEQ-7 (February 2008)
GRC - Groundwater remediation concentrations (EPA, September 27, 1989).
Bold values exceed the exceeds the groundwater screening levels or GRC.

Table has been reproduced from January 2010 Applied Water Consulting report.

Table 2-5 October 2010 Soil Sample Results, BNSF Somers Site, Somers, Montana

Sample Location: Sample Depth (ft): Collection Date:	S-10-1I 8.5-9.5 10/29/10	S-10-1I 10-11 10/29/10	S-10-3R 4-6 10/29/10	Equipment Rinse Blank* 11/07/10	Regional Screening Level
Phenols Method 8270 (ug/kg)					
4-Chloro-3-methylphenol	< 196	< 226	< 204	< 26.3	6,100
2-Chlorophenol	< 196	< 226	< 204	< 5.3	390
2,4-Dichlorophenol	< 196	< 226	< 204	< 5.3	180
2,4-Dimethylphenol	J 231	**3,090**	< 204	< 5.3	1,200
4,6-Dinitro-2-methylphenol	< 1,010	< 1,160	< 1,050	< 26.3	4.9
2,4-Dinitrophenol	< 1,010	< 1,160	< 1,050	< 5.3	120
2-Methylphenol	< 196	1,500	< 204	< 5.3	--
3&4-Methylphenol	< 392	2,520	< 408	< 5.3	--
2-Nitrophenol	< 196	< 226	< 204	< 10.5	--
4-Nitrophenol	< 1,010	< 1,160	< 1,050	< 26.3	--
Pentachlorophenol	< 1,010	< 1,160	< 1,050	< 5.3	0.89
Phenol	< 196	< 226	< 204	< 26.3	18,000
2,4,5-Trichlorophenol	< 1,010	< 1,160	< 1,050	< 12.1	6,100
2,4,6-Trichlorophenol	< 196	< 226	< 204	< 5.3	44
Total Phenols (mg/kg)	0.231	7.11	0	0	--
PAH Method 8270-SIM (ug/kg)					
Acenaphthene (PAH)	2,350	**10,900**	J 7.5	< 0.021	3,400
Acenaphthylene (PAH)	505	222	< 1.1	< 0.021	--
Anthracene (PAH)	1,080	2,580	J 9.2	< 0.021	17,000
Benzo(a)anthracene (CPAH)	**2,200**	**1,010**	< 6.2	< 0.021	0.15
Benzo(a)pyrene (CPAH)	**903**	**372**	< 6.2	< 0.021	0.015
Benzo(b)fluoranthene (CPAH)	**1,410**	**551**	< 0.94	< 0.021	0.15
Benzo(g,h,i)perylene (PAH)	279	117	< 6.2	< 0.021	--
Benzo(k)fluoranthene (CPAH)	**643**	**222**	< 6.2	< 0.021	1.5
Chrysene (CPAH)	**2,050**	**973**	< 6.2	< 0.021	15
Dibenz(a,h)anthracene (CPAH)	**126**	**49.9**	< 6.2	< 0.021	0.015
Fluoranthene (PAH)	**9,310**	**4,470**	23.6	< 0.021	2,300
Fluorene (PAH)	1,060	**6,260**	J 10.4	< 0.021	2,300
Indeno(1,2,3-cd)pyrene (CPAH)	**274**	**118**	< 6.2	< 0.021	0.15
Naphthalene (PAH)	**1,510**	**33,000**	**J 8.6**	J 0.085	3.6
Phenanthrene (PAH)	1,710	11,800	36.3	< 0.021	--
Pyrene (PAH)	**8,730**	**3,450**	15.9	< 0.021	1,700
TPAH (mg/kg)	34.1	76.1	0.112	J 0.085	--
CPAH (mg/kg)	7.61	3.30	0	0	--
Zinc (mg/kg)	0.0458	0.04	0.041	J 0.0013	68,000

Notes:

J - Estimated concentration
ND - Not detected
* - The blank was collected from the split spoon used during drilling activities. Units are in ug/L for phenols and PAHs and mg/L for zinc.
Results reported on a "dry-weight" basis
Regional Screening Level (RSL) - Residential, EPA Region 9 (November 2010)
ROD target cleanup levels: TPAH = 1,875 mg/kg, CPAH = 3.6 mg/kg, phenols = 3,000 mg/kg, zinc = 15,750 mg/kg.

Results exceeding the ROD cleanup levels or RSLs have been bolded.

Table 2-6 November 2010 Groundwater Sample Results, BNSF Somers Site, Somers, Montana

Sample Location: Collection Date:	S-10-1S 11/08/10	S-10-1I 11/08/10	S-10-1D 11/09/10	S-10-2S 11/07/10	S-10-2I 11/07/10	Duplicate S-10-2I 11/07/10	S-10-2D 11/08/10	Equipment Blank 11/07/10	Field Blank 11/07/10
Phenols Method 8270 (ug/L)									
2,4,5-Trichlorophenol	< 515	< 25.1	< 25.6	< 25.5	< 26.3	< 28.1	< 25.4	< 25.1	< 25.6
2,4,6-Trichlorophenol	< 103	< 5.0	< 5.1	< 5.1	< 5.3	< 5.6	< 5.1	< 5.0	< 5.1
2,4-Dichlorophenol	< 103	< 5.0	< 5.1	< 5.1	< 5.3	< 5.6	< 5.1	< 5.0	< 5.1
2,4-Dimethylphenol	**19,500**	**J 5,200**	256	159	**8,850**	**9,550**	726	< 5.0	< 5.1
2,4-Dinitrophenol	< 515	< 25.1	< 25.6	< 25.5	< 26.3	< 28.1	< 25.4	< 25.1	< 25.6
2-Chlorophenol	< 103	< 5.0	< 5.1	< 5.1	< 5.3	< 5.6	< 5.1	< 5.0	< 5.1
2-Methylphenol	5,190	< 5.0	12	< 5.1	< 5.3	< 5.6	< 5.1	< 5.0	< 12
2-Nitrophenol	< 103	< 5.0	< 5.1	< 5.1	< 5.3	< 5.6	< 5.1	< 5.0	< 5.1
3&4-Methylphenol	4,380	J 1,970	44.4	< 10.2	< 10.5	< 11.2	< 10.2	< 10.1	< 10.3
4,6-Dinitro-2-methylphenol	< 515	< 25.1	< 25.6	< 25.5	< 26.3	< 28.1	< 25.4	< 25.1	< 25.6
4-Chloro-3-methylphenol	< 103	< 5.0	< 5.1	< 5.1	< 5.3	< 5.6	< 5.1	< 5.0	< 5.1
4-Nitrophenol	< 515	< 25.1	< 25.6	< 25.5	< 26.3	< 28.1	< 25.4	< 25.1	< 25.6
Pentachlorophenol	< 237	< 11.6	< 11.8	< 11.7	< 12.1	< 12.9	< 11.7	< 11.6	< 11.8
Phenol	J 186	J 2,280	44	< 5.1	< 5.3	< 5.6	< 5.1	< 5.0	< 5.1
Total Phenols (ug/L)	**29,256**	**J 9,450**	356	159	**8,850**	**9,550**	726	0	0
PAH Method 8270-SIM (ug/L)									
Acenaphthene (PAH)	1,450	291	196	0.13	0.920	0.94	1.9	J 0.020	0.045
Acenaphthylene (PAH)	29.1	7.2	3.9	< 0.021	< 0.022	< 0.033	0.079	< 0.020	< 0.020
Anthracene (PAH)	227	20.4	10.7	U, < 0.041	0.310	0.29	0.36	J 0.020	< 0.020
Benzo(a)anthracene (CPAH)	**80.2**	**1.9**	**0.18**	< 0.021	< 0.022	< 0.033	< 0.021	< 0.020	< 0.020
Benzo(a)pyrene (CPAH)	**24.9**	**0.58**	< 0.020	< 0.021	< 0.022	< 0.033	< 0.021	< 0.020	< 0.020
Benzo(b)fluoranthene (CPAH)	**J 38.0**	**J 0.91**	< 0.020	< 0.021	< 0.022	< 0.033	< 0.021	< 0.020	< 0.020
Benzo(g,h,i)perylene (PAH)	7.3	0.16	< 0.020	< 0.021	< 0.022	< 0.033	< 0.021	< 0.020	< 0.020
Benzo(k)fluoranthene (CPAH)	**15.2**	**0.35**	< 0.020	< 0.021	< 0.022	< 0.033	< 0.021	< 0.020	< 0.020
Chrysene (CPAH)	**75.8**	1.7	0.16	< 0.021	< 0.022	< 0.033	< 0.021	< 0.020	< 0.020
Dibenz(a,h)anthracene (CPAH)	2.7	< 0.021	< 0.020	< 0.021	< 0.022	< 0.033	< 0.021	< 0.020	< 0.020
Fluoranthene (PAH)	434	16.5	6.0	< 0.021	0.049	J 0.057	< 0.021	< 0.020	< 0.020
Fluorene (PAH)	703	113	80.3	J+ 0.070	0.390	0.42	0.57	< 0.020	0.052
Indeno(1,2,3-cd)pyrene (CPAH)	**6.9**	**0.16**	< 0.020	< 0.021	< 0.022	< 0.033	< 0.021	< 0.020	< 0.020
Naphthalene (PAH)	**J 17,500**	**J 15,300**	**J 4,550**	**J 12.4**	**J 456**	**J 395**	**J 1,050**	J 0.064	J 0.064
Phenanthrene (PAH)	1060	86.3	62.1	U, < 0.044	0.460	0.41	0.47	< 0.020	0.190
Pyrene (PAH)	5.4	10.2	3.4	< 0.021	< 0.022	< 0.033	< 0.021	< 0.020	< 0.020
TPAH (ug/L)	**J 21,660**	**J 15,850**	**J 4,913**	J 12.6	**J 458**	**J 397**	**J 1,053**	J 0.104	J 0.351
CPAH (ug/L)	**244**	**5.6**	**0.34**	0	0	0	0	0	0
Zinc (mg/L)	0.0091	J 0.0131	0.315	J 0.0227	J 0.0289	J 0.0287	J 0.927	J 0.0017	J 0.0016

Notes:

J - Estimated concentration

ND - Not detected

ROD Target cleanup levels: TPAH = 40 µg/L, CPAH = 0.030 µg/L, phenols = 6,000 µg/L, zinc = 5 mg/L.

ROD target cleanup level exceedances are bolded.

Table 2-7 October 2010 AWC Soil Analytical Results, Somers, Montana

Sample Location: Collection Date:	S-10-1S 10/26/2010	RSL
SVOC Method 8270C (mg/kg)		
1-Methylnapthalene	**51**	22
2-Methylnapthalene	146	310
Acenaphthene	53	3,400
Anthracene	13	17,000
Benzo(a)anthracene	**8**	0.15
Benzo(a)pyrene	**3.8**	0.015
Benzo(b)fluoranthene	**5.2**	0.15
Benzo(g,h,i)perylene	0.74	--
Benzo(k)fluoranthene	**2.1**	1.5
Chrysene	6.4	15
Fluoranthene	31	2,300
Fluorene	30	2,300
Indeno(1,2,3,-cd)pyrene	**2.4**	0.15
Napthalene	**197**	3.9
Phenanthrene	57	--
Pyrene	22	1,700
EPH Screen (mg/kg)	**1,390**	200
Zinc EPA Method 6020 (mg/kg)	29	68,000

Notes:

AWC - Applied Water Consulting
[1]RSL - Regional Screening Level - EPA Region 9 (April 2009)
EPH - Extractable Petroleum Hydrocarbons
Bold values exceed the RSL

Table has been reproduced from November 2010 AWC letter.

Table 2-8 November 2010 AWC Groundwater Analytical Results, Somers, MT

Sample Location: Collection Date:	S-10-1S 11/18/2010	Groundwater Action Level	
SVOC Method 8270C (ug/L)			
1-Methylnapthalene	**23,300**	0.015	2
2,4-Dimethylphenol	**13,500**	1.2	2
2-Methylnapthalene	**38,600**	0.9	2
m+p-Cresol	**1,430**	1.9	2
o-Cresol	**2,120**	2	2
Acenaphthene	**19,800**	27	2
Acenaphthylene	272	--	
Anthracene	**12900**	450	2
Benzo(a)anthracene	**640**	0.014	2
Benzo(a)pyrene	**572**	0.031	1
Benzo(b)fluoranthene	**316**	0.047	2
Benzo(g,h,i)perylene	87	--	
Benzo(k)fluoranthene	**326**	0.46	2
Chrysene	**1,020**	1.4	2
Dibenzo(a,h)anthracene	**132**	0.015	2
Fluoranthene	**6,500**	210	2
Fluorene	**9,700**	33	2
Indeno(1,2,3,-cd)pyrene	**158**	0.16	2
Napthalene	**108,000**	100	1
Phenanthrene	16,000	--	
Pyrene	**5,620**	150	2
VPH Massachusetts Method (ug/L)			
Benzene	**319**	5	3
Toluene	718	1,000	3
Ethylbenzene	395	700	3
Total Xylenes	1410	10,000	3
MTBE	ND	30	3
Napthalene	**13,700**	100	3
C9 - C10 Aromatics	**14,800**	1,000	3
C5 - C8 Aliphatics	**1,320**	700	3
C9 - C12 Aliphatics	**11,000**	1,000	3
EPH Massachusetts Method (ug/L)			
C11 - C22 Aromatics	**11,000**	1,000	3
C9 - C 18 Aliphatics	ND	1,000	3
C19 - C36 Aliphatics	ND	1,000	3
Total Extractable Hydrocarbons	**20,800**	1,000	3

Notes:

AWC - Applied Water Consulting
[1]MCL = Maximum Contaminant Level per Drinking Water Standards
[2]RSL = Regional Screening Level - EPA Region 9 (April 2009)
[3]RBSL = Montana Tier 1 Risk Based Screening Level (Sept. 2009)
ND - Not detected at the reporting limit
Bold values exceed the MCL, RSL, or RBSL

Table has been reproduced from November 2010 AWC letter.

Table 2-9 October 2010 Groundwater Analytical Results - Plume Stability Network , BNSF Somers Site, Somers, Montana

	Background	Source		Downgradient									Other		Quality Control		
Sample Location:	**S-86-1**	**S-88-1**	**S-88-2**	**S-6**	**S-84-15**	**S-84-16**	**S-85-6a**	**S-85-6b**	**(S-32) S-85-6b Dup**	**S-88-3**	**S-91-2**	**Resample S-91-2**	**S-85-5a**	**S-85-5b**	**(S-31) Field Blank**	**Method Blank**	**Method Blank**
Collection Date:	**10/06/10**	**10/07/10**	**--**	**--**	**10/07/10**	**10/06/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**11/07/10**	**10/06/10**	**10/06/10**	**10/07/10**		
Phenols Method 8270 (ug/L)																	
2,4,5-Trichlorophenol	< 51.3	< 532	NS	dry	< 54.3	< 51.3	< 52.1	< 51.5	< 51.3	< 51.3	< 51.5	< 53.8	NA	NA	< 51.5	< 50.0	< 50.0
2,4,6-Trichlorophenol	< 10.3	< 106	NS	dry	< 10.9	< 10.3	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.8	NA	NA	< 10.3	< 10.0	< 10.0
2,4-Dichlorophenol	< 10.3	< 106	NS	dry	< 10.9	< 10.3	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.8	NA	NA	< 10.3	< 10.0	< 10.0
2,4-Dimethylphenol	< 10.3	13,000	NS	dry	< 10.9	< 10.3	< 10.4	< 10.3	< 10.3	668	3,140	3,120	NA	NA	< 10.3	< 10.0	< 10.0
2,4-Dinitrophenol	< 51.3	< 532	NS	dry	< 54.3	< 51.3	< 52.1	< 51.5	< 51.3	< 51.3	< 51.5	< 53.8	NA	NA	< 51.5	< 50.0	< 50.0
2-Chlorophenol	< 10.3	< 106	NS	dry	< 10.9	< 10.3	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.8	NA	NA	< 10.3	< 10.0	< 10.0
2-Methylphenol	< 10.3	< 106	NS	dry	< 10.9	< 10.3	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.8	NA	NA	< 10.3	< 10.0	< 10.0
2-Nitrophenol	< 10.3	< 106	NS	dry	< 10.9	< 10.3	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.8	NA	NA	< 10.3	< 10.0	< 10.0
3&4-Methylphenol	< 20.5	6,740	NS	dry	< 21.7	< 20.5	< 20.8	< 20.6	< 20.5	< 20.5	< 20.6	< 21.5	NA	NA	< 20.6	< 20.0	< 20.0
4,6-Dinitro-2-methylphenol	< 51.3	< 532	NS	dry	< 54.3	< 51.3	< 52.1	< 51.5	< 51.3	< 51.3	< 51.5	< 53.8	NA	NA	< 51.5	< 50.0	< 50.0
4-Chloro-3-methylphenol	< 10.3	< 106	NS	dry	< 10.9	< 10.3	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.8	NA	NA	< 10.3	< 10.0	< 10.0
4-Nitrophenol	< 51.3	< 532	NS	dry	< 54.3	< 51.3	< 52.1	< 51.5	< 51.3	< 51.3	< 51.5	< 53.8	NA	NA	< 51.5	< 50.0	< 50.0
Pentachlorophenol	< 23.6	< 245	NS	dry	< 25.0	< 23.6	< 24.0	< 23.7	< 23.6	< 23.6	< 23.7	< 24.7	NA	NA	< 23.7	< 23.0	< 23.0
Phenol	< 10.3	485	NS	dry	< 10.9	< 10.3	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.8	NA	NA	< 10.3	< 10.0	< 10.0
Total Phenols (ug/L)	ND	**13,638**	NS	dry	ND	ND	ND	ND	ND	668	3,140	3,120	NA	NA	ND	ND	ND
PAH Method 8270-SIM (ug/L)																	
Acenaphthene (PAH)	0.51	139	NS	dry	< 0.043	0.43	0.11	< 0.041	< 0.041	0.44	0.72	NA	NA	NA	< 0.040	< 0.040	< 0.040
Acenaphthylene (PAH)	< 0.042	5.1	NS	dry	< 0.043	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	NA	NA	NA	< 0.040	< 0.040	< 0.040
Anthracene (PAH)	< 0.042	6.3	NS	dry	< 0.043	J 0.037	< 0.041	< 0.041	< 0.041	J 0.029	J 0.027	NA	NA	NA	< 0.040	< 0.040	< 0.040
Benzo(a)anthracene (CPAH)	<* 0.31	1.5	NS	dry	< 0.043	<* 0.31	<* 0.31	<* 0.31	<* 0.31	<* 0.31	< 0.041	NA	NA	NA	<* 0.30	<* 0.30	< 0.040
Benzo(a)pyrene (CPAH)	<* 0.31	0.51	NS	dry	< 0.043	<* 0.31	<* 0.31	<* 0.31	<* 0.31	<* 0.31	< 0.041	NA	NA	NA	<* 0.30	<* 0.30	< 0.040
Benzo(b)fluoranthene (CPAH)	<* 0.31	0.74	NS	dry	< 0.043	<* 0.31	<* 0.31	<* 0.31	<* 0.31	<* 0.31	< 0.041	NA	NA	NA	<* 0.30	<* 0.30	< 0.040
Benzo(g,h,i)perylene (PAH)	< 0.042	0.14	NS	dry	< 0.043	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	NA	NA	NA	< 0.040	< 0.040	< 0.040
Benzo(k)fluoranthene (CPAH)	< 0.042	0.29	NS	dry	< 0.043	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	NA	NA	NA	< 0.040	< 0.040	< 0.040
Chrysene (CPAH)	< 0.042	1.3	NS	dry	< 0.043	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	NA	NA	NA	< 0.040	< 0.040	< 0.040
Dibenz(a,h)anthracene (CPAH)	<* 0.31	0.05	NS	dry	< 0.043	<* 0.31	<* 0.31	<* 0.31	<* 0.31	<* 0.31	< 0.041	NA	NA	NA	<* 0.30	<* 0.30	< 0.040
Fluoranthene (PAH)	< 0.042	9.1	NS	dry	J 0.022	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	NA	NA	NA	< 0.040	< 0.040	< 0.040
Fluorene (PAH)	0.088	44.0	NS	dry	< 0.043	0.69	0.079	< 0.041	< 0.041	0.20	0.47	NA	NA	NA	< 0.040	< 0.040	< 0.040
Indeno(1,2,3-cd)pyrene (CPAH)	< 0.042	0.13	NS	dry	< 0.043	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	NA	NA	NA	< 0.040	< 0.040	< 0.040
Naphthalene (PAH)	J 0.037	3,410	NS	dry	< 0.043	0.050	< 0.041	J 0.024	< 0.041	635	1.4	NA	NA	NA	< 0.040	< 0.040	< 0.040
Phenanthrene (PAH)	< 0.042	41.9	NS	dry	J 0.035	0.26	0.047	< 0.041	< 0.041	0.075	0.23	NA	NA	NA	< 0.040	< 0.040	< 0.040
Pyrene (PAH)	< 0.042	6.4	NS	dry	< 0.043	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	< 0.041	NA	NA	NA	< 0.040	< 0.040	< 0.040
TPAH (ug/L)	J 0.64	**3,666**	NS	dry	J 0.057	J 1.47	0.236	J 0.024	ND	**J 636**	J 2.85	NA	NA	NA	ND	ND	ND
CPAH (ug/L)	ND	**4.52**	NS	dry	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND
Total Suspended Solids (mg/L)	J 7.9	88.6	NS	dry	J 6.3	45.0	97.7	54.7	53.6	552	33.4	NA	NA	NA	< 10.0	< 10.0	< 10.0
Zinc (mg/L)	**23.1**	0.0095	NS	dry	0.0328	0.0060	0.0159	**21.2**	**21.7**	0.25	0.0061	NA	0.0328	0.664	< 0.0050	J 0.0017	J 0.0019

Notes:

(#) - Indicates blind duplicate or field blank number assignment on the Chain of Custody.
dry - Well had insufficient water for sample collection
J - Estimated concentration
ND - Not detected
NS - Not sampled due to the presence of emulsified creosote
NA - Not Analyzed
* - Samples were non-detect. Method Reporting Limit was elevated; however, Method Detection Limit was 0.020 ug/L.

Target cleanup levels: TPAH = 40 µg/L, CPAH = 0.030 µg/L, phenols = 6,000 µg/L, zinc = 5 mg/L.
Target cleanup level exceedences are bolded.

Table 2-10 October 2010 Groundwater Analytical Results - Natural Attenuation Network, BNSF Somers Site, Somers, Montana

	Upgradient				Source			Downgradient				Quality Control			
Sample Location:	**S-85-7**	**S-85-8a**	**S-85-8b**	**(S-85-29) S-85-8b Dup**	**S-93-2S**	**S-93-2D**	**S-93-5S**	**S-85-6a**	**S-85-6b**	**(S-32) S-85-6b Dup**	**S-88-3**	**(S-85-8) Field Blank**	**(S-31) Field Blank**	**Method Blank**	**Method Blank**
Collection Date:	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**	**10/07/10**		
Plume Stability Parameters															
Phenols Method 8270 (ug/L)															
2,4,5-Trichlorophenol	< 51.3	< 52.1	< 52.1	< 52.6	< 51.0	< 52.1	NS	< 52.1	< 51.5	< 51.3	< 51.3	< 51.3	< 51.5	< 50.0	< 50.0
2,4,6-Trichlorophenol	< 10.3	< 10.4	< 10.4	< 10.5	< 10.2	< 10.4	NS	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.3	< 10.0	< 10.0
2,4-Dichlorophenol	< 10.3	< 10.4	< 10.4	< 10.5	< 10.2	< 10.4	NS	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.3	< 10.0	< 10.0
2,4-Dimethylphenol	< 10.3	< 10.4	< 10.4	< 10.5	3,780	20.7	NS	< 10.4	< 10.3	< 10.3	668	< 10.3	< 10.3	< 10.0	< 10.0
2,4-Dinitrophenol	< 51.3	< 52.1	< 52.1	< 52.6	< 51.0	< 52.1	NS	< 52.1	< 51.5	< 51.3	< 51.3	< 51.3	< 51.5	< 50.0	< 50.0
2-Chlorophenol	< 10.3	< 10.4	< 10.4	< 10.5	< 10.2	< 10.4	NS	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.3	< 10.0	< 10.0
2-Methylphenol	< 10.3	< 10.4	< 10.4	< 10.5	< 10.2	< 10.4	NS	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.3	< 10.0	< 10.0
2-Nitrophenol	< 10.3	< 10.4	< 10.4	< 10.5	< 10.2	< 10.4	NS	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.3	< 10.0	< 10.0
3&4-Methylphenol	< 20.5	< 20.8	< 20.8	< 21.1	< 20.4	< 20.8	NS	< 20.8	< 20.6	< 20.5	< 20.5	< 20.5	< 20.6	< 20.0	< 20.0
4,6-Dinitro-2-methylphenol	< 51.3	< 52.1	< 52.1	< 52.6	< 51.0	< 52.1	NS	< 52.1	< 51.5	< 51.3	< 51.3	< 51.3	< 51.5	< 50.0	< 50.0
4-Chloro-3-methylphenol	< 10.3	< 10.4	< 10.4	< 10.5	< 10.2	< 10.4	NS	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.3	< 10.0	< 10.0
4-Nitrophenol	< 51.3	< 52.1	< 52.1	< 52.6	< 51.0	< 52.1	NS	< 52.1	< 51.5	< 51.3	< 51.3	< 51.3	< 51.5	< 50.0	< 50.0
Pentachlorophenol	< 23.6	< 24.0	< 24.0	< 24.2	< 25.5	< 24.0	NS	< 24.0	< 23.7	< 23.6	< 23.6	< 23.6	< 23.7	< 23.0	< 23.0
Phenol	< 10.3	< 10.4	< 10.4	< 10.5	J 6.0	< 10.4	NS	< 10.4	< 10.3	< 10.3	< 10.3	< 10.3	< 10.3	< 10.0	< 10.0
Total Phenols (ug/L)	ND	ND	ND	ND	3,786	20.7	NS	ND	ND	ND	668	ND	ND	ND	ND
PAH Method 8270-SIM (ug/L)															
Acenaphthene (PAH)	< 0.041	0.96	< 0.042	< 0.041	21.1	5.0	NS	0.11	< 0.041	< 0.041	0.44	< 0.040	< 0.040	< 0.040	< 0.040
Acenaphthylene (PAH)	< 0.041	< 0.043	< 0.042	< 0.041	J 0.25	0.077	NS	< 0.041	< 0.041	< 0.041	< 0.041	< 0.040	< 0.040	< 0.040	< 0.040
Anthracene (PAH)	< 0.041	< 0.043	< 0.042	< 0.041	1.4	1.2	NS	< 0.041	< 0.041	< 0.041	J 0.029	< 0.040	< 0.040	< 0.040	< 0.040
Benzo(a)anthracene (CPAH)	<* 0.31	< 0.043	< 0.042	<* 0.31	J 0.14	0.16	NS	<* 0.31	<* 0.31	<* 0.31	<* 0.31	<* 0.30	<* 0.30	<* 0.30	< 0.040
Benzo(a)pyrene (CPAH)	<* 0.31	< 0.043	< 0.042	<* 0.31	< 0.041	J 0.023	NS	<* 0.31	<* 0.31	<* 0.31	<* 0.31	<* 0.30	<* 0.30	<* 0.30	< 0.040
Benzo(b)fluoranthene (CPAH)	<* 0.31	< 0.043	< 0.042	<* 0.31	J 0.036	J 0.031	NS	<* 0.31	<* 0.31	<* 0.31	<* 0.31	<* 0.30	<* 0.30	<* 0.30	< 0.040
Benzo(g,h,i)perylene (PAH)	< 0.041	< 0.043	< 0.042	< 0.041	< 0.041	< 0.041	NS	< 0.041	< 0.041	< 0.041	< 0.041	< 0.040	< 0.040	< 0.040	< 0.040
Benzo(k)fluoranthene (CPAH)	< 0.041	< 0.043	< 0.042	< 0.041	< 0.041	< 0.041	NS	< 0.041	< 0.041	< 0.041	< 0.041	< 0.040	< 0.040	< 0.040	< 0.040
Chrysene (CPAH)	< 0.041	< 0.043	< 0.042	< 0.041	J 0.14	0.16	NS	< 0.041	< 0.041	< 0.041	< 0.041	< 0.040	< 0.040	< 0.040	< 0.040
Dibenz(a,h)anthracene (CPAH)	<* 0.31	< 0.043	< 0.042	<* 0.31	< 0.041	< 0.041	NS	<* 0.31	<* 0.31	<* 0.31	<* 0.31	<* 0.30	<* 0.30	<* 0.30	< 0.040
Fluoranthene (PAH)	< 0.041	J 0.022	< 0.042	< 0.041	2.6	2.1	NS	< 0.041	< 0.041	< 0.041	< 0.041	< 0.040	< 0.040	< 0.040	< 0.040
Fluorene (PAH)	< 0.041	0.20	< 0.042	< 0.041	7.2	5.2	NS	0.079	< 0.041	< 0.041	0.20	< 0.040	< 0.040	< 0.040	< 0.040
Indeno(1,2,3-cd)pyrene (CPAH)	< 0.041	< 0.043	< 0.042	< 0.041	< 0.041	< 0.041	NS	< 0.041	< 0.041	< 0.041	< 0.041	< 0.040	< 0.040	< 0.040	< 0.040
Naphthalene (PAH)	< 0.041	0.56	< 0.042	< 0.041	0.47	0.067	NS	< 0.041	J 0.024	< 0.041	635	< 0.040	< 0.040	< 0.040	< 0.040
Phenanthrene (PAH)	< 0.041	J 0.030	< 0.042	< 0.041	3.2	3.4	NS	0.047	< 0.041	< 0.041	0.075	< 0.040	< 0.040	< 0.040	< 0.040
Pyrene (PAH)	< 0.041	< 0.043	< 0.042	< 0.041	1.5	1.4	NS	< 0.041	< 0.041	< 0.041	< 0.041	< 0.040	< 0.040	< 0.040	< 0.040
TPAH (ug/L)	ND	J 1.77	ND	ND	J 38.0	J 18.8	NS	0.236	J 0.024	ND	**J 636**	ND	ND	ND	ND
CPAH (ug/L)	ND	ND	ND	ND	**J 0.316**	**J 0.37**	NS	ND	ND	ND	ND	ND	ND	ND	ND
Total Suspended Solids (mg/L)	< 10.0	225	< 10.0	< 10.0	50.4	1,090	NS	97.7	54.7	53.6	552	< 10.0	< 10.0	< 10.0	< 10.0
Zinc (mg/L)	0.178	**8.26**	0.234	0.228	U,< 0.0050	0.0114	NS	0.0159	**21.2**	**21.7**	0.25	U,< 0.0050	< 0.0050	J 0.0017	J 0.0019
Natural Attenuation Parameters															
Laboratory Parameters	2.57				1.30			1.37							
Nitrate as N (mg/L)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	NS	< 0.10	< 0.10	< 0.10	0.21	NA	< 0.10	< 0.10	NA
Sulfate (mg/L)	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	NS	< 1.0	< 1.0	< 1.0	2.5	NA	< 1.0	< 1.0	NA
Iron, Ferrous (mg/L)	UJ,< 0.40	UJ,< 0.40	UJ,< 0.40	UJ,< 0.40	UJ,< 0.40	UJ,< 0.40	NS	J 0.40	UJ,< 0.40	J 0.70	UJ,< 0.40	NA	UJ,< 0.40	< 0.40	NA
Methane (ug/L)	500	18,000	690	560	16,000	23,000	NS	28,000	30,000	25,000	25,000	0.650	0.240	NA	NA
Oxygen (mg/L)	1.90	2.10	2.60	2.20	1.30	1.30	NS	1.30	J 1.10	J 2.10	1.20	7.40	7.50	NA	NA
Field Parameters															
Dissolved Oxygen (mg/L)	0.38	0.31	0.30	NA	NM	0.33	NM	0.44	0.22	NA	0.31	NA	NA	NA	NA
Oxidation/Reduction Potential (mV)	-136.9	-171.4	-162.9	NA	NM	-151.6	NS	-156.3	-110.3	NA	-122.9	NA	NA	NA	NA

Notes:

(#) = Indicates blind duplicate or field blank number assignment on the Chain of Custody.
J - Estimated concentration
UJ - Undetected result, reporting limit is estimated. See Data Verification Report.
NA - Not Analyzed
NS - Not sampled due to the presence of emulsified creosote
U - Evaluated to be undetected at the reporting limit/concentration.
* - Samples were non-detect. Method Reporting Limit was elevated; however, Method Detection Limit was 0.020 ug/L.

Evidence of Intrinsic Contaminant Biodegradation

Parameter	Upgradient Area	Source Area	Downgradient Area
Nitrate	Elevated concentrations if nitrate is naturally present in ambient	Depleted concentrations relative to upgradient, typically < analytical detection	Depleted concentrations relative to upgradient; little or no recovery in values relative to source area
Sulfate	Elevated concentrations if sulfate is naturally present in ambient	Depleted concentrations relative to upgradient; possible presence of sulfide	Depleted concentrations relative to upgradient; concentrations may be higher than in source area
Ferrous Iron	Dependent on soil mineralogy. Ferrous iron is typically non-detect	Elevated concentrations of ferrous iron	Elevated concentrations of ferrous iron; concentrations may be lower than in source area
Methane	Methane concentrations typically non-detect	Elevated concentrations relative to upgradient	Lower concentrations relative to source area, or non-detect
Dissolved Oxygen (DO)	Elevated DO concentrations (>~2 mg/L)	Depleted DO concentrations (<1 mg/L)	Depleted DO concentrations relative to upgradient, with possible increased concentrations relative to
Oxidation/Reduction Potential (ORP)	ORP values > 0 mV if DO is present (>2 mg/L)	Reduced ORP values relative to upgradient, typically < 0 mV	Reduced ORP values relative to upgradient, with possible increased values relative to source area

Table 2-11 October 2010 Groundwater Field Parameters , BNSF Somers Site, Somers, Montana

	Well Number	Sample Equipment	pH (Standard Units)		Conductivity (umhos/cm)		Temperature (C)		Dissolved Oxygen (mg/l)		RedOx (mV)	
			First Reading	Last Reading	First Reading	Last Reading	First Reading	Last Reading	First Reading	Last Reading	First Reading	Last Reading
Upgradient												
	S-85-7	PP	8.27	8.29	0.299	0.208	8.96	8.98	0.81	0.38	-120.1	-136.9
	S-85-8A	PP	7.29	7.09	0.590	0.581	10.45	10.35	0.65	0.31	-175.0	-171.4
	S-85-8B	PP	8.22	8.25	0.231	0.231	9.85	9.87	0.73	0.30	-171.5	-162.9
Source												
	S-93-2S	PP	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	S-93-2D	PP	7.02	7.00	0.862	0.865	11.17	10.97	0.76	0.33	-147.6	-151.6
	S-88-1	PP	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	S-88-2	PP	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	S-93-5S	PP	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
Downgradient												
	S-84-15	PP	6.89	6.81	1.017	1.013	10.13	9.90	0.63	0.31	-47.3	-95.5
	S-84-16	PP	6.84	6.63	1.604	1.608	11.13	11.19	1.21	0.47	-122.8	-128.1
	S-85-6A	PP	6.70	6.69	0.979	0.972	9.23	9.19	0.58	0.44	-157.7	-156.3
	S-85-6B	PP	6.69	6.68	1.106	1.098	9.13	9.14	0.26	0.22	-106.4	-110.3
	S-88-3	PP	6.51	6.35	1.239	12.6	9.63	9.34	1.29	0.31	-105.2	-122.9
	S-91-2	PP	6.69	6.61	0.993	0.995	9.13	9.07	1.15	0.32	-141.5	-148.1
Background												
	S-86-1	PP	7.36	6.91	0.767	0.754	12.24	10.8	3.5	2.66	-54.5	-54.1
Other												
	S-85-5A (LTU)	PP	7.17	7.02	1.039	1.046	10.36	10.32	1.50	0.95	-19.9	-15.9
	S-85-5B	PP	7.66	7.69	0.804	0.815	8.98	8.81	0.54	0.32	-86.9	-122.6
	S-5R (LTU)	PP	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]
	S-6 (LTU)	PP	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]	---[1]
	S-93-7 (LTU)	PP	7.39	7.06	1.096	1.069	10.67	10.27	4.29	1.70	-54.0	-40.6
	TW-1	G	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Notes:

--- = Parameter not recorded.

PP = Low flow sampling with a peristaltic pump

G = Grab Sample. Municipal well sample is collected from a faucet semi-annually.

NM = Not measured due to sheen, strong hydrocarbon odor, or emulsified creosote in well.

1 = Well was dry or contained very little water. No field parameters were taken.

NR = Not recorded during sampling event.

Table 3-1 Air Sampling Specifications

Sample ID	Media	Area Description	Sample Duration	Sample Depths[a]	Number of 6 Liter Summas	6-Liter Purge Canisters	TO-15 QC (Field Duplicate) Samples	TO-15 VOCs[b]	TO-15 VOC Analytical Method	Number of TO-17 VOCs Samples	TO-17 VOC Analytes	TO-17 (Field Duplicate) Samples	Required Reporting Limit	Fixed Gases for Soil Gas	Fixed Gases Analytical Method	In-Field Soil Gas Tracer Gas (don't need laboratory analysis)
512 Somers Road																
SG-1	Soil Gas	Collected below crawl space	0.5 hr	1/2 DTW and above Cfa	2	1	1 FD/sample depth	See Table 3-2	USEPA TO-15	2	See Table 3-3	0	See Table 3-3	Oxygen, Carbon Dioxide, Nitrogen, Methane	ASTM 1946	Helium
CS-1	Crawl Space	Crawl space	24 hr	3-5 ft above ground	1	NA	1 FD*			1		0				
IA-1	Indoor Air	Kitchen area or other common living area	24 hr	3-5 ft above ground	1		1 FD*			1		0				
IA-2	Indoor Air	Bathroom	24 hr	3-5 ft above ground	1					1		0				
520 Somers Road																
SG-2	Soil Gas	Collected below crawl space	0.5 hr	1/2 DTW and above Cfa	2	1	0	See Table 3-2	USEPA TO-15	2	See Table 3-3	1 FD/sample depth	See Table 3-3	Oxygen, Carbon Dioxide, Nitrogen, Methane	ASTM 1946	Helium
CS-2	Crawl Space	Crawl space	24 hr	3-5 ft above ground	1	NA	0			1		1 FD*				
IA-3	Indoor Air	Kitchen area or other common living area	24 hr	3-5 ft above ground	1		0			1		1 FD*				
IA-4	Indoor Air	Bathroom	24 hr	3-5 ft above ground	1					1						
528 Somers Road																
SG-3	Soil Gas	Collected below crawl space	0.5 hr	1/2 DTW and above Cfa	2	1	0	See Table 3-2	USEPA TO-15	2	See Table 3-3	0	See Table 3-3	Oxygen, Carbon Dioxide, Nitrogen, Methane	ASTM 1946	Helium
CS-3	Crawl Space	Crawl space	24 hr	2-3 ft above ground	1	NA	0			1		0				
IA-5	Indoor Air	Kitchen area or other common living area	24 hr	3-5 ft above ground	1		0			1		0				
IA-6	Indoor Air	Bathroom	24 hr	3-5 ft above ground	1					1		0				
536 Somers Road																
SG-4	Soil Gas	Collected below crawl space	0.5 hr	1/2 DTW and above Cfa	2	1	0	See Table 3-2	USEPA TO-15	2	See Table 3-3	0	See Table 3-3	Oxygen, Carbon Dioxide, Nitrogen, Methane	ASTM 1946	Helium
CS-4	Crawl Space	Crawl space	24 hr	3-5 ft above ground	1	NA	0			1		0				
IA-7	Indoor Air	Kitchen area or other common living area	24 hr	3-5 ft above ground	1		0			1		0				
IA-8	Indoor Air	Bathroom	24 hr	3-5 ft above ground	1					1		0				

Table 3-1 Air Sampling Specifications

Sample ID	Media	Area Description	Sample Duration	Sample Depths[a]	Number of 6 Liter Summas	6-Liter Purge Canisters	TO-15 QC (Field Duplicate) Samples	TO-15 VOCs[b]	TO-15 VOC Analytical Method	Number of TO-17 VOCs Samples	TO-17 VOC Analytes	TO-17 (Field Duplicate) Samples	Required Reporting Limit	Fixed Gases for Soil Gas	Fixed Gases Analytical Method	In-Field Soil Gas Tracer Gas (don't need laboratory analysis)
544 Somers Road																
SG-5	Soil Gas	Collected below crawl space	0.5 hr	1/2 DTW and above Cfa	2	1	0	See Table 3-2	USEPA TO-15	2	See Table 3-3	0	See Table 3-3	Oxygen, Carbon Dioxide, Nitrogen, Methane	ASTM 1946	Helium
BS-1	Basement	Basement	24 hr	3-5 ft above ground	2	NA	0			1		0				
IA-9	Indoor Air	Kitchen area or other common living area	24 hr	3-5 ft above ground	1		0			1		0				
IA-10	Indoor Air	Bathroom	24 hr	3-5 ft above ground	1					1		0				
Ambient Air																
AA-1	Ambient Air	Upwind Location	24 hr	3-5 ft above ground	4	NA	1 FD*	See Table 3-2	USEPA TO-15	4	See Table 3-3	1 FD*	See Table 3-3	NA	NA	NA
AA-2	Ambient Air	Downwind Location	24 hr	3-5 ft above ground	4					4						
TOTAL NUMBER 6L SUMMAS REQUIRED					**34+**	**6[c]**	**5**									
TOTAL NUMBER TD TUBES REQUIRED										**56**	**8 (plus one field blank)**					

Notes:

AA= ambient air
BS = basement
BTEX = benzene, toluene, ethylbenzene, and xylenes
CFa = above capillary fringe. A sample should be collected in the unsaturated zone just above the capillary fringe. See report text for more details.
CS = crawl space
DTW = depth to groundwater
FD = field duplicate. * Field duplicates should be collected for a minimum of 10% of the samples collected per sample day for QA/QC purposes.
ft bgs = feet below ground surface
GW = groundwater
IA = indoor air
MDC = maximum detected concentration
na = not applicable
SG = soil gas
VISL = vapor intrusion screening level
[a] Soil gas samples are dependent on the depth to groundwater.
[b] Volatile Organic Compounds (VOCs) identified by TO-15 SIM analyte list.
[c] Purging requires a Summa canister set at the same flowrate used for subsequent sampling (<200 mL/min for soil gas). Note: tedlar bags may be utilized in place of summa canisters.
One upwind and downwind ambient air sample is required for each day of indoor air sampling (expect 4 days of indoor air samples)+A56.
\+ 3 or 4 extra summa canisters will be ordered from the lab for a total of approximately 38 canisters. Aproximately 3 Summa canisters needed per house for emission chamber testing for a grand total of 53 canisters.

Table 3-2 Proposed Screening Levels and Required Reporting Limits for Method TO-15 Analytes

Analyte	MRL µg/m^3	MRL ppbv	USEPA Residential Ambient Air RSL (TRL = 1E-05) µg/m^3
Dichlorodifluoromethane (CFC 12)	0.50	0.10	210
Chloromethane	0.20	0.097	94
Vinyl Chloride	0.10	0.039	1.6
Bromomethane	0.10	0.026	5
Chloroethane	0.10	0.038	10,000
Trichlorofluoromethane	0.10	0.018	730
1,1-Dichloroethene	0.10	0.025	210
Methylene Chloride	0.50	0.14	52
Trichlorotrifluoroethane	0.10	0.013	31,000
trans-1,2-Dichloroethene	0.10	0.025	63
1,1-Dichloroethane	0.10	0.025	15
cis-1,2-Dichloroethene [a]	0.10	0.025	63
Chloroform	0.10	0.02	1.1
1,2-Dichloroethane	0.10	0.025	0.94
1,1,1-Trichloroethane	0.10	0.018	5,200
Benzene	0.10	0.031	3.1
Carbon Tetrachloride	5.00	1.7	4.1
1,2-Dichloropropane	0.10	0.022	2.4
Trichloroethene	0.10	0.019	12
Bromodichloromethane	0.10	0.015	0.66
cis-1,3-Dichloropropene	0.50	0.11	6.1
trans-1,3-Dichloropropene	0.50	0.11	6.1
1,1,2-Trichloroethane	0.10	0.018	1.5
Toluene	0.50	0.13	5,200
1,2-Dibromoethane	0.10	0.013	0.041
Tetrachloroethene	0.10	0.015	4.1
Chlorobenzene	0.10	0.022	52
Ethylbenzene	0.50	0.12	9.7
m,p-Xylenes	0.50	0.12	730
o-Xylene	0.50	0.12	730
1,1,2,2-Tetrachloroethane	0.10	0.015	0.42
1,3-Dichlorobenzene [b]	0.10	0.017	2.2
1,4-Dichlorobenzene	0.10	0.017	2.2
1,2-Dichlorobenzene	0.10	0.017	210
1,2,4-Trichlorobenzene	0.50	0.067	2.1
Naphthalene	0.50	0.095	0.72
Propene	0.50	0.29	3,100
1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	0.50	0.072	NA
1,3-Butadiene	0.20	0.090	0.81
Ethanol	5.0	2.7	NA
Acetonitrile	0.50	0.30	63
Acrolein	2.0	0.87	0.021
Acetone	5.0	2.1	32,000
2-Propanol (Isopropyl Alcohol)	0.50	0.2	7,300
Acrylonitrile	0.50	0.23	0.36
3-Chloro-1-propene (Allyl Chloride)	0.10	0.032	4.1
Carbon Disulfide	1.00	0.32	730
Methyl tert-Butyl Ether	0.10	0.028	94
Vinyl Acetate	5.0	1.4	210
2-Butanone (MEK)	5.0	1.7	5,200
Ethyl Acetate	0.50	0.14	NA
n-Hexane	0.50	0.14	730
Tetrahydrofuran (THF)	0.50	0.17	NA
Cyclohexane	0.50	0.15	6,300
1,4-Dioxane	0.50	0.14	3.2
Methyl Methacrylate	0.50	0.12	730
n-Heptane	0.50	0.12	NA
4-Methyl-2-pentanone	0.50	0.12	3,100
2-Hexanone	0.50	0.12	31
Dibromochloromethane	0.10	0.012	0.9
n-Butyl Acetate	0.50	0.11	NA
n-Octane	0.50	0.11	NA
Bromoform	0.50	0.048	22
Styrene	0.50	0.12	1,000
n-Nonane	0.50	0.095	210
Cumene	0.50	0.10	420
alpha-Pinene	0.50	0.090	NA
n-Propylbenzene	0.50	0.10	1,000
4-Ethyltoluene	0.50	0.10	NA
1,3,5-Trimethylbenzene [c]	0.50	0.10	7.3
1,2,4-Trimethylbenzene	0.50	0.10	7.3
Benzyl Chloride	0.50	0.097	0.5
d-Limonene	0.50	0.090	NA
1,2-Dibromo-3-chloropropane	0.50	0.052	0.0016
Hexachlorobutadiene	0.50	0.047	1.1

Notes:

[a] RSL not available for cis-1,2-dichloroethene; therefore, RSL for trans-1,2-dichloroethene conservatively assumed.

[b] RSL not available for 1,3-dichlorobenzene; therefore, RSL for 1,4-dichlorobenzene conservatively assumed.

[c] RSL not available for 1,3,5-trimethylbenzene; therefore, RSL for 1,2,4-trimethylbenzene conservatively assumed.

NA= Not Available

RSL = USEPA Regional Screening Level (November 2010 update). Available online at: http://www.epa.gov/region9/superfund/prg/index.html

SL = screening level

TRL = target risk level

µg/m^3 = micrograms per cubic meter

MRL = minumum reporting limit

ppbv = parts per billion by volume

Table 3-3 Proposed Screening Levels and Required Reporting Limits for Method TO-17 Analytes

Analyte	MRL µg/m^3	MRL ppbv	Can Chemical Be Analyzed by TO-17?*	USEPA RSL Volatile Designation	USEPA Residential Ambient Air RSL (TRL = 1E-05) µg/m^3
Benzo(a)anthracene	NA	NA	No	Not Volatile	0.087
Benzo(a)pyrene	NA	NA	No	Not Volatile	0.0087
Benzo(b)fluoranthene	NA	NA	No	Not Volatile	0.087
Benzo(k)fluoranthene	NA	NA	No	Not Volatile	0.087
Chrysene	NA	NA	No	Not Volatile	0.87
Dibenz(a,h)anthracene	NA	NA	No	Not Volatile	0.0087
Indeno(1,2,3-cd) pyrene	NA	NA	No	Not Volatile	0.087
1-Methylnaphthalene	NA	NA	Yes	Volatile	NA
2-Methylnaphthalene	NA	NA	Yes	Volatile	NA
3,4 Dimethylphenol	NA	NA	Yes	Not Volatile	NA
2,4 Dimethylphenol	NA	NA	Yes	Not Volatile	NA
Acenaphthene	NA	NA	No	Volatile	NA
Naphthalene	0.50	0.095	Yes	Volatile	0.72

Notes:

NA= Not Available

RSL = USEPA Regional Screening Level (November 2010 update). Available online at: http://www.epa.gov/region9/superfund/prg/index.html

SL = screening level

TRL = target risk level

µg/m^3 = micrograms per cubic meter

MRL = minumum reporting limit

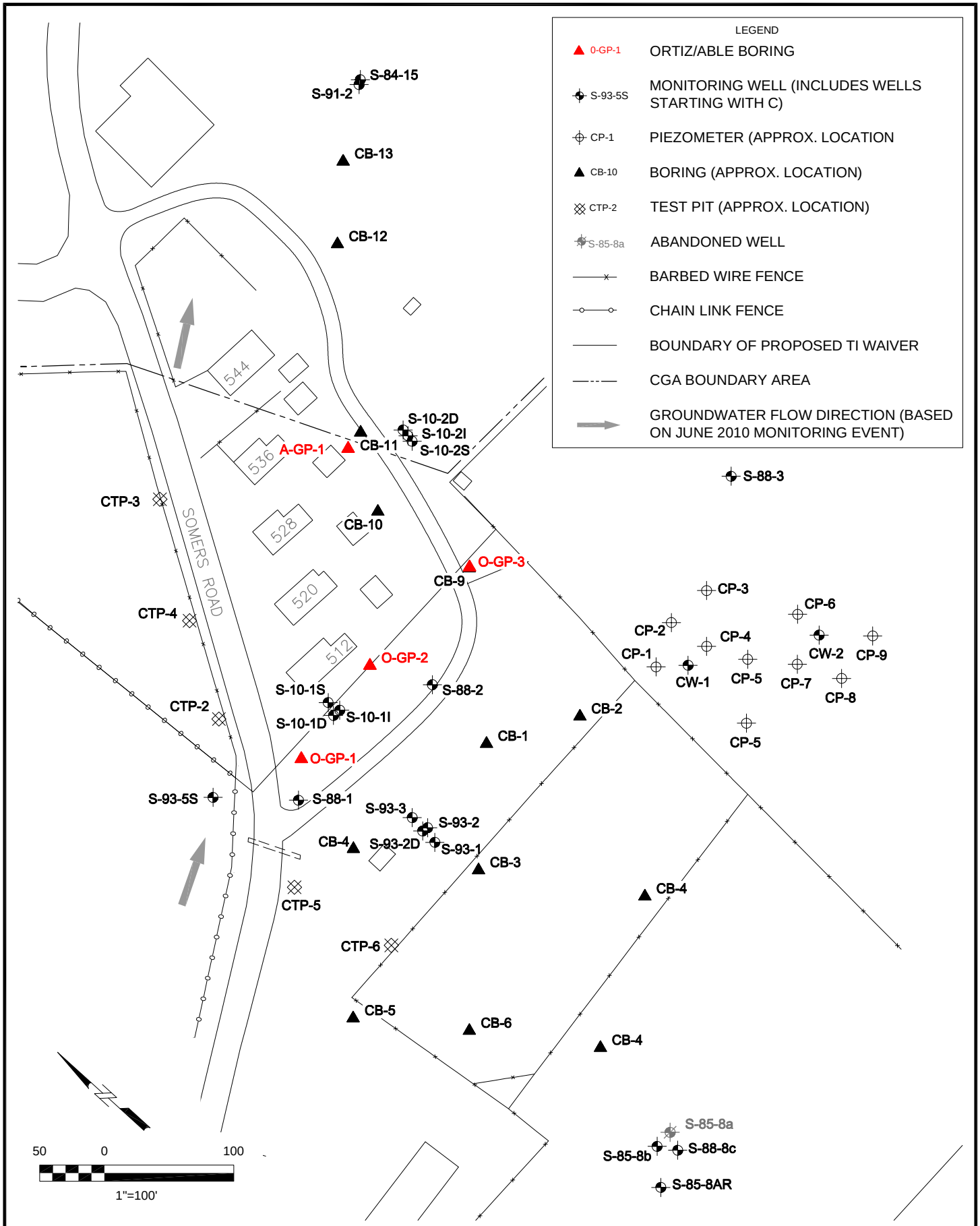
ppbv = parts per billion by volume

* = According to Air Toxics and Columbia Analytical Labs

Reference:

USEPA, 2002. Draft Guidance for Evaluating Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). Office of Solid Waste and Emergency Response, Washington, D.C.
November 29, 2002.

Figures



AECOM

BNSF RAILWAY COMPANY

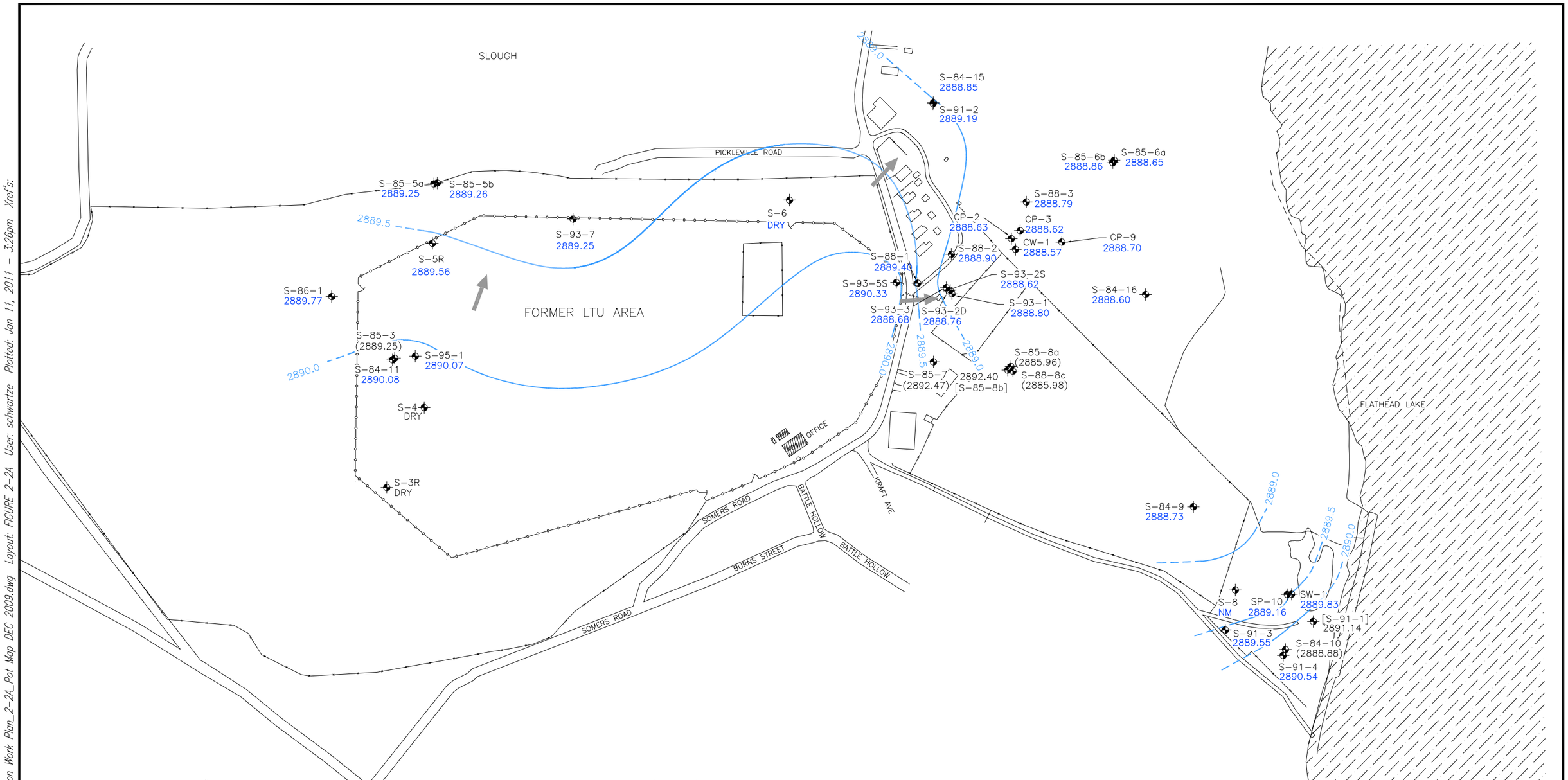
SOMERS, MONTANA (60190166-200)

INVESTIGATION LOCATIONS

DATE: 01/11/11 | DRWN: E.S.S./DEN

FIGURE 2-1

File: M:\BNSF Somers\BNSF-Som - Vapor Intrusion Work Plan_2-1_Investigation Locations.dwg Layout: FIGURE 2-1 User: schwartze Plotted: Jan 11, 2011 - 4:16pm Xref's:



NOTE: FLATHEAD LAKE ELEVATION (ft msl) = 2888.94

LEGEND

S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
2890.33	GROUNDWATER ELEVATION (ft msl)
(2880.50)	RECORDED ELEVATION IS NOT USED TO CONTOUR
— 2889.5 —	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
→	GROUNDWATER FLOW DIRECTION
—X——X—	BARBEDWIRE FENCE
—O——O—	CHAIN LINK FENCE

AECOM

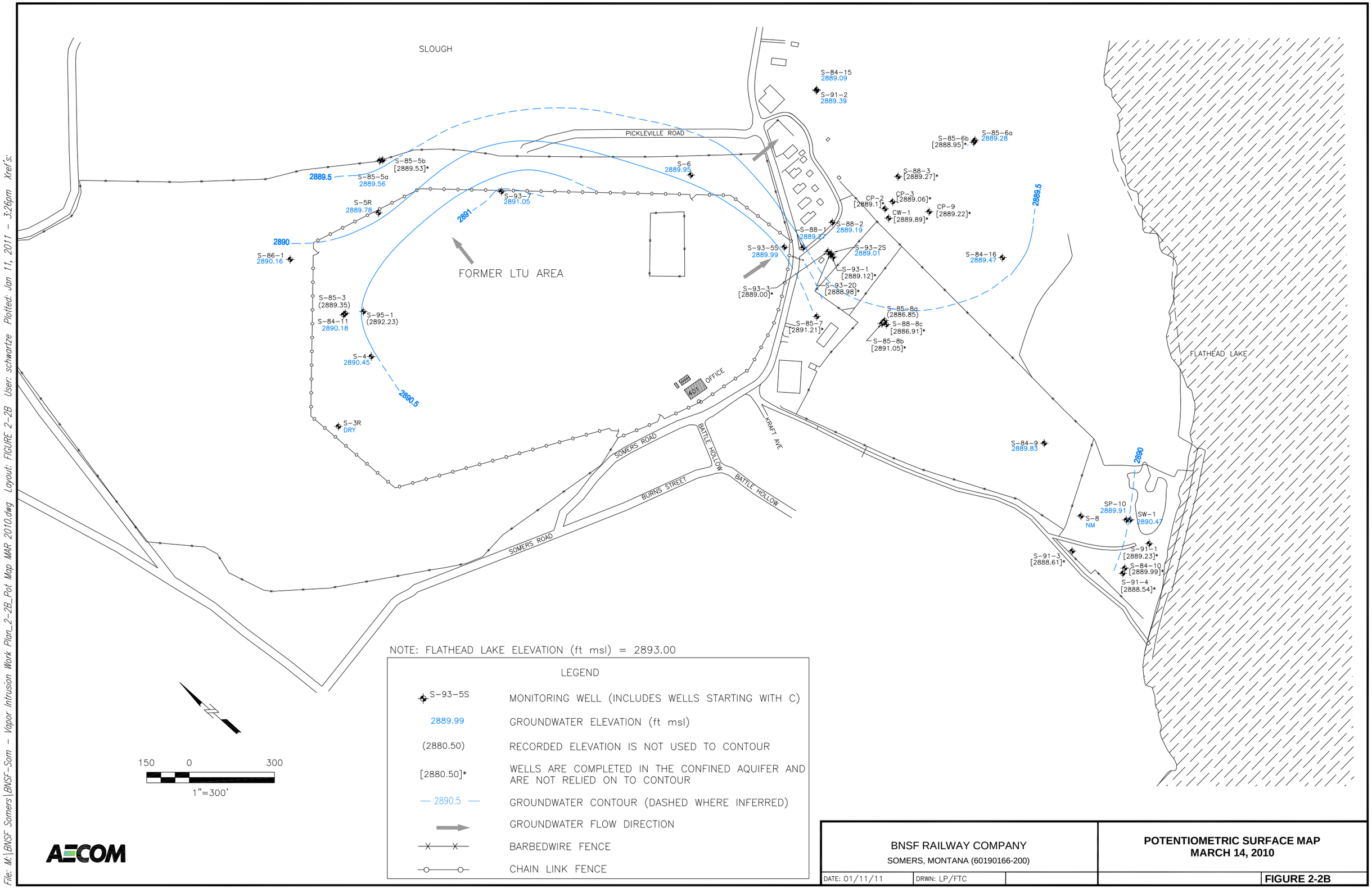
BNSF RAILWAY COMPANY
SOMERS, MONTANA (60190166-200)

POTENTIOMETRIC SURFACE MAP
DECEMBER 15, 2009

DATE: 01/11/11 | DRWN: E.S.S./GOL

FIGURE 2-2A

File: M:\BNSF Somers\BNSF-Som - Vapor Intrusion Work Plan_2-2A_Pot Map DEC 2009.dwg Layout: FIGURE 2-2A User: schwartze Plotted: Jan 11, 2011 - 3:26pm Xref's:



NOTE: FLATHEAD LAKE ELEVATION (ft msl) = 2893.00

LEGEND

S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
2889.99	GROUNDWATER ELEVATION (ft msl)
(2880.50)	RECORDED ELEVATION IS NOT USED TO CONTOUR
[2880.50]*	WELLS ARE COMPLETED IN THE CONFINED AQUIFER AND ARE NOT RELIED ON TO CONTOUR
2890.5	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
	GROUNDWATER FLOW DIRECTION
	BARBEDWIRE FENCE
	CHAIN LINK FENCE

AECOM

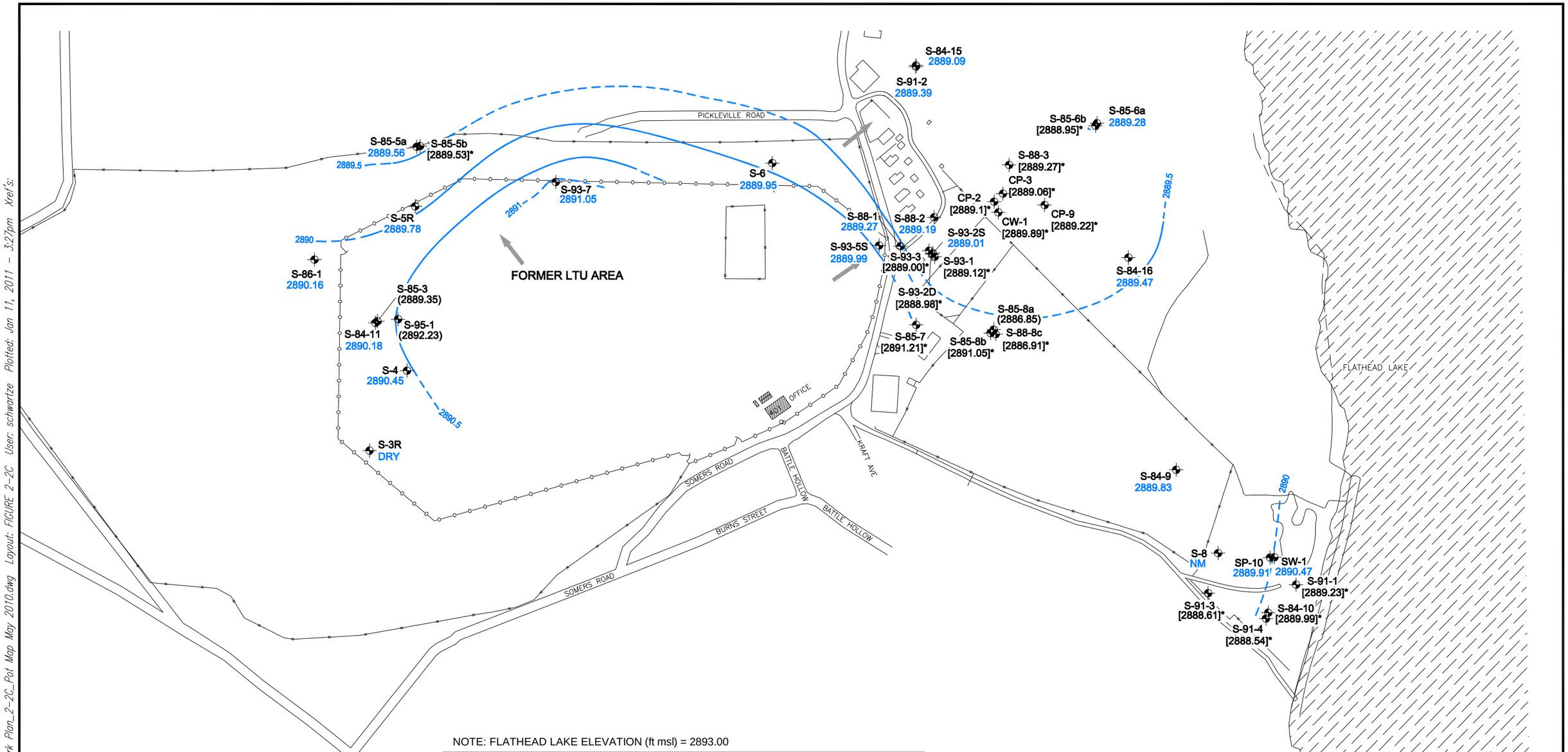
BNSF RAILWAY COMPANY
SOMERS, MONTANA (60190166-200)

POTENTIOMETRIC SURFACE MAP
MARCH 14, 2010

DATE: 01/11/11 | DRWN: LP/FTC

FIGURE 2-2B

File: M:\BNSF Somers\BNSF-Som - Vapor Intrusion Work Plan_2-2B_Pot Map MAR 2010.dwg Layout: FIGURE 2-2B User: schwartze Plotted: Jan 11, 2011 - 3:26pm Xref's:



NOTE: FLATHEAD LAKE ELEVATION (ft msl) = 2893.00

LEGEND

S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
2889.99	GROUNDWATER ELEVATION (ft msl)
(2892.23)	RECORDED ELEVATION IS NOT USED TO CONTOUR
[2880.50]*	WELLS ARE COMPLETED IN THE CONFINED AQUIFER AND ARE NOT RELIED ON TO CONTOUR
2890.5	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
	GROUNDWATER FLOW DIRECTION
	BARBEDWIRE FENCE
	CHAIN LINK FENCE

150 0 300

1"=300'

AECOM

BNSF RAILWAY COMPANY

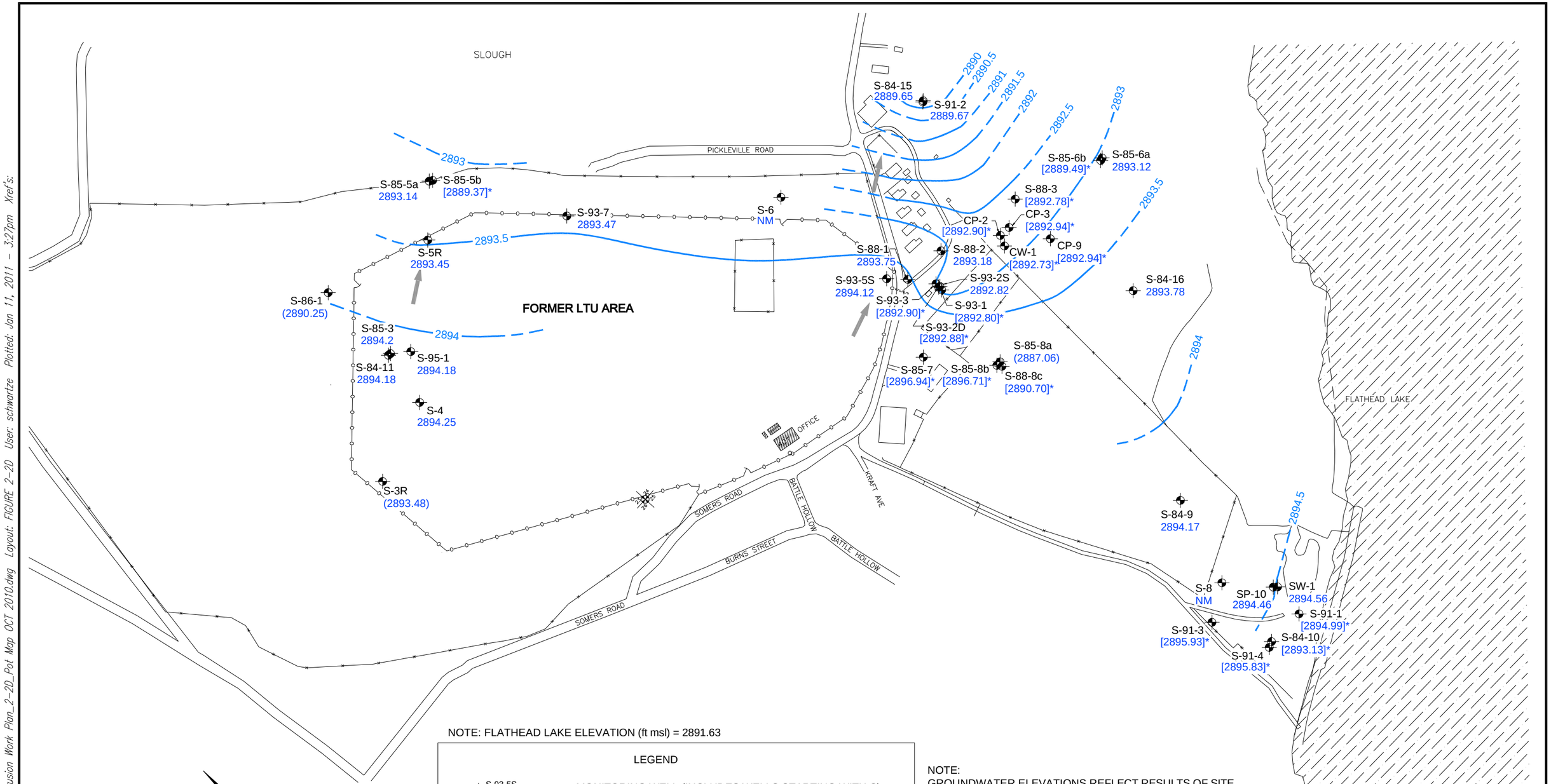
SOMERS, MONTANA (60190166-200)

POTENITOMETRIC SURFACE MAP
MAY 31, 2010

DATE: 01/11/11 | DRWN: E.S.S./DEN

FIGURE 2-2C

File: M:\BNSF Somers\BNSF-Som - Vapor Intrusion Work Plan_2-2C_Pot Map May 2010.dwg Layout: FIGURE 2-2C User: schwartze Plotted: Jan 11, 2011 - 3:27pm Xref's:



NOTE: FLATHEAD LAKE ELEVATION (ft msl) = 2891.63

150 0 300

1"=300'

LEGEND

S-93-5S	MONITORING WELL (INCLUDES WELLS STARTING WITH C)
2890.69	GROUNDWATER ELEVATION (ft msl)
(2880.50)	RECORDED ELEVATION IS NOT USED TO CONTOUR
[2880.50]*	WELLS ARE COMPLETED IN THE CONFINED AQUIFER AND ARE NOT RELIED ON TO CONTOUR
2890.5	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
	GROUNDWATER FLOW DIRECTION
	BARBEDWIRE FENCE
	CHAIN LINK FENCE

NOTE:
GROUNDWATER ELEVATIONS REFLECT RESULTS OF SITE WIDE SURVEY CONDUCTED IN DECEMBER 2010. MEASURING POINT ELEVATIONS OF WELLS ADJUSTED PER SURVEY. WELLS S-3R, S-6, S-86-1, S-85-5B, S-85-6B, AND S-85-8A WERE ABANDONED NOVEMBER 2010 AND WERE NOT INCLUDED IN THE SURVEY. GROUNDWATER ELEVATIONS AT THESE WELLS WERE NOT USED TO CONTOUR.

AECOM

BNSF RAILWAY COMPANY
SOMERS, MONTANA (60190166-200)

POTENTIOMETRIC SURFACE MAP
OCTOBER 4, 2010

DATE: 01/11/11 | DRWN: E.S.S./DEN

FIGURE 2-2D

File: M:\BNSF Somers\BNSF-Som - Vapor Intrusion Work Plan_2-2D_Pot Map OCT 2010.dwg Layout: FIGURE 2-2D User: schwartze Plotted: Jan 11, 2011 - 3:27pm Xref's:

Appendix A

S-10-1 and S-10-2 Laboratory Reports

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

January 05, 2011

Shelly Young
AECOM, Inc.
207 North Broadway, Suite 315
Billings, MT 59101

RE: Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Dear Shelly Young:
Enclosed are the analytical results for sample(s) received by the laboratory on December 16, 2010. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Denise Jensen

denise.jensen@pacelabs.com
Project Manager

Enclosures

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(612)607-1700

CERTIFICATIONS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Minnesota Certification IDs
1700 Elm Street SE Suite 200, Minneapolis, MN 55414
Alaska Certification #: UST-078
Alaska Certification #MN00064
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
EPA Region 8 Certification #: Pace
Florida/NELAP Certification #: E87605
Georgia Certification #: 959
Idaho Certification #: MN00064
Illinois Certification #: 200011
Iowa Certification #: 368
Kansas Certification #: E-10167
Louisiana Certification #: 03086
Louisiana Certification #: LA080009
Maine Certification #: 2007029
Maryland Certification #: 322
Michigan DEQ Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT CERT0092
Nebraska Certification #: Pace
Nevada Certification #: MN_00064
New Jersey Certification #: MN-002
New Mexico Certification #: Pace
New York Certification #: 11647
North Carolina Certification #: 530
North Dakota Certification #: R-036
North Dakota Certification #: R-036A
Ohio VAP Certification #: CL101
Oklahoma Certification #: D9921
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Tennessee Certification #: 02818
Texas Certification #: T104704192
Washington Certification #: C754
Wisconsin Certification #: 999407970

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SAMPLE SUMMARY

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10145454001	**S-10-2 D**	Water	12/15/10 09:55	12/16/10 10:02
10145454002	**S-10-2 I**	Water	12/15/10 10:20	12/16/10 10:02
10145454003	**S-10-2 S UNFILTERED**	Water	12/15/10 10:57	12/16/10 10:02
10145454004	**S-10-1 S UNFILTERED**	Water	12/15/10 11:30	12/16/10 10:02
10145454005	**S-10-1 I**	Water	12/15/10 12:00	12/16/10 10:02
10145454006	**S-10-1 D**	Water	12/15/10 12:35	12/16/10 10:02
10145454007	**S-10-2 S FILTERED**	Water	12/15/10 10:57	12/16/10 10:02
10145454008	**S-10-1 S FILTERED**	Solid	12/15/10 11:30	12/16/10 10:02
10145454009	**S-10-2-D DILUTION**	Water	12/15/10 09:55	12/16/10 10:02
10145454010	**S-10-2-I DILUTION**	Water	12/15/10 10:20	12/16/10 10:02
10145454011	**S-10-2-S UNFILTERED DILUTION**	Water	12/15/10 10:57	12/16/10 10:02
10145454012	**S-10-1-I DILUTION 1**	Water	12/15/10 12:00	12/16/10 10:02
10145454013	**S-10-1-I DILUTION 2**	Water	12/15/10 12:00	12/16/10 10:02
10145454014	**S-10-1-D DILUTION 1**	Water	12/15/10 12:35	12/16/10 10:02
10145454015	**S-10-1-D DILUTION 2**	Water	12/15/10 12:35	12/16/10 10:02
10145454016	**S-10-2-S FILTERED DILUTION**	Water	12/15/10 10:57	12/16/10 10:02
10145454017	**S-10-1-S UNFILTERED**	Solid	12/15/10 11:30	12/16/10 10:02
10145454018	**S-10-1 I DILUTION 3**	Water	12/15/10 12:00	12/16/10 10:02
10145454019	**S-10-1 D DILUTION 3**	Water	12/15/10 12:35	12/16/10 10:02
10145454020	**S-10-2 D DILUTION**	Water	12/15/10 09:55	12/16/10 10:02
10145454021	**S-10-2 I DILUTION**	Water	12/15/10 10:20	12/16/10 10:02
10145454022	**S-10-1 S FILTERED DILUTION**	Solid	12/15/10 11:30	12/16/10 10:02
10145454023	**S-10-1 S FILTERED DILUTION 2**	Solid	12/15/10 11:30	12/16/10 10:02
10145454024	**S-10-1 S DILUTION 1**	Solid	12/15/10 11:30	12/16/10 10:02
10145454025	**S-10-1 S DILUTION 2**	Solid	12/15/10 11:30	12/16/10 10:02
10145454027	**S-10-2 S UNFILTERED DILUTION**	Water	12/15/10 10:57	12/16/10 10:02
10145454028	**S-10-1 I DILUTION**	Water	12/15/10 12:00	12/16/10 10:02
10145454029	**S-10-2 S FILTERED DILUTION**	Water	12/15/10 12:00	12/16/10 10:02

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SAMPLE ANALYTE COUNT

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Lab ID	Sample ID	Method	Analysts	Analytes Reported
10145454001	**S-10-2 D**	EPA 6020	RJS	1
		EPA 8270	JMW	20
		EPA 8270 by SIM	JLR	18
		SM 2540D	AS1	1
10145454002	**S-10-2 I**	EPA 6020	RJS	1
		EPA 8270	JMW	20
		EPA 8270 by SIM	JLR	18
		SM 2540D	AS1	1
10145454003	**S-10-2 S UNFILTERED**	EPA 6020	RJS	1
		EPA 8270	JMW	20
		EPA 8270 by SIM	JLR	18
		SM 2540D	AS1	1
10145454004	**S-10-1 S UNFILTERED**	EPA 6020	RJS	1
10145454005	**S-10-1 I**	EPA 6020	RJS	1
		EPA 8270	JMW	20
		EPA 8270 by SIM	JLR	18
		SM 2540D	AS1	1
10145454006	**S-10-1 D**	EPA 6020	RJS	1
		EPA 8270	JMW	20
		EPA 8270 by SIM	JLR	18
		SM 2540D	AS1	1
10145454007	**S-10-2 S FILTERED**	EPA 8270	JMW	20
		EPA 8270 by SIM	JLR	18
10145454008	**S-10-1 S FILTERED**	EPA 8270	JLR	20
		EPA 8270 by SIM	JMW	18
10145454009	**S-10-2-D DILUTION**	EPA 8270 by SIM	JLR	18
10145454010	**S-10-2-I DILUTION**	EPA 8270 by SIM	JLR	18
10145454011	**S-10-2-S UNFILTERED DILUTION**	EPA 8270 by SIM	JMW	18
10145454012	**S-10-1-I DILUTION 1**	EPA 8270 by SIM	JLR	18
10145454013	**S-10-1-I DILUTION 2**	EPA 8270 by SIM	JLR	18
10145454014	**S-10-1-D DILUTION 1**	EPA 8270 by SIM	JLR	18
10145454015	**S-10-1-D DILUTION 2**	EPA 8270 by SIM	JLR	18
10145454016	**S-10-2-S FILTERED DILUTION**	EPA 8270 by SIM	JMW	18
10145454017	**S-10-1-S UNFILTERED**	EPA 8270	JLR	20
		EPA 8270 by SIM	JMW	18
10145454018	**S-10-1 I DILUTION 3**	EPA 8270 by SIM	JLR	18
10145454019	**S-10-1 D DILUTION 3**	EPA 8270 by SIM	JMW	18

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SAMPLE ANALYTE COUNT

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Lab ID	Sample ID	Method	Analysts	Analytes Reported
10145454020	**S-10-2 D DILUTION**	EPA 8270	JLR	20
10145454021	**S-10-2 I DILUTION**	EPA 8270	JLR	20
10145454022	**S-10-1 S FILTERED DILUTION**	EPA 8270 by SIM	JMW	18
10145454023	**S-10-1 S FILTERED DILUTION 2**	EPA 8270 by SIM	JMW	18
10145454024	**S-10-1 S DILUTION 1**	EPA 8270 by SIM	JMW	18
10145454025	**S-10-1 S DILUTION 2**	EPA 8270 by SIM	JMW	18
10145454027	**S-10-2 S UNFILTERED DILUTION**	EPA 8270	JLR	20
10145454028	**S-10-1 I DILUTION**	EPA 8270	JLR	20
10145454029	**S-10-2 S FILTERED DILUTION**	EPA 8270	JLR	20

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Date: January 05, 2011

The total suspended solids analysis on sample S-10-1 S could not be completed as the sample would not filter.

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 6020**
Description: 6020 MET ICPMS
Client: AECOM
Date: January 05, 2011

General Information:
6 samples were analyzed for EPA 6020. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3020 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270**
Description: 8270 MSSV
Client: AECOM
Date: January 05, 2011

General Information:
2 samples were analyzed for EPA 8270. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3550 with any exceptions noted below.
The samples were prepared in accordance with EPA 3520 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

QC Batch: OEXT/14535

S4: Surrogate recovery not evaluated against control limits due to sample dilution.

- S-10-1 I (Lab ID: 10145454005)
  - 2,4,6-Tribromophenol (S)
  - 2-Fluorobiphenyl (S)
  - 2-Fluorophenol (S)
  - Nitrobenzene-d5 (S)
  - Phenol-d6 (S)
  - Terphenyl-d14 (S)
- S-10-1 I DILUTION (Lab ID: 10145454028)
  - Nitrobenzene-d5 (S)
- S-10-2 I DILUTION (Lab ID: 10145454021)
  - Nitrobenzene-d5 (S)

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

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1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270**
Description: 8270 MSSV
Client: AECOM
Date: January 05, 2011

QC Batch: MSSV/6156

A matrix spike/matrix spike duplicate was not performed due to insufficient sample volume.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: OEXT/14535

D2: Samples evaluated to 1/2 the reporting limit.

- BLANK (Lab ID: 910398)
  - Nitrobenzene-d5 (S)
- S-10-1 D (Lab ID: 10145454006)
  - Nitrobenzene-d5 (S)
- S-10-1 I (Lab ID: 10145454005)
  - Nitrobenzene-d5 (S)
- S-10-1 I DILUTION (Lab ID: 10145454028)
  - Nitrobenzene-d5 (S)
- S-10-2 D (Lab ID: 10145454001)
  - Nitrobenzene-d5 (S)
- S-10-2 D DILUTION (Lab ID: 10145454020)
  - Nitrobenzene-d5 (S)
- S-10-2 I (Lab ID: 10145454002)
  - Nitrobenzene-d5 (S)
- S-10-2 I DILUTION (Lab ID: 10145454021)
  - Nitrobenzene-d5 (S)
- S-10-2 S FILTERED (Lab ID: 10145454007)
  - Nitrobenzene-d5 (S)
- S-10-2 S FILTERED DILUTION (Lab ID: 10145454029)
  - Nitrobenzene-d5 (S)
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - Nitrobenzene-d5 (S)
- S-10-2 S UNFILTERED DILUTION (Lab ID: 10145454027)
  - Nitrobenzene-d5 (S)

D3: Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

- S-10-1 D (Lab ID: 10145454006)
  - Nitrobenzene-d5 (S)

D4: Sample was diluted due to the presence of high levels of target analytes.

- S-10-1 I (Lab ID: 10145454005)
  - Nitrobenzene-d5 (S)
- S-10-1 I DILUTION (Lab ID: 10145454028)
  - Nitrobenzene-d5 (S)
- S-10-2 D DILUTION (Lab ID: 10145454020)
  - Nitrobenzene-d5 (S)

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270**
Description: 8270 MSSV
Client: AECOM
Date: January 05, 2011

Analyte Comments:

QC Batch: OEXT/14535

D4: Sample was diluted due to the presence of high levels of target analytes.

- S-10-2 I DILUTION (Lab ID: 10145454021)
  - Nitrobenzene-d5 (S)
- S-10-2 S FILTERED (Lab ID: 10145454007)
  - Nitrobenzene-d5 (S)
- S-10-2 S FILTERED DILUTION (Lab ID: 10145454029)
  - Nitrobenzene-d5 (S)
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - Nitrobenzene-d5 (S)
- S-10-2 S UNFILTERED DILUTION (Lab ID: 10145454027)
  - Nitrobenzene-d5 (S)

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- S-10-1 I (Lab ID: 10145454005)
  - 2,4-Dimethylphenol
- S-10-2 D (Lab ID: 10145454001)
  - 2,4-Dimethylphenol
- S-10-2 I (Lab ID: 10145454002)
  - 2,4-Dimethylphenol
- S-10-2 S FILTERED (Lab ID: 10145454007)
  - 2,4-Dimethylphenol
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - 2,4-Dimethylphenol

QC Batch: OEXT/14539

D2: Samples evaluated to 1/2 the reporting limit.

- BLANK (Lab ID: 910492)
  - Nitrobenzene-d5 (S)
- S-10-1 S FILTERED (Lab ID: 10145454008)
  - Nitrobenzene-d5 (S)
- S-10-1-S UNFILTERED (Lab ID: 10145454017)
  - Nitrobenzene-d5 (S)

D3: Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

- MS (Lab ID: 910494)
  - Nitrobenzene-d5 (S)
- MSD (Lab ID: 910495)
  - Nitrobenzene-d5 (S)
- S-10-1 S FILTERED (Lab ID: 10145454008)
  - Nitrobenzene-d5 (S)
- S-10-1-S UNFILTERED (Lab ID: 10145454017)
  - Nitrobenzene-d5 (S)

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

General Information:
6 samples were analyzed for EPA 8270 by SIM. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3550 with any exceptions noted below.
The samples were prepared in accordance with EPA 3510 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

QC Batch: OEXT/14489

S4: Surrogate recovery not evaluated against control limits due to sample dilution.

- S-10-1 D DILUTION 3 (Lab ID: 10145454019)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1 I DILUTION 3 (Lab ID: 10145454018)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1-D DILUTION 2 (Lab ID: 10145454015)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1-I DILUTION 2 (Lab ID: 10145454013)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-2-D DILUTION (Lab ID: 10145454009)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-2-I DILUTION (Lab ID: 10145454010)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

QC Batch: OEXT/14538

S4: Surrogate recovery not evaluated against control limits due to sample dilution.

- S-10-1 S DILUTION 1 (Lab ID: 10145454024)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1 S DILUTION 2 (Lab ID: 10145454025)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1 S FILTERED DILUTION (Lab ID: 10145454022)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1 S FILTERED DILUTION 2 (Lab ID: 10145454023)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: OEXT/14538

A matrix spike and matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10145454008

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 910490)
  - Benzo(a)anthracene
  - Benzo(k)fluoranthene
  - Dibenz(a,h)anthracene
- MSD (Lab ID: 910491)
  - Benzo(b)fluoranthene
  - Benzo(k)fluoranthene
  - Dibenz(a,h)anthracene

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

Analyte Comments:

QC Batch: OEXT/14489

D2: Samples evaluated to 1/2 the reporting limit.

- S-10-1 D (Lab ID: 10145454006)
  - 2-Fluorobiphenyl (S)
- S-10-1 D DILUTION 3 (Lab ID: 10145454019)
  - 2-Fluorobiphenyl (S)
- S-10-1 I (Lab ID: 10145454005)
  - 2-Fluorobiphenyl (S)
- S-10-1 I DILUTION 3 (Lab ID: 10145454018)
  - 2-Fluorobiphenyl (S)
- S-10-1-D DILUTION 1 (Lab ID: 10145454014)
  - 2-Fluorobiphenyl (S)
- S-10-1-D DILUTION 2 (Lab ID: 10145454015)
  - 2-Fluorobiphenyl (S)
- S-10-1-I DILUTION 1 (Lab ID: 10145454012)
  - 2-Fluorobiphenyl (S)
- S-10-1-I DILUTION 2 (Lab ID: 10145454013)
  - 2-Fluorobiphenyl (S)
- S-10-2 D (Lab ID: 10145454001)
  - 2-Fluorobiphenyl (S)
- S-10-2 I (Lab ID: 10145454002)
  - 2-Fluorobiphenyl (S)
- S-10-2 S FILTERED (Lab ID: 10145454007)
  - 2-Fluorobiphenyl (S)
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - 2-Fluorobiphenyl (S)
- S-10-2-D DILUTION (Lab ID: 10145454009)
  - 2-Fluorobiphenyl (S)
- S-10-2-I DILUTION (Lab ID: 10145454010)
  - 2-Fluorobiphenyl (S)
- S-10-2-S FILTERED DILUTION (Lab ID: 10145454016)
  - 2-Fluorobiphenyl (S)
- S-10-2-S UNFILTERED DILUTION (Lab ID: 10145454011)
  - 2-Fluorobiphenyl (S)

D4: Sample was diluted due to the presence of high levels of target analytes.

- S-10-1 D DILUTION 3 (Lab ID: 10145454019)
  - 2-Fluorobiphenyl (S)
- S-10-1 I DILUTION 3 (Lab ID: 10145454018)
  - 2-Fluorobiphenyl (S)
- S-10-1-D DILUTION 1 (Lab ID: 10145454014)
  - 2-Fluorobiphenyl (S)
- S-10-1-I DILUTION 1 (Lab ID: 10145454012)
  - 2-Fluorobiphenyl (S)

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

Analyte Comments:

QC Batch: OEXT/14489

D4: Sample was diluted due to the presence of high levels of target analytes.

- S-10-1-I DILUTION 2 (Lab ID: 10145454013)
  - 2-Fluorobiphenyl (S)
- S-10-2-D DILUTION (Lab ID: 10145454009)
  - 2-Fluorobiphenyl (S)
- S-10-2-I DILUTION (Lab ID: 10145454010)
  - 2-Fluorobiphenyl (S)
- S-10-2-S FILTERED DILUTION (Lab ID: 10145454016)
  - 2-Fluorobiphenyl (S)
- S-10-2-S UNFILTERED DILUTION (Lab ID: 10145454011)
  - 2-Fluorobiphenyl (S)

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- S-10-1 D (Lab ID: 10145454006)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Naphthalene
  - Phenanthrene
- S-10-1 I (Lab ID: 10145454005)
  - Acenaphthene
  - Anthracene
  - Benzo(a)anthracene
  - Chrysene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene
- S-10-1-D DILUTION 1 (Lab ID: 10145454014)
  - Acenaphthene
  - Naphthalene
- S-10-1-I DILUTION 1 (Lab ID: 10145454012)
  - Acenaphthene
  - Fluorene
  - Naphthalene
  - Phenanthrene
- S-10-1-I DILUTION 2 (Lab ID: 10145454013)
  - Naphthalene
- S-10-2 D (Lab ID: 10145454001)
  - Naphthalene
- S-10-2 I (Lab ID: 10145454002)
  - Naphthalene

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

Analyte Comments:

QC Batch: OEXT/14489

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- S-10-2 S FILTERED (Lab ID: 10145454007)
  - Naphthalene
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - Naphthalene

QC Batch: OEXT/14538

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- MS (Lab ID: 910490)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene
- MSD (Lab ID: 910491)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene
- S-10-1 S FILTERED (Lab ID: 10145454008)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene
- S-10-1-S UNFILTERED (Lab ID: 10145454017)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270**
Description: 8270 MSSV
Client: AECOM
Date: January 05, 2011

General Information:
11 samples were analyzed for EPA 8270. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3550 with any exceptions noted below.
The samples were prepared in accordance with EPA 3520 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

QC Batch: OEXT/14535

S4: Surrogate recovery not evaluated against control limits due to sample dilution.

- S-10-1 I (Lab ID: 10145454005)
  - 2,4,6-Tribromophenol (S)
  - 2-Fluorobiphenyl (S)
  - 2-Fluorophenol (S)
  - Nitrobenzene-d5 (S)
  - Phenol-d6 (S)
  - Terphenyl-d14 (S)
- S-10-1 I DILUTION (Lab ID: 10145454028)
  - Nitrobenzene-d5 (S)
- S-10-2 I DILUTION (Lab ID: 10145454021)
  - Nitrobenzene-d5 (S)

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270**
Description: 8270 MSSV
Client: AECOM
Date: January 05, 2011

QC Batch: MSSV/6156

A matrix spike/matrix spike duplicate was not performed due to insufficient sample volume.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: OEXT/14535

D2: Samples evaluated to 1/2 the reporting limit.

- BLANK (Lab ID: 910398)
  - Nitrobenzene-d5 (S)
- S-10-1 D (Lab ID: 10145454006)
  - Nitrobenzene-d5 (S)
- S-10-1 I (Lab ID: 10145454005)
  - Nitrobenzene-d5 (S)
- S-10-1 I DILUTION (Lab ID: 10145454028)
  - Nitrobenzene-d5 (S)
- S-10-2 D (Lab ID: 10145454001)
  - Nitrobenzene-d5 (S)
- S-10-2 D DILUTION (Lab ID: 10145454020)
  - Nitrobenzene-d5 (S)
- S-10-2 I (Lab ID: 10145454002)
  - Nitrobenzene-d5 (S)
- S-10-2 I DILUTION (Lab ID: 10145454021)
  - Nitrobenzene-d5 (S)
- S-10-2 S FILTERED (Lab ID: 10145454007)
  - Nitrobenzene-d5 (S)
- S-10-2 S FILTERED DILUTION (Lab ID: 10145454029)
  - Nitrobenzene-d5 (S)
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - Nitrobenzene-d5 (S)
- S-10-2 S UNFILTERED DILUTION (Lab ID: 10145454027)
  - Nitrobenzene-d5 (S)

D3: Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

- S-10-1 D (Lab ID: 10145454006)
  - Nitrobenzene-d5 (S)

D4: Sample was diluted due to the presence of high levels of target analytes.

- S-10-1 I (Lab ID: 10145454005)
  - Nitrobenzene-d5 (S)
- S-10-1 I DILUTION (Lab ID: 10145454028)
  - Nitrobenzene-d5 (S)
- S-10-2 D DILUTION (Lab ID: 10145454020)
  - Nitrobenzene-d5 (S)

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270**
Description: 8270 MSSV
Client: AECOM
Date: January 05, 2011

Analyte Comments:

QC Batch: OEXT/14535

D4: Sample was diluted due to the presence of high levels of target analytes.

- S-10-2 I DILUTION (Lab ID: 10145454021)
  - Nitrobenzene-d5 (S)
- S-10-2 S FILTERED (Lab ID: 10145454007)
  - Nitrobenzene-d5 (S)
- S-10-2 S FILTERED DILUTION (Lab ID: 10145454029)
  - Nitrobenzene-d5 (S)
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - Nitrobenzene-d5 (S)
- S-10-2 S UNFILTERED DILUTION (Lab ID: 10145454027)
  - Nitrobenzene-d5 (S)

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- S-10-1 I (Lab ID: 10145454005)
  - 2,4-Dimethylphenol
- S-10-2 D (Lab ID: 10145454001)
  - 2,4-Dimethylphenol
- S-10-2 I (Lab ID: 10145454002)
  - 2,4-Dimethylphenol
- S-10-2 S FILTERED (Lab ID: 10145454007)
  - 2,4-Dimethylphenol
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - 2,4-Dimethylphenol

QC Batch: OEXT/14539

D2: Samples evaluated to 1/2 the reporting limit.

- BLANK (Lab ID: 910492)
  - Nitrobenzene-d5 (S)
- S-10-1 S FILTERED (Lab ID: 10145454008)
  - Nitrobenzene-d5 (S)
- S-10-1-S UNFILTERED (Lab ID: 10145454017)
  - Nitrobenzene-d5 (S)

D3: Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

- MS (Lab ID: 910494)
  - Nitrobenzene-d5 (S)
- MSD (Lab ID: 910495)
  - Nitrobenzene-d5 (S)
- S-10-1 S FILTERED (Lab ID: 10145454008)
  - Nitrobenzene-d5 (S)
- S-10-1-S UNFILTERED (Lab ID: 10145454017)
  - Nitrobenzene-d5 (S)

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

General Information:
16 samples were analyzed for EPA 8270 by SIM. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3550 with any exceptions noted below.
The samples were prepared in accordance with EPA 3510 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

QC Batch: OEXT/14489

S4: Surrogate recovery not evaluated against control limits due to sample dilution.

- S-10-1 D DILUTION 3 (Lab ID: 10145454019)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1 I DILUTION 3 (Lab ID: 10145454018)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1-D DILUTION 2 (Lab ID: 10145454015)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1-I DILUTION 2 (Lab ID: 10145454013)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-2-D DILUTION (Lab ID: 10145454009)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-2-I DILUTION (Lab ID: 10145454010)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

QC Batch: OEXT/14538

S4: Surrogate recovery not evaluated against control limits due to sample dilution.

- S-10-1 S DILUTION 1 (Lab ID: 10145454024)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1 S DILUTION 2 (Lab ID: 10145454025)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1 S FILTERED DILUTION (Lab ID: 10145454022)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)
- S-10-1 S FILTERED DILUTION 2 (Lab ID: 10145454023)
  - 2-Fluorobiphenyl (S)
  - Terphenyl-d14 (S)

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: OEXT/14538

A matrix spike and matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10145454008

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 910490)
  - Benzo(a)anthracene
  - Benzo(k)fluoranthene
  - Dibenz(a,h)anthracene
- MSD (Lab ID: 910491)
  - Benzo(b)fluoranthene
  - Benzo(k)fluoranthene
  - Dibenz(a,h)anthracene

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

Analyte Comments:

QC Batch: OEXT/14489

D2: Samples evaluated to 1/2 the reporting limit.

- S-10-1 D (Lab ID: 10145454006)
  - 2-Fluorobiphenyl (S)
- S-10-1 D DILUTION 3 (Lab ID: 10145454019)
  - 2-Fluorobiphenyl (S)
- S-10-1 I (Lab ID: 10145454005)
  - 2-Fluorobiphenyl (S)
- S-10-1 I DILUTION 3 (Lab ID: 10145454018)
  - 2-Fluorobiphenyl (S)
- S-10-1-D DILUTION 1 (Lab ID: 10145454014)
  - 2-Fluorobiphenyl (S)
- S-10-1-D DILUTION 2 (Lab ID: 10145454015)
  - 2-Fluorobiphenyl (S)
- S-10-1-I DILUTION 1 (Lab ID: 10145454012)
  - 2-Fluorobiphenyl (S)
- S-10-1-I DILUTION 2 (Lab ID: 10145454013)
  - 2-Fluorobiphenyl (S)
- S-10-2 D (Lab ID: 10145454001)
  - 2-Fluorobiphenyl (S)
- S-10-2 I (Lab ID: 10145454002)
  - 2-Fluorobiphenyl (S)
- S-10-2 S FILTERED (Lab ID: 10145454007)
  - 2-Fluorobiphenyl (S)
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - 2-Fluorobiphenyl (S)
- S-10-2-D DILUTION (Lab ID: 10145454009)
  - 2-Fluorobiphenyl (S)
- S-10-2-I DILUTION (Lab ID: 10145454010)
  - 2-Fluorobiphenyl (S)
- S-10-2-S FILTERED DILUTION (Lab ID: 10145454016)
  - 2-Fluorobiphenyl (S)
- S-10-2-S UNFILTERED DILUTION (Lab ID: 10145454011)
  - 2-Fluorobiphenyl (S)

D4: Sample was diluted due to the presence of high levels of target analytes.

- S-10-1 D DILUTION 3 (Lab ID: 10145454019)
  - 2-Fluorobiphenyl (S)
- S-10-1 I DILUTION 3 (Lab ID: 10145454018)
  - 2-Fluorobiphenyl (S)
- S-10-1-D DILUTION 1 (Lab ID: 10145454014)
  - 2-Fluorobiphenyl (S)
- S-10-1-I DILUTION 1 (Lab ID: 10145454012)
  - 2-Fluorobiphenyl (S)

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

Analyte Comments:

QC Batch: OEXT/14489

D4: Sample was diluted due to the presence of high levels of target analytes.

- S-10-1-I DILUTION 2 (Lab ID: 10145454013)
  - 2-Fluorobiphenyl (S)
- S-10-2-D DILUTION (Lab ID: 10145454009)
  - 2-Fluorobiphenyl (S)
- S-10-2-I DILUTION (Lab ID: 10145454010)
  - 2-Fluorobiphenyl (S)
- S-10-2-S FILTERED DILUTION (Lab ID: 10145454016)
  - 2-Fluorobiphenyl (S)
- S-10-2-S UNFILTERED DILUTION (Lab ID: 10145454011)
  - 2-Fluorobiphenyl (S)

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- S-10-1 D (Lab ID: 10145454006)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Naphthalene
  - Phenanthrene
- S-10-1 I (Lab ID: 10145454005)
  - Acenaphthene
  - Anthracene
  - Benzo(a)anthracene
  - Chrysene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene
- S-10-1-D DILUTION 1 (Lab ID: 10145454014)
  - Acenaphthene
  - Naphthalene
- S-10-1-I DILUTION 1 (Lab ID: 10145454012)
  - Acenaphthene
  - Fluorene
  - Naphthalene
  - Phenanthrene
- S-10-1-I DILUTION 2 (Lab ID: 10145454013)
  - Naphthalene
- S-10-2 D (Lab ID: 10145454001)
  - Naphthalene
- S-10-2 I (Lab ID: 10145454002)
  - Naphthalene

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **EPA 8270 by SIM**
Description: 8270 MSSV PAH by SIM
Client: AECOM
Date: January 05, 2011

Analyte Comments:

QC Batch: OEXT/14489

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- S-10-2 S FILTERED (Lab ID: 10145454007)
  - Naphthalene
- S-10-2 S UNFILTERED (Lab ID: 10145454003)
  - Naphthalene

QC Batch: OEXT/14538

E: Analyte concentration exceeded the calibration range. The reported result is estimated.

- MS (Lab ID: 910490)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene
- MSD (Lab ID: 910491)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene
- S-10-1 S FILTERED (Lab ID: 10145454008)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene
- S-10-1-S UNFILTERED (Lab ID: 10145454017)
  - Acenaphthene
  - Anthracene
  - Fluorene
  - Fluoranthene
  - Naphthalene
  - Phenanthrene
  - Pyrene

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PROJECT NARRATIVE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Method: **SM 2540D**
Description: 2540D Total Suspended Solids
Client: AECOM
Date: January 05, 2011

General Information:
5 samples were analyzed for SM 2540D. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2 D **Lab ID: 10145454001** Collected: 12/15/10 09:55 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020		Preparation Method: EPA 3020						
Zinc	**574**	ug/L	25.0	6.4	5	12/21/10 16:29	12/29/10 10:49	7440-66-6	
8270 MSSV	Analytical Method: EPA 8270		Preparation Method: EPA 3520						
4-Chloro-3-methylphenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:11	59-50-7	
2-Chlorophenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:11	95-57-8	
2,4-Dichlorophenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:11	120-83-2	
2,4-Dimethylphenol	**409**	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:11	105-67-9	E
4,6-Dinitro-2-methylphenol	ND	ug/L	51.3	25.6	1	12/22/10 17:23	12/28/10 23:11	534-52-1	
2,4-Dinitrophenol	ND	ug/L	51.3	25.6	1	12/22/10 17:23	12/28/10 23:11	51-28-5	
2-Methylphenol(o-Cresol)	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:11	95-48-7	
3&4-Methylphenol	ND	ug/L	20.5	10.3	1	12/22/10 17:23	12/28/10 23:11		
2-Nitrophenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:11	88-75-5	
4-Nitrophenol	ND	ug/L	51.3	25.6	1	12/22/10 17:23	12/28/10 23:11	100-02-7	
Pentachlorophenol	ND	ug/L	23.6	11.8	1	12/22/10 17:23	12/28/10 23:11	87-86-5	
Phenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:11	108-95-2	
2,4,5-Trichlorophenol	ND	ug/L	51.3	25.6	1	12/22/10 17:23	12/28/10 23:11	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:11	88-06-2	
Nitrobenzene-d5 (S)	85	%	53-125		1	12/22/10 17:23	12/28/10 23:11	4165-60-0	D2
2-Fluorobiphenyl (S)	72	%	56-125		1	12/22/10 17:23	12/28/10 23:11	321-60-8	
Terphenyl-d14 (S)	80	%	61-125		1	12/22/10 17:23	12/28/10 23:11	1718-51-0	
Phenol-d6 (S)	77	%	56-125		1	12/22/10 17:23	12/28/10 23:11	13127-88-3	
2-Fluorophenol (S)	71	%	54-125		1	12/22/10 17:23	12/28/10 23:11	367-12-4	
2,4,6-Tribromophenol (S)	88	%	58-125		1	12/22/10 17:23	12/28/10 23:11	118-79-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM		Preparation Method: EPA 3510						
Acenaphthene	**0.73**	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	83-32-9	
Acenaphthylene	**0.078**	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	208-96-8	
Anthracene	**0.048**	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	120-12-7	
Benzo(a)anthracene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	207-08-9	
Chrysene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	53-70-3	
Fluoranthene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	206-44-0	
Fluorene	**0.22**	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	193-39-5	
Naphthalene	**69.5**	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	91-20-3	E
Phenanthrene	**0.14**	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	85-01-8	
Pyrene	ND	ug/L	0.042	0.021	1	12/17/10 11:28	12/22/10 13:45	129-00-0	
2-Fluorobiphenyl (S)	91	%	43-125		1	12/17/10 11:28	12/22/10 13:45	321-60-8	D2
Terphenyl-d14 (S)	98	%	34-136		1	12/17/10 11:28	12/22/10 13:45	1718-51-0	
2540D Total Suspended Solids	Analytical Method: SM 2540D								
Total Suspended Solids	**25.4**	mg/L	10.0	5.0	1		12/22/10 13:50		

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2 I **Lab ID: 10145454002** Collected: 12/15/10 10:20 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3020								
Zinc	**16.5**	ug/L	5.0	1.3	1	12/21/10 16:29	12/29/10 10:44	7440-66-6	
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
4-Chloro-3-methylphenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:40	59-50-7	
2-Chlorophenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:40	95-57-8	
2,4-Dichlorophenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:40	120-83-2	
2,4-Dimethylphenol	**1240**	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:40	105-67-9	E
4,6-Dinitro-2-methylphenol	ND	ug/L	51.3	25.6	1	12/22/10 17:23	12/28/10 23:40	534-52-1	
2,4-Dinitrophenol	ND	ug/L	51.3	25.6	1	12/22/10 17:23	12/28/10 23:40	51-28-5	
2-Methylphenol(o-Cresol)	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:40	95-48-7	
3&4-Methylphenol	ND	ug/L	20.5	10.3	1	12/22/10 17:23	12/28/10 23:40		
2-Nitrophenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:40	88-75-5	
4-Nitrophenol	ND	ug/L	51.3	25.6	1	12/22/10 17:23	12/28/10 23:40	100-02-7	
Pentachlorophenol	ND	ug/L	23.6	11.8	1	12/22/10 17:23	12/28/10 23:40	87-86-5	
Phenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:40	108-95-2	
2,4,5-Trichlorophenol	ND	ug/L	51.3	25.6	1	12/22/10 17:23	12/28/10 23:40	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	10.3	5.1	1	12/22/10 17:23	12/28/10 23:40	88-06-2	
Nitrobenzene-d5 (S)	82	%	53-125		1	12/22/10 17:23	12/28/10 23:40	4165-60-0	D2
2-Fluorobiphenyl (S)	68	%	56-125		1	12/22/10 17:23	12/28/10 23:40	321-60-8	
Terphenyl-d14 (S)	74	%	61-125		1	12/22/10 17:23	12/28/10 23:40	1718-51-0	
Phenol-d6 (S)	77	%	56-125		1	12/22/10 17:23	12/28/10 23:40	13127-88-3	
2-Fluorophenol (S)	72	%	54-125		1	12/22/10 17:23	12/28/10 23:40	367-12-4	
2,4,6-Tribromophenol (S)	83	%	58-125		1	12/22/10 17:23	12/28/10 23:40	118-79-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**0.76**	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	83-32-9	
Acenaphthylene	ND	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	208-96-8	
Anthracene	**0.19**	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	120-12-7	
Benzo(a)anthracene	ND	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	207-08-9	
Chrysene	ND	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	53-70-3	
Fluoranthene	**0.025J**	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	206-44-0	
Fluorene	**0.40**	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	193-39-5	
Naphthalene	**49.6**	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	91-20-3	E
Phenanthrene	**0.44**	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	85-01-8	
Pyrene	**0.034J**	ug/L	0.041	0.020	1	12/17/10 11:28	12/22/10 14:06	129-00-0	
2-Fluorobiphenyl (S)	90	%	43-125		1	12/17/10 11:28	12/22/10 14:06	321-60-8	D2
Terphenyl-d14 (S)	97	%	34-136		1	12/17/10 11:28	12/22/10 14:06	1718-51-0	
2540D Total Suspended Solids	Analytical Method: SM 2540D								
Total Suspended Solids	**185**	mg/L	10.0	5.0	1		12/22/10 13:50		

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2 S UNFILTERED **Lab ID: 10145454003** Collected: 12/15/10 10:57 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3020								
Zinc	**3.2J**	ug/L	5.0	1.3	1	12/21/10 16:29	12/28/10 14:02	7440-66-6	
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
4-Chloro-3-methylphenol	ND	ug/L	20.4	10.2	2	12/22/10 17:23	12/29/10 18:47	59-50-7	
2-Chlorophenol	ND	ug/L	20.4	10.2	2	12/22/10 17:23	12/29/10 18:47	95-57-8	
2,4-Dichlorophenol	ND	ug/L	20.4	10.2	2	12/22/10 17:23	12/29/10 18:47	120-83-2	
2,4-Dimethylphenol	**263**	ug/L	20.4	10.2	2	12/22/10 17:23	12/29/10 18:47	105-67-9	E
4,6-Dinitro-2-methylphenol	ND	ug/L	102	51.0	2	12/22/10 17:23	12/29/10 18:47	534-52-1	
2,4-Dinitrophenol	ND	ug/L	102	51.0	2	12/22/10 17:23	12/29/10 18:47	51-28-5	
2-Methylphenol(o-Cresol)	ND	ug/L	20.4	10.2	2	12/22/10 17:23	12/29/10 18:47	95-48-7	
3&4-Methylphenol	ND	ug/L	40.8	20.4	2	12/22/10 17:23	12/29/10 18:47		
2-Nitrophenol	ND	ug/L	20.4	10.2	2	12/22/10 17:23	12/29/10 18:47	88-75-5	
4-Nitrophenol	ND	ug/L	102	51.0	2	12/22/10 17:23	12/29/10 18:47	100-02-7	
Pentachlorophenol	ND	ug/L	46.9	23.5	2	12/22/10 17:23	12/29/10 18:47	87-86-5	
Phenol	ND	ug/L	20.4	10.2	2	12/22/10 17:23	12/29/10 18:47	108-95-2	
2,4,5-Trichlorophenol	ND	ug/L	102	51.0	2	12/22/10 17:23	12/29/10 18:47	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	20.4	10.2	2	12/22/10 17:23	12/29/10 18:47	88-06-2	
Nitrobenzene-d5 (S)	75	%	53-125		2	12/22/10 17:23	12/29/10 18:47	4165-60-0	D2,D4
2-Fluorobiphenyl (S)	72	%	56-125		2	12/22/10 17:23	12/29/10 18:47	321-60-8	
Terphenyl-d14 (S)	85	%	61-125		2	12/22/10 17:23	12/29/10 18:47	1718-51-0	
Phenol-d6 (S)	71	%	56-125		2	12/22/10 17:23	12/29/10 18:47	13127-88-3	
2-Fluorophenol (S)	65	%	54-125		2	12/22/10 17:23	12/29/10 18:47	367-12-4	
2,4,6-Tribromophenol (S)	87	%	58-125		2	12/22/10 17:23	12/29/10 18:47	118-79-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**0.32**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	83-32-9	
Acenaphthylene	**0.14**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	208-96-8	
Anthracene	**0.074**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	120-12-7	
Benzo(a)anthracene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	207-08-9	
Chrysene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	53-70-3	
Fluoranthene	**0.065**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	206-44-0	
Fluorene	**0.17**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	193-39-5	
Naphthalene	**18.7**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	91-20-3	E
Phenanthrene	**0.26**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	85-01-8	
Pyrene	**0.055**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:27	129-00-0	
2-Fluorobiphenyl (S)	81	%	43-125		1	12/17/10 11:28	12/22/10 14:27	321-60-8	D2
Terphenyl-d14 (S)	91	%	34-136		1	12/17/10 11:28	12/22/10 14:27	1718-51-0	
2540D Total Suspended Solids	Analytical Method: SM 2540D								
Total Suspended Solids	**14.6**	mg/L	10.0	5.0	1		12/22/10 13:50		

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 S UNFILTERED **Lab ID: 10145454004** Collected: 12/15/10 11:30 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3020								
Zinc	**816**	ug/L	125	31.8	5	12/21/10 16:29	12/29/10 10:53	7440-66-6	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 I **Lab ID: 10145454005** Collected: 12/15/10 12:00 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3020								
Zinc	**31.1**	ug/L	25.0	6.4	5	12/21/10 16:29	12/28/10 14:26	7440-66-6	
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
4-Chloro-3-methylphenol	ND	ug/L	518	259	50	12/22/10 17:23	12/29/10 20:14	59-50-7	
2-Chlorophenol	ND	ug/L	518	259	50	12/22/10 17:23	12/29/10 20:14	95-57-8	
2,4-Dichlorophenol	ND	ug/L	518	259	50	12/22/10 17:23	12/29/10 20:14	120-83-2	
2,4-Dimethylphenol	**9550**	ug/L	518	259	50	12/22/10 17:23	12/29/10 20:14	105-67-9	E
4,6-Dinitro-2-methylphenol	ND	ug/L	2590	1300	50	12/22/10 17:23	12/29/10 20:14	534-52-1	
2,4-Dinitrophenol	ND	ug/L	2590	1300	50	12/22/10 17:23	12/29/10 20:14	51-28-5	
2-Methylphenol(o-Cresol)	ND	ug/L	518	259	50	12/22/10 17:23	12/29/10 20:14	95-48-7	
3&4-Methylphenol	**3880**	ug/L	1040	518	50	12/22/10 17:23	12/29/10 20:14		
2-Nitrophenol	ND	ug/L	518	259	50	12/22/10 17:23	12/29/10 20:14	88-75-5	
4-Nitrophenol	ND	ug/L	2590	1300	50	12/22/10 17:23	12/29/10 20:14	100-02-7	
Pentachlorophenol	ND	ug/L	1190	596	50	12/22/10 17:23	12/29/10 20:14	87-86-5	
Phenol	**506J**	ug/L	518	259	50	12/22/10 17:23	12/29/10 20:14	108-95-2	
2,4,5-Trichlorophenol	ND	ug/L	2590	1300	50	12/22/10 17:23	12/29/10 20:14	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	518	259	50	12/22/10 17:23	12/29/10 20:14	88-06-2	
Nitrobenzene-d5 (S)	0	%	53-125		50	12/22/10 17:23	12/29/10 20:14	4165-60-0	D2,D4, S4
2-Fluorobiphenyl (S)	0	%	56-125		50	12/22/10 17:23	12/29/10 20:14	321-60-8	S4
Terphenyl-d14 (S)	0	%	61-125		50	12/22/10 17:23	12/29/10 20:14	1718-51-0	S4
Phenol-d6 (S)	0	%	56-125		50	12/22/10 17:23	12/29/10 20:14	13127-88-3	S4
2-Fluorophenol (S)	0	%	54-125		50	12/22/10 17:23	12/29/10 20:14	367-12-4	S4
2,4,6-Tribromophenol (S)	0	%	58-125		50	12/22/10 17:23	12/29/10 20:14	118-79-6	S4
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**117**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	83-32-9	E
Acenaphthylene	**8.4**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	208-96-8	
Anthracene	**41.9**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	120-12-7	E
Benzo(a)anthracene	**10.8**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	56-55-3	E
Benzo(a)pyrene	**3.7**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	50-32-8	
Benzo(b)fluoranthene	**6.2**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	205-99-2	
Benzo(g,h,i)perylene	**0.99**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	191-24-2	
Benzo(k)fluoranthene	**2.2**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	207-08-9	
Chrysene	**10.4**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	218-01-9	E
Dibenz(a,h)anthracene	**0.43**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	53-70-3	
Fluoranthene	**57.2**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	206-44-0	E
Fluorene	**74.9**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	86-73-7	E
Indeno(1,2,3-cd)pyrene	**1.0**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	193-39-5	
Naphthalene	**1000**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	91-20-3	E
Phenanthrene	**79.1**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	85-01-8	E
Pyrene	**44.7**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 14:48	129-00-0	E
2-Fluorobiphenyl (S)	71	%	43-125		1	12/17/10 11:28	12/22/10 14:48	321-60-8	D2
Terphenyl-d14 (S)	91	%	34-136		1	12/17/10 11:28	12/22/10 14:48	1718-51-0	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 I **Lab ID: 10145454005** Collected: 12/15/10 12:00 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
2540D Total Suspended Solids	Analytical Method: SM 2540D								
Total Suspended Solids	**250**	mg/L	10.0	5.0	1		12/22/10 13:50		

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 D **Lab ID: 10145454006** Collected: 12/15/10 12:35 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3020								
Zinc	**131**	ug/L	5.0	1.3	1	12/21/10 16:29	12/28/10 14:11	7440-66-6	
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
4-Chloro-3-methylphenol	ND	ug/L	51.5	25.8	5	12/22/10 17:23	12/29/10 19:45	59-50-7	
2-Chlorophenol	ND	ug/L	51.5	25.8	5	12/22/10 17:23	12/29/10 19:45	95-57-8	
2,4-Dichlorophenol	ND	ug/L	51.5	25.8	5	12/22/10 17:23	12/29/10 19:45	120-83-2	
2,4-Dimethylphenol	**197**	ug/L	51.5	25.8	5	12/22/10 17:23	12/29/10 19:45	105-67-9	
4,6-Dinitro-2-methylphenol	ND	ug/L	258	129	5	12/22/10 17:23	12/29/10 19:45	534-52-1	
2,4-Dinitrophenol	ND	ug/L	258	129	5	12/22/10 17:23	12/29/10 19:45	51-28-5	
2-Methylphenol(o-Cresol)	ND	ug/L	51.5	25.8	5	12/22/10 17:23	12/29/10 19:45	95-48-7	
3&4-Methylphenol	ND	ug/L	103	51.5	5	12/22/10 17:23	12/29/10 19:45		
2-Nitrophenol	ND	ug/L	51.5	25.8	5	12/22/10 17:23	12/29/10 19:45	88-75-5	
4-Nitrophenol	ND	ug/L	258	129	5	12/22/10 17:23	12/29/10 19:45	100-02-7	
Pentachlorophenol	ND	ug/L	119	59.3	5	12/22/10 17:23	12/29/10 19:45	87-86-5	
Phenol	**36.2J**	ug/L	51.5	25.8	5	12/22/10 17:23	12/29/10 19:45	108-95-2	
2,4,5-Trichlorophenol	ND	ug/L	258	129	5	12/22/10 17:23	12/29/10 19:45	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	51.5	25.8	5	12/22/10 17:23	12/29/10 19:45	88-06-2	
Nitrobenzene-d5 (S)	75	%	53-125		5	12/22/10 17:23	12/29/10 19:45	4165-60-0	D2,D3
2-Fluorobiphenyl (S)	78	%	56-125		5	12/22/10 17:23	12/29/10 19:45	321-60-8	
Terphenyl-d14 (S)	82	%	61-125		5	12/22/10 17:23	12/29/10 19:45	1718-51-0	
Phenol-d6 (S)	75	%	56-125		5	12/22/10 17:23	12/29/10 19:45	13127-88-3	
2-Fluorophenol (S)	68	%	54-125		5	12/22/10 17:23	12/29/10 19:45	367-12-4	
2,4,6-Tribromophenol (S)	82	%	58-125		5	12/22/10 17:23	12/29/10 19:45	118-79-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**94.9**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	83-32-9	E
Acenaphthylene	**4.9**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	208-96-8	
Anthracene	**16.1**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	120-12-7	E
Benzo(a)anthracene	**0.24**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	56-55-3	
Benzo(a)pyrene	**0.031J**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	50-32-8	
Benzo(b)fluoranthene	**0.048**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	207-08-9	
Chrysene	**0.21**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	53-70-3	
Fluoranthene	**7.0**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	206-44-0	
Fluorene	**59.5**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	86-73-7	E
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	193-39-5	
Naphthalene	**421**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	91-20-3	E
Phenanthrene	**53.0**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	85-01-8	E
Pyrene	**4.4**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:09	129-00-0	
2-Fluorobiphenyl (S)	75	%	43-125		1	12/17/10 11:28	12/22/10 15:09	321-60-8	D2
Terphenyl-d14 (S)	94	%	34-136		1	12/17/10 11:28	12/22/10 15:09	1718-51-0	
2540D Total Suspended Solids	Analytical Method: SM 2540D								
Total Suspended Solids	**2180**	mg/L	20.0	10.0	1		12/22/10 13:50		

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2 S FILTERED **Lab ID: 10145454007** Collected: 12/15/10 10:57 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
4-Chloro-3-methylphenol	ND	ug/L	20.6	10.3	2	12/22/10 17:23	12/29/10 19:16	59-50-7	
2-Chlorophenol	ND	ug/L	20.6	10.3	2	12/22/10 17:23	12/29/10 19:16	95-57-8	
2,4-Dichlorophenol	ND	ug/L	20.6	10.3	2	12/22/10 17:23	12/29/10 19:16	120-83-2	
2,4-Dimethylphenol	**276**	ug/L	20.6	10.3	2	12/22/10 17:23	12/29/10 19:16	105-67-9	E
4,6-Dinitro-2-methylphenol	ND	ug/L	103	51.5	2	12/22/10 17:23	12/29/10 19:16	534-52-1	
2,4-Dinitrophenol	ND	ug/L	103	51.5	2	12/22/10 17:23	12/29/10 19:16	51-28-5	
2-Methylphenol(o-Cresol)	ND	ug/L	20.6	10.3	2	12/22/10 17:23	12/29/10 19:16	95-48-7	
3&4-Methylphenol	ND	ug/L	41.2	20.6	2	12/22/10 17:23	12/29/10 19:16		
2-Nitrophenol	ND	ug/L	20.6	10.3	2	12/22/10 17:23	12/29/10 19:16	88-75-5	
4-Nitrophenol	ND	ug/L	103	51.5	2	12/22/10 17:23	12/29/10 19:16	100-02-7	
Pentachlorophenol	ND	ug/L	47.4	23.7	2	12/22/10 17:23	12/29/10 19:16	87-86-5	
Phenol	ND	ug/L	20.6	10.3	2	12/22/10 17:23	12/29/10 19:16	108-95-2	
2,4,5-Trichlorophenol	ND	ug/L	103	51.5	2	12/22/10 17:23	12/29/10 19:16	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	20.6	10.3	2	12/22/10 17:23	12/29/10 19:16	88-06-2	
Nitrobenzene-d5 (S)	86	%	53-125		2	12/22/10 17:23	12/29/10 19:16	4165-60-0	D2,D4
2-Fluorobiphenyl (S)	77	%	56-125		2	12/22/10 17:23	12/29/10 19:16	321-60-8	
Terphenyl-d14 (S)	88	%	61-125		2	12/22/10 17:23	12/29/10 19:16	1718-51-0	
Phenol-d6 (S)	79	%	56-125		2	12/22/10 17:23	12/29/10 19:16	13127-88-3	
2-Fluorophenol (S)	72	%	54-125		2	12/22/10 17:23	12/29/10 19:16	367-12-4	
2,4,6-Tribromophenol (S)	92	%	58-125		2	12/22/10 17:23	12/29/10 19:16	118-79-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**0.60**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	83-32-9	
Acenaphthylene	**0.12**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	208-96-8	
Anthracene	**0.13**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	120-12-7	
Benzo(a)anthracene	**0.029J**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	207-08-9	
Chrysene	**0.021J**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	53-70-3	
Fluoranthene	**0.12**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	206-44-0	
Fluorene	**0.34**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	193-39-5	
Naphthalene	**22.8**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	91-20-3	E
Phenanthrene	**0.51**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	85-01-8	
Pyrene	**0.10**	ug/L	0.041	0.021	1	12/17/10 11:28	12/22/10 15:30	129-00-0	
2-Fluorobiphenyl (S)	84	%	43-125		1	12/17/10 11:28	12/22/10 15:30	321-60-8	D2
Terphenyl-d14 (S)	94	%	34-136		1	12/17/10 11:28	12/22/10 15:30	1718-51-0	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 S FILTERED **Lab ID: 10145454008** Collected: 12/15/10 11:30 Received: 12/16/10 10:02 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3550								
4-Chloro-3-methylphenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 12:29	59-50-7	
2-Chlorophenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 12:29	95-57-8	
2,4-Dichlorophenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 12:29	120-83-2	
2,4-Dimethylphenol	**938000J**	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 12:29	105-67-9	
4,6-Dinitro-2-methylphenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 12:29	534-52-1	
2,4-Dinitrophenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 12:29	51-28-5	
2-Methylphenol(o-Cresol)	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 12:29	95-48-7	
3&4-Methylphenol	ND	ug/kg	1980000	990000	10	12/22/10 18:02	01/04/11 12:29		
2-Nitrophenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 12:29	88-75-5	
4-Nitrophenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 12:29	100-02-7	
Pentachlorophenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 12:29	87-86-5	
Phenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 12:29	108-95-2	
2,4,5-Trichlorophenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 12:29	95-95-4	
2,4,6-Trichlorophenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 12:29	88-06-2	
Nitrobenzene-d5 (S)	91	%	57-125		10	12/22/10 18:02	01/04/11 12:29	4165-60-0	D2,D3
2-Fluorobiphenyl (S)	86	%	62-125		10	12/22/10 18:02	01/04/11 12:29	321-60-8	
Terphenyl-d14 (S)	97	%	64-125		10	12/22/10 18:02	01/04/11 12:29	1718-51-0	
Phenol-d6 (S)	90	%	59-125		10	12/22/10 18:02	01/04/11 12:29	13127-88-3	
2-Fluorophenol (S)	88	%	59-125		10	12/22/10 18:02	01/04/11 12:29	367-12-4	
2,4,6-Tribromophenol (S)	87	%	46-125		10	12/22/10 18:02	01/04/11 12:29	118-79-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3550								
Acenaphthene	**7530000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	83-32-9	E
Acenaphthylene	**157000**	ug/kg	30000	2640	5	12/22/10 18:01	12/27/10 22:38	208-96-8	
Anthracene	**1770000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	120-12-7	E
Benzo(a)anthracene	**531000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	56-55-3	M1
Benzo(a)pyrene	**169000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	50-32-8	
Benzo(b)fluoranthene	**256000**	ug/kg	30000	2280	5	12/22/10 18:01	12/27/10 22:38	205-99-2	M1
Benzo(g,h,i)perylene	**45000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	191-24-2	
Benzo(k)fluoranthene	**120000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	207-08-9	M1
Chrysene	**495000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	53-70-3	M1
Fluoranthene	**3110000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	206-44-0	E
Fluorene	**3780000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	86-73-7	E
Indeno(1,2,3-cd)pyrene	**40100**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	193-39-5	
Naphthalene	**13700000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	91-20-3	E
Phenanthrene	**7170000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	85-01-8	E
Pyrene	**2350000**	ug/kg	30000	15000	5	12/22/10 18:01	12/27/10 22:38	129-00-0	E
2-Fluorobiphenyl (S)	42	%	39-125		5	12/22/10 18:01	12/27/10 22:38	321-60-8	
Terphenyl-d14 (S)	51	%	30-150		5	12/22/10 18:01	12/27/10 22:38	1718-51-0	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2-D DILUTION **Lab ID: 10145454009** Collected: 12/15/10 09:55 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	83-32-9	
Acenaphthylene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	208-96-8	
Anthracene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	120-12-7	
Benzo(a)anthracene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	56-55-3	
Benzo(a)pyrene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	207-08-9	
Chrysene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	53-70-3	
Fluoranthene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	206-44-0	
Fluorene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	193-39-5	
Naphthalene	**252**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	91-20-3	
Phenanthrene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	85-01-8	
Pyrene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 18:59	129-00-0	
2-Fluorobiphenyl (S)	0	%	43-125		50	12/17/10 07:00	12/22/10 18:59	321-60-8	D2,D4, S4
Terphenyl-d14 (S)	0	%	34-136		50	12/17/10 07:00	12/22/10 18:59	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2-I DILUTION **Lab ID: 10145454010** Collected: 12/15/10 10:20 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	83-32-9	
Acenaphthylene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	208-96-8	
Anthracene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	120-12-7	
Benzo(a)anthracene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	56-55-3	
Benzo(a)pyrene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	207-08-9	
Chrysene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	53-70-3	
Fluoranthene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	206-44-0	
Fluorene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	193-39-5	
Naphthalene	**184**	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	91-20-3	
Phenanthrene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	85-01-8	
Pyrene	ND	ug/L	2.0	1.0	50	12/17/10 07:00	12/22/10 19:19	129-00-0	
2-Fluorobiphenyl (S)	0	%	43-125		50	12/17/10 07:00	12/22/10 19:19	321-60-8	D2,D4, S4
Terphenyl-d14 (S)	0	%	34-136		50	12/17/10 07:00	12/22/10 19:19	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2-S UNFILTERED DILUTION **Lab ID: 10145454011** Collected: 12/15/10 10:57 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**0.31**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	83-32-9	
Acenaphthylene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	208-96-8	
Anthracene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	120-12-7	
Benzo(a)anthracene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	207-08-9	
Chrysene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	53-70-3	
Fluoranthene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	206-44-0	
Fluorene	**0.18J**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	193-39-5	
Naphthalene	**20.5**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	91-20-3	
Phenanthrene	**0.29**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	85-01-8	
Pyrene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 12:53	129-00-0	
2-Fluorobiphenyl (S)	84	%	43-125		5	12/17/10 07:00	12/23/10 12:53	321-60-8	D2,D4
Terphenyl-d14 (S)	94	%	34-136		5	12/17/10 07:00	12/23/10 12:53	1718-51-0	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1-I DILUTION 1 **Lab ID: 10145454012** Collected: 12/15/10 12:00 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**353**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	83-32-9	E
Acenaphthylene	**10.1**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	208-96-8	
Anthracene	**50.1**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	120-12-7	
Benzo(a)anthracene	**9.9**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	56-55-3	
Benzo(a)pyrene	**3.4**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	50-32-8	
Benzo(b)fluoranthene	**5.7**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	205-99-2	
Benzo(g,h,i)perylene	**1.0**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	191-24-2	
Benzo(k)fluoranthene	**2.2**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	207-08-9	
Chrysene	**9.9**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	218-01-9	
Dibenz(a,h)anthracene	**0.42**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	53-70-3	
Fluoranthene	**63.7**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	206-44-0	
Fluorene	**161**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	86-73-7	E
Indeno(1,2,3-cd)pyrene	**0.99**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	193-39-5	
Naphthalene	**1440**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	91-20-3	E
Phenanthrene	**197**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	85-01-8	E
Pyrene	**44.2**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:01	129-00-0	
2-Fluorobiphenyl (S)	88	%	43-125		10	12/17/10 07:00	12/22/10 20:01	321-60-8	D2,D4
Terphenyl-d14 (S)	86	%	34-136		10	12/17/10 07:00	12/22/10 20:01	1718-51-0	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1-I DILUTION 2 **Lab ID: 10145454013** Collected: 12/15/10 12:00 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**354**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	83-32-9	
Acenaphthylene	**9.8**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	208-96-8	
Anthracene	**48.1**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	120-12-7	
Benzo(a)anthracene	**9.9**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	56-55-3	
Benzo(a)pyrene	**3.1**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	50-32-8	
Benzo(b)fluoranthene	**4.9**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	191-24-2	
Benzo(k)fluoranthene	**2.2**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	207-08-9	
Chrysene	**9.6**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	53-70-3	
Fluoranthene	**59.9**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	206-44-0	
Fluorene	**159**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	193-39-5	
Naphthalene	**3770**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	91-20-3	E
Phenanthrene	**195**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	85-01-8	
Pyrene	**42.1**	ug/L	2.1	1.0	50	12/17/10 07:00	12/22/10 20:22	129-00-0	
2-Fluorobiphenyl (S)	0	%	43-125		50	12/17/10 07:00	12/22/10 20:22	321-60-8	D2,D4, S4
Terphenyl-d14 (S)	0	%	34-136		50	12/17/10 07:00	12/22/10 20:22	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1-D DILUTION 1 **Lab ID: 10145454014** Collected: 12/15/10 12:35 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**239**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	83-32-9	E
Acenaphthylene	**5.6**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	208-96-8	
Anthracene	**16.2**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	120-12-7	
Benzo(a)anthracene	**0.31J**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	207-08-9	
Chrysene	**0.22J**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	53-70-3	
Fluoranthene	**7.1**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	206-44-0	
Fluorene	**98.6**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	193-39-5	
Naphthalene	**1120**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	91-20-3	E
Phenanthrene	**78.4**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	85-01-8	
Pyrene	**4.4**	ug/L	0.41	0.21	10	12/17/10 07:00	12/22/10 20:43	129-00-0	
2-Fluorobiphenyl (S)	88	%	43-125		10	12/17/10 07:00	12/22/10 20:43	321-60-8	D2,D4
Terphenyl-d14 (S)	96	%	34-136		10	12/17/10 07:00	12/22/10 20:43	1718-51-0	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1-D DILUTION 2 **Lab ID: 10145454015** Collected: 12/15/10 12:35 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**244**	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	83-32-9	
Acenaphthylene	**5.4**	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	208-96-8	
Anthracene	**16.8**	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	120-12-7	
Benzo(a)anthracene	ND	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	56-55-3	
Benzo(a)pyrene	ND	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	207-08-9	
Chrysene	ND	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	53-70-3	
Fluoranthene	**7.3**	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	206-44-0	
Fluorene	**95.9**	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	193-39-5	
Naphthalene	**5000**	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	91-20-3	
Phenanthrene	**77.9**	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	85-01-8	
Pyrene	**4.6**	ug/L	4.1	2.1	100	12/17/10 07:00	12/22/10 21:03	129-00-0	
2-Fluorobiphenyl (S)	0	%	43-125		100	12/17/10 07:00	12/22/10 21:03	321-60-8	D2,S4
Terphenyl-d14 (S)	0	%	34-136		100	12/17/10 07:00	12/22/10 21:03	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2-S FILTERED DILUTION **Lab ID: 10145454016** Collected: 12/15/10 10:57 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**0.59**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	83-32-9	
Acenaphthylene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	208-96-8	
Anthracene	**0.11J**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	120-12-7	
Benzo(a)anthracene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	56-55-3	
Benzo(a)pyrene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	207-08-9	
Chrysene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	53-70-3	
Fluoranthene	**0.13J**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	206-44-0	
Fluorene	**0.33**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	193-39-5	
Naphthalene	**24.8**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	91-20-3	
Phenanthrene	**0.50**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	85-01-8	
Pyrene	**0.11J**	ug/L	0.21	0.10	5	12/17/10 07:00	12/23/10 13:14	129-00-0	
2-Fluorobiphenyl (S)	82	%	43-125		5	12/17/10 07:00	12/23/10 13:14	321-60-8	D2,D4
Terphenyl-d14 (S)	90	%	34-136		5	12/17/10 07:00	12/23/10 13:14	1718-51-0	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1-S UNFILTERED **Lab ID: 10145454017** Collected: 12/15/10 11:30 Received: 12/16/10 10:02 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3550								
4-Chloro-3-methylphenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 13:54	59-50-7	
2-Chlorophenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 13:54	95-57-8	
2,4-Dichlorophenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 13:54	120-83-2	
2,4-Dimethylphenol	**705000J**	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 13:54	105-67-9	
4,6-Dinitro-2-methylphenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 13:54	534-52-1	
2,4-Dinitrophenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 13:54	51-28-5	
2-Methylphenol(o-Cresol)	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 13:54	95-48-7	
3&4-Methylphenol	ND	ug/kg	1980000	990000	10	12/22/10 18:02	01/04/11 13:54		
2-Nitrophenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 13:54	88-75-5	
4-Nitrophenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 13:54	100-02-7	
Pentachlorophenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 13:54	87-86-5	
Phenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 13:54	108-95-2	
2,4,5-Trichlorophenol	ND	ug/kg	5100000	2550000	10	12/22/10 18:02	01/04/11 13:54	95-95-4	
2,4,6-Trichlorophenol	ND	ug/kg	990000	495000	10	12/22/10 18:02	01/04/11 13:54	88-06-2	
Nitrobenzene-d5 (S)	80	%	57-125		10	12/22/10 18:02	01/04/11 13:54	4165-60-0	D2,D3
2-Fluorobiphenyl (S)	84	%	62-125		10	12/22/10 18:02	01/04/11 13:54	321-60-8	
Terphenyl-d14 (S)	94	%	64-125		10	12/22/10 18:02	01/04/11 13:54	1718-51-0	
Phenol-d6 (S)	87	%	59-125		10	12/22/10 18:02	01/04/11 13:54	13127-88-3	
2-Fluorophenol (S)	87	%	59-125		10	12/22/10 18:02	01/04/11 13:54	367-12-4	
2,4,6-Tribromophenol (S)	84	%	46-125		10	12/22/10 18:02	01/04/11 13:54	118-79-6	
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3550								
Acenaphthene	**8410000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	83-32-9	E
Acenaphthylene	**178000**	ug/kg	30000	2640	5	12/22/10 18:01	12/28/10 18:36	208-96-8	
Anthracene	**2070000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	120-12-7	E
Benzo(a)anthracene	**601000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	56-55-3	
Benzo(a)pyrene	**192000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	50-32-8	
Benzo(b)fluoranthene	**305000**	ug/kg	30000	2280	5	12/22/10 18:01	12/28/10 18:36	205-99-2	
Benzo(g,h,i)perylene	**49700**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	191-24-2	
Benzo(k)fluoranthene	**119000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	207-08-9	
Chrysene	**562000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	53-70-3	
Fluoranthene	**3520000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	206-44-0	E
Fluorene	**4230000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	86-73-7	E
Indeno(1,2,3-cd)pyrene	**49500**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	193-39-5	
Naphthalene	**15000000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	91-20-3	E
Phenanthrene	**7300000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	85-01-8	E
Pyrene	**2720000**	ug/kg	30000	15000	5	12/22/10 18:01	12/28/10 18:36	129-00-0	E
2-Fluorobiphenyl (S)	40	%	39-125		5	12/22/10 18:01	12/28/10 18:36	321-60-8	
Terphenyl-d14 (S)	53	%	30-150		5	12/22/10 18:01	12/28/10 18:36	1718-51-0	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 I DILUTION 3 **Lab ID: 10145454018** Collected: 12/15/10 12:00 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**764**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	83-32-9	
Acenaphthylene	**410**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	208-96-8	
Anthracene	**387**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	120-12-7	
Benzo(a)anthracene	**405**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	56-55-3	
Benzo(a)pyrene	**380**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	50-32-8	
Benzo(b)fluoranthene	**386**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	205-99-2	
Benzo(g,h,i)perylene	**415**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	191-24-2	
Benzo(k)fluoranthene	**422**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	207-08-9	
Chrysene	**426**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	218-01-9	
Dibenz(a,h)anthracene	**400**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	53-70-3	
Fluoranthene	**439**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	206-44-0	
Fluorene	**554**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	86-73-7	
Indeno(1,2,3-cd)pyrene	**403**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	193-39-5	
Naphthalene	**12200**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	91-20-3	
Phenanthrene	**582**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	85-01-8	
Pyrene	**461**	ug/L	103	51.3	2500	12/17/10 09:15	12/23/10 15:19	129-00-0	
2-Fluorobiphenyl (S)	0	%	43-125		2500	12/17/10 09:15	12/23/10 15:19	321-60-8	D2,D4, S4
Terphenyl-d14 (S)	0	%	34-136		2500	12/17/10 09:15	12/23/10 15:19	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 D DILUTION 3 **Lab ID: 10145454019** Collected: 12/15/10 12:35 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3510								
Acenaphthene	**116**	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	83-32-9	
Acenaphthylene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	208-96-8	
Anthracene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	120-12-7	
Benzo(a)anthracene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	56-55-3	
Benzo(a)pyrene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	50-32-8	
Benzo(b)fluoranthene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	205-99-2	
Benzo(g,h,i)perylene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	191-24-2	
Benzo(k)fluoranthene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	207-08-9	
Chrysene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	218-01-9	
Dibenz(a,h)anthracene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	53-70-3	
Fluoranthene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	206-44-0	
Fluorene	**47.2**	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	193-39-5	
Naphthalene	**2640**	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	91-20-3	
Phenanthrene	**38.6**	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	85-01-8	
Pyrene	ND	ug/L	20.5	10.3	500	12/17/10 09:15	12/23/10 13:56	129-00-0	
2-Fluorobiphenyl (S)	0	%	43-125		500	12/17/10 09:15	12/23/10 13:56	321-60-8	D2,D4, S4
Terphenyl-d14 (S)	0	%	34-136		500	12/17/10 09:15	12/23/10 13:56	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2 D DILUTION **Lab ID: 10145454020** Collected: 12/15/10 09:55 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
2,4,5-Trichlorophenol	ND	ug/L	513	256	10	12/22/10 10:00	01/03/11 16:59	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	103	51.3	10	12/22/10 10:00	01/03/11 16:59	88-06-2	
2,4-Dichlorophenol	ND	ug/L	103	51.3	10	12/22/10 10:00	01/03/11 16:59	120-83-2	
2,4-Dimethylphenol	**758**	ug/L	103	51.3	10	12/22/10 10:00	01/03/11 16:59	105-67-9	
2,4-Dinitrophenol	ND	ug/L	513	256	10	12/22/10 10:00	01/03/11 16:59	51-28-5	
2-Chlorophenol	ND	ug/L	103	51.3	10	12/22/10 10:00	01/03/11 16:59	95-57-8	
2-Methylphenol(o-Cresol)	ND	ug/L	103	51.3	10	12/22/10 10:00	01/03/11 16:59	95-48-7	
2-Nitrophenol	ND	ug/L	103	51.3	10	12/22/10 10:00	01/03/11 16:59	88-75-5	
3&4-Methylphenol	ND	ug/L	205	103	10	12/22/10 10:00	01/03/11 16:59		
4,6-Dinitro-2-methylphenol	ND	ug/L	513	256	10	12/22/10 10:00	01/03/11 16:59	534-52-1	
4-Chloro-3-methylphenol	ND	ug/L	103	51.3	10	12/22/10 10:00	01/03/11 16:59	59-50-7	
4-Nitrophenol	ND	ug/L	513	256	10	12/22/10 10:00	01/03/11 16:59	100-02-7	
Pentachlorophenol	ND	ug/L	236	118	10	12/22/10 10:00	01/03/11 16:59	87-86-5	
Phenol	ND	ug/L	103	51.3	10	12/22/10 10:00	01/03/11 16:59	108-95-2	
Nitrobenzene-d5 (S)	77	%	53-125		10	12/22/10 10:00	01/03/11 16:59	4165-60-0	D2,D4
2-Fluorobiphenyl (S)	86	%	56-125		10	12/22/10 10:00	01/03/11 16:59	321-60-8	
Terphenyl-d14 (S)	98	%	61-125		10	12/22/10 10:00	01/03/11 16:59	1718-51-0	
Phenol-d6 (S)	85	%	56-125		10	12/22/10 10:00	01/03/11 16:59	13127-88-3	
2-Fluorophenol (S)	78	%	54-125		10	12/22/10 10:00	01/03/11 16:59	367-12-4	
2,4,6-Tribromophenol (S)	99	%	58-125		10	12/22/10 10:00	01/03/11 16:59	118-79-6	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2 I DILUTION **Lab ID: 10145454021** Collected: 12/15/10 10:20 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
2,4,5-Trichlorophenol	ND	ug/L	2560	1280	50	12/22/10 10:00	12/30/10 14:04	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	513	256	50	12/22/10 10:00	12/30/10 14:04	88-06-2	
2,4-Dichlorophenol	ND	ug/L	513	256	50	12/22/10 10:00	12/30/10 14:04	120-83-2	
2,4-Dimethylphenol	**5540**	ug/L	513	256	50	12/22/10 10:00	12/30/10 14:04	105-67-9	
2,4-Dinitrophenol	ND	ug/L	2560	1280	50	12/22/10 10:00	12/30/10 14:04	51-28-5	
2-Chlorophenol	ND	ug/L	513	256	50	12/22/10 10:00	12/30/10 14:04	95-57-8	
2-Methylphenol(o-Cresol)	ND	ug/L	513	256	50	12/22/10 10:00	12/30/10 14:04	95-48-7	
2-Nitrophenol	ND	ug/L	513	256	50	12/22/10 10:00	12/30/10 14:04	88-75-5	
3&4-Methylphenol	ND	ug/L	1030	513	50	12/22/10 10:00	12/30/10 14:04		
4,6-Dinitro-2-methylphenol	ND	ug/L	2560	1280	50	12/22/10 10:00	12/30/10 14:04	534-52-1	
4-Chloro-3-methylphenol	ND	ug/L	513	256	50	12/22/10 10:00	12/30/10 14:04	59-50-7	
4-Nitrophenol	ND	ug/L	2560	1280	50	12/22/10 10:00	12/30/10 14:04	100-02-7	
Pentachlorophenol	ND	ug/L	1180	590	50	12/22/10 10:00	12/30/10 14:04	87-86-5	
Phenol	ND	ug/L	513	256	50	12/22/10 10:00	12/30/10 14:04	108-95-2	
Nitrobenzene-d5 (S)	0	%	53-125		50	12/22/10 10:00	12/30/10 14:04	4165-60-0	D2,D4, S4
2-Fluorobiphenyl (S)	91	%	56-125		50	12/22/10 10:00	12/30/10 14:04	321-60-8	
Terphenyl-d14 (S)	89	%	61-125		50	12/22/10 10:00	12/30/10 14:04	1718-51-0	
Phenol-d6 (S)	91	%	56-125		50	12/22/10 10:00	12/30/10 14:04	13127-88-3	
2-Fluorophenol (S)	84	%	54-125		50	12/22/10 10:00	12/30/10 14:04	367-12-4	
2,4,6-Tribromophenol (S)	90	%	58-125		50	12/22/10 10:00	12/30/10 14:04	118-79-6	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 S FILTERED DILUTION **Lab ID: 10145454022** Collected: 12/15/10 11:30 Received: 12/16/10 10:02 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3550								
Acenaphthene	**880000**	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	83-32-9	
Acenaphthylene	ND	ug/kg	54500	4800	100	12/22/10 18:01	12/28/10 17:33	208-96-8	
Anthracene	**163000**	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	120-12-7	
Benzo(a)anthracene	**49900J**	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	56-55-3	
Benzo(a)pyrene	ND	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	54500	4150	100	12/22/10 18:01	12/28/10 17:33	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	207-08-9	
Chrysene	**50000J**	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	53-70-3	
Fluoranthene	**309000**	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	206-44-0	
Fluorene	**420000**	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	193-39-5	
Naphthalene	**4690000**	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	91-20-3	
Phenanthrene	**767000**	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	85-01-8	
Pyrene	**235000**	ug/kg	54500	27300	100	12/22/10 18:01	12/28/10 17:33	129-00-0	
2-Fluorobiphenyl (S)	0	%	39-125		100	12/22/10 18:01	12/28/10 17:33	321-60-8	S4
Terphenyl-d14 (S)	0	%	30-150		100	12/22/10 18:01	12/28/10 17:33	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 S FILTERED DILUTION 2 **Lab ID: 10145454023** Collected: 12/15/10 11:30 Received: 12/16/10 10:02 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3550								
Acenaphthene	**86700000**	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	83-32-9	
Acenaphthylene	ND	ug/kg	30000000	26400000	500	12/22/10 18:01	12/29/10 20:11	208-96-8	
Anthracene	**19200000J**	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	120-12-7	
Benzo(a)anthracene	ND	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	56-55-3	
Benzo(a)pyrene	ND	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	30000000	22800000	500	12/22/10 18:01	12/29/10 20:11	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	207-08-9	
Chrysene	ND	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	53-70-3	
Fluoranthene	**30600000**	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	206-44-0	
Fluorene	**42900000**	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	193-39-5	
Naphthalene	**474000000**	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	91-20-3	
Phenanthrene	**76300000**	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	85-01-8	
Pyrene	**22900000J**	ug/kg	30000000	15000000	500	12/22/10 18:01	12/29/10 20:11	129-00-0	
2-Fluorobiphenyl (S)	0	%	39-125		500	12/22/10 18:01	12/29/10 20:11	321-60-8	S4
Terphenyl-d14 (S)	0	%	30-150		500	12/22/10 18:01	12/29/10 20:11	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 S DILUTION 1 **Lab ID: 10145454024** Collected: 12/15/10 11:30 Received: 12/16/10 10:02 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3550								
Acenaphthene	**10400000**	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	83-32-9	
Acenaphthylene	ND	ug/kg	600000	52800	100	12/22/10 18:01	12/28/10 17:54	208-96-8	
Anthracene	**1890000**	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	120-12-7	
Benzo(a)anthracene	**602000**	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	56-55-3	
Benzo(a)pyrene	ND	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	50-32-8	
Benzo(b)fluoranthene	**308000J**	ug/kg	600000	45600	100	12/22/10 18:01	12/28/10 17:54	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	207-08-9	
Chrysene	**590000J**	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	53-70-3	
Fluoranthene	**3620000**	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	206-44-0	
Fluorene	**5050000**	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	193-39-5	
Naphthalene	**55600000**	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	91-20-3	
Phenanthrene	**8950000**	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	85-01-8	
Pyrene	**2810000**	ug/kg	600000	300000	100	12/22/10 18:01	12/28/10 17:54	129-00-0	
2-Fluorobiphenyl (S)	0	%	39-125		100	12/22/10 18:01	12/28/10 17:54	321-60-8	S4
Terphenyl-d14 (S)	0	%	30-150		100	12/22/10 18:01	12/28/10 17:54	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 S DILUTION 2 **Lab ID: 10145454025** Collected: 12/15/10 11:30 Received: 12/16/10 10:02 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV PAH by SIM	Analytical Method: EPA 8270 by SIM Preparation Method: EPA 3550								
Acenaphthene	**9810000**	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	83-32-9	
Acenaphthylene	ND	ug/kg	3000000	264000	500	12/22/10 18:01	12/29/10 20:32	208-96-8	
Anthracene	**2150000J**	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	120-12-7	
Benzo(a)anthracene	ND	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	56-55-3	
Benzo(a)pyrene	ND	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	3000000	228000	500	12/22/10 18:01	12/29/10 20:32	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	207-08-9	
Chrysene	ND	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	53-70-3	
Fluoranthene	**3440000**	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	206-44-0	
Fluorene	**4850000**	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	193-39-5	
Naphthalene	**54100000**	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	91-20-3	
Phenanthrene	**8670000**	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	85-01-8	
Pyrene	**2650000J**	ug/kg	3000000	1500000	500	12/22/10 18:01	12/29/10 20:32	129-00-0	
2-Fluorobiphenyl (S)	0	%	39-125		500	12/22/10 18:01	12/29/10 20:32	321-60-8	S4
Terphenyl-d14 (S)	0	%	30-150		500	12/22/10 18:01	12/29/10 20:32	1718-51-0	S4

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2 S UNFILTERED DILUTION **Lab ID: 10145454027** Collected: 12/15/10 10:57 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
2,4,5-Trichlorophenol	ND	ug/L	204	102	4	12/22/10 13:02	01/03/11 17:28	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	40.8	20.4	4	12/22/10 13:02	01/03/11 17:28	88-06-2	
2,4-Dichlorophenol	ND	ug/L	40.8	20.4	4	12/22/10 13:02	01/03/11 17:28	120-83-2	
2,4-Dimethylphenol	**321**	ug/L	40.8	20.4	4	12/22/10 13:02	01/03/11 17:28	105-67-9	
2,4-Dinitrophenol	ND	ug/L	204	102	4	12/22/10 13:02	01/03/11 17:28	51-28-5	
2-Chlorophenol	ND	ug/L	40.8	20.4	4	12/22/10 13:02	01/03/11 17:28	95-57-8	
2-Methylphenol(o-Cresol)	ND	ug/L	40.8	20.4	4	12/22/10 13:02	01/03/11 17:28	95-48-7	
2-Nitrophenol	ND	ug/L	40.8	20.4	4	12/22/10 13:02	01/03/11 17:28	88-75-5	
3&4-Methylphenol	ND	ug/L	81.6	40.8	4	12/22/10 13:02	01/03/11 17:28		
4,6-Dinitro-2-methylphenol	ND	ug/L	204	102	4	12/22/10 13:02	01/03/11 17:28	534-52-1	
4-Chloro-3-methylphenol	ND	ug/L	40.8	20.4	4	12/22/10 13:02	01/03/11 17:28	59-50-7	
4-Nitrophenol	ND	ug/L	204	102	4	12/22/10 13:02	01/03/11 17:28	100-02-7	
Pentachlorophenol	ND	ug/L	93.9	46.9	4	12/22/10 13:02	01/03/11 17:28	87-86-5	
Phenol	ND	ug/L	40.8	20.4	4	12/22/10 13:02	01/03/11 17:28	108-95-2	
Nitrobenzene-d5 (S)	84	%	53-125		4	12/22/10 13:02	01/03/11 17:28	4165-60-0	D2,D4
2-Fluorobiphenyl (S)	82	%	56-125		4	12/22/10 13:02	01/03/11 17:28	321-60-8	
Terphenyl-d14 (S)	100	%	61-125		4	12/22/10 13:02	01/03/11 17:28	1718-51-0	
Phenol-d6 (S)	80	%	56-125		4	12/22/10 13:02	01/03/11 17:28	13127-88-3	
2-Fluorophenol (S)	71	%	54-125		4	12/22/10 13:02	01/03/11 17:28	367-12-4	
2,4,6-Tribromophenol (S)	100	%	58-125		4	12/22/10 13:02	01/03/11 17:28	118-79-6	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-1 I DILUTION **Lab ID: 10145454028** Collected: 12/15/10 12:00 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
2,4,5-Trichlorophenol	ND	ug/L	5180	2590	100	12/22/10 13:02	01/03/11 17:56	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	1040	518	100	12/22/10 13:02	01/03/11 17:56	88-06-2	
2,4-Dichlorophenol	ND	ug/L	1040	518	100	12/22/10 13:02	01/03/11 17:56	120-83-2	
2,4-Dimethylphenol	**11400**	ug/L	1040	518	100	12/22/10 13:02	01/03/11 17:56	105-67-9	
2,4-Dinitrophenol	ND	ug/L	5180	2590	100	12/22/10 13:02	01/03/11 17:56	51-28-5	
2-Chlorophenol	ND	ug/L	1040	518	100	12/22/10 13:02	01/03/11 17:56	95-57-8	
2-Methylphenol(o-Cresol)	ND	ug/L	1040	518	100	12/22/10 13:02	01/03/11 17:56	95-48-7	
2-Nitrophenol	ND	ug/L	1040	518	100	12/22/10 13:02	01/03/11 17:56	88-75-5	
3&4-Methylphenol	**4560**	ug/L	2070	1040	100	12/22/10 13:02	01/03/11 17:56		
4,6-Dinitro-2-methylphenol	ND	ug/L	5180	2590	100	12/22/10 13:02	01/03/11 17:56	534-52-1	
4-Chloro-3-methylphenol	ND	ug/L	1040	518	100	12/22/10 13:02	01/03/11 17:56	59-50-7	
4-Nitrophenol	ND	ug/L	5180	2590	100	12/22/10 13:02	01/03/11 17:56	100-02-7	
Pentachlorophenol	ND	ug/L	2380	1190	100	12/22/10 13:02	01/03/11 17:56	87-86-5	
Phenol	**557J**	ug/L	1040	518	100	12/22/10 13:02	01/03/11 17:56	108-95-2	
Nitrobenzene-d5 (S)	0	%	53-125		100	12/22/10 13:02	01/03/11 17:56	4165-60-0	D2,D4, S4
2-Fluorobiphenyl (S)	84	%	56-125		100	12/22/10 13:02	01/03/11 17:56	321-60-8	
Terphenyl-d14 (S)	94	%	61-125		100	12/22/10 13:02	01/03/11 17:56	1718-51-0	
Phenol-d6 (S)	84	%	56-125		100	12/22/10 13:02	01/03/11 17:56	13127-88-3	
2-Fluorophenol (S)	83	%	54-125		100	12/22/10 13:02	01/03/11 17:56	367-12-4	
2,4,6-Tribromophenol (S)	85	%	58-125		100	12/22/10 13:02	01/03/11 17:56	118-79-6	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Sample: S-10-2 S FILTERED DILUTION **Lab ID: 10145454029** Collected: 12/15/10 12:00 Received: 12/16/10 10:02 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8270 MSSV	Analytical Method: EPA 8270 Preparation Method: EPA 3520								
2,4,5-Trichlorophenol	ND	ug/L	206	103	4	12/22/10 13:02	01/03/11 18:25	95-95-4	
2,4,6-Trichlorophenol	ND	ug/L	41.2	20.6	4	12/22/10 13:02	01/03/11 18:25	88-06-2	
2,4-Dichlorophenol	ND	ug/L	41.2	20.6	4	12/22/10 13:02	01/03/11 18:25	120-83-2	
2,4-Dimethylphenol	**331**	ug/L	41.2	20.6	4	12/22/10 13:02	01/03/11 18:25	105-67-9	
2,4-Dinitrophenol	ND	ug/L	206	103	4	12/22/10 13:02	01/03/11 18:25	51-28-5	
2-Chlorophenol	ND	ug/L	41.2	20.6	4	12/22/10 13:02	01/03/11 18:25	95-57-8	
2-Methylphenol(o-Cresol)	ND	ug/L	41.2	20.6	4	12/22/10 13:02	01/03/11 18:25	95-48-7	
2-Nitrophenol	ND	ug/L	41.2	20.6	4	12/22/10 13:02	01/03/11 18:25	88-75-5	
3&4-Methylphenol	ND	ug/L	82.5	41.2	4	12/22/10 13:02	01/03/11 18:25		
4,6-Dinitro-2-methylphenol	ND	ug/L	206	103	4	12/22/10 13:02	01/03/11 18:25	534-52-1	
4-Chloro-3-methylphenol	ND	ug/L	41.2	20.6	4	12/22/10 13:02	01/03/11 18:25	59-50-7	
4-Nitrophenol	ND	ug/L	206	103	4	12/22/10 13:02	01/03/11 18:25	100-02-7	
Pentachlorophenol	ND	ug/L	94.8	47.4	4	12/22/10 13:02	01/03/11 18:25	87-86-5	
Phenol	ND	ug/L	41.2	20.6	4	12/22/10 13:02	01/03/11 18:25	108-95-2	
Nitrobenzene-d5 (S)	90	%	53-125		4	12/22/10 13:02	01/03/11 18:25	4165-60-0	D2,D4
2-Fluorobiphenyl (S)	87	%	56-125		4	12/22/10 13:02	01/03/11 18:25	321-60-8	
Terphenyl-d14 (S)	100	%	61-125		4	12/22/10 13:02	01/03/11 18:25	1718-51-0	
Phenol-d6 (S)	85	%	56-125		4	12/22/10 13:02	01/03/11 18:25	13127-88-3	
2-Fluorophenol (S)	76	%	54-125		4	12/22/10 13:02	01/03/11 18:25	367-12-4	
2,4,6-Tribromophenol (S)	101	%	58-125		4	12/22/10 13:02	01/03/11 18:25	118-79-6	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

QC Batch: MPRP/24077 Analysis Method: EPA 6020
QC Batch Method: EPA 3020 Analysis Description: 6020 MET
Associated Lab Samples: 10145454001, 10145454002, 10145454003, 10145454004, 10145454005, 10145454006

METHOD BLANK: 908684 Matrix: Water
Associated Lab Samples: 10145454001, 10145454002, 10145454003, 10145454004, 10145454005, 10145454006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Zinc	ug/L	ND	5.0	12/28/10 12:47	

LABORATORY CONTROL SAMPLE: 908685

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Zinc	ug/L	80	80.4	100	80-120	

MATRIX SPIKE SAMPLE: 908686

Parameter	Units	9284037006 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Zinc	ug/L		80	408	97	75-125	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 908688 908689

Parameter	Units	10145528005 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Zinc	ug/L	2.0J	80	80	86.7	83.1	106	101	75-125	4	20	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

QC Batch: OEXT/14539 | Analysis Method: EPA 8270
QC Batch Method: EPA 3550 | Analysis Description: 8270 Solid MSSV
Associated Lab Samples: 10145454008, 10145454017

METHOD BLANK: 910492 | Matrix: Solid
Associated Lab Samples: 10145454008, 10145454017

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
2,4,5-Trichlorophenol	ug/kg	ND	510000	01/04/11 12:01	
2,4,6-Trichlorophenol	ug/kg	ND	99000	01/04/11 12:01	
2,4-Dichlorophenol	ug/kg	ND	99000	01/04/11 12:01	
2,4-Dimethylphenol	ug/kg	ND	99000	01/04/11 12:01	
2,4-Dinitrophenol	ug/kg	ND	510000	01/04/11 12:01	
2-Chlorophenol	ug/kg	ND	99000	01/04/11 12:01	
2-Methylphenol(o-Cresol)	ug/kg	ND	99000	01/04/11 12:01	
2-Nitrophenol	ug/kg	ND	99000	01/04/11 12:01	
3&4-Methylphenol	ug/kg	ND	198000	01/04/11 12:01	
4,6-Dinitro-2-methylphenol	ug/kg	ND	510000	01/04/11 12:01	
4-Chloro-3-methylphenol	ug/kg	ND	99000	01/04/11 12:01	
4-Nitrophenol	ug/kg	ND	510000	01/04/11 12:01	
Pentachlorophenol	ug/kg	ND	510000	01/04/11 12:01	
Phenol	ug/kg	ND	99000	01/04/11 12:01	
2,4,6-Tribromophenol (S)	%	91	46-125	01/04/11 12:01	
2-Fluorobiphenyl (S)	%	84	62-125	01/04/11 12:01	
2-Fluorophenol (S)	%	87	59-125	01/04/11 12:01	
Nitrobenzene-d5 (S)	%	101	57-125	01/04/11 12:01	D2
Phenol-d6 (S)	%	86	59-125	01/04/11 12:01	
Terphenyl-d14 (S)	%	92	64-125	01/04/11 12:01	

LABORATORY CONTROL SAMPLE: 910493

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2,4,5-Trichlorophenol	ug/kg	500000	475000J	95	59-125	
2,4,6-Trichlorophenol	ug/kg	500000	475000	95	60-125	
2,4-Dichlorophenol	ug/kg	500000	510000	102	57-125	
2,4-Dimethylphenol	ug/kg	500000	496000	99	44-125	
2,4-Dinitrophenol	ug/kg	500000	412000J	82	30-125	
2-Chlorophenol	ug/kg	500000	471000	94	60-125	
2-Methylphenol(o-Cresol)	ug/kg	500000	458000	92	55-125	
2-Nitrophenol	ug/kg	500000	529000	106	57-125	
3&4-Methylphenol	ug/kg	500000	456000	91	56-125	
4,6-Dinitro-2-methylphenol	ug/kg	500000	390000J	78	41-125	
4-Chloro-3-methylphenol	ug/kg	500000	512000	102	61-125	
4-Nitrophenol	ug/kg	500000	489000J	98	55-125	
Pentachlorophenol	ug/kg	500000	388000J	78	36-125	
Phenol	ug/kg	500000	434000	87	58-125	
2,4,6-Tribromophenol (S)	%			98	46-125	
2-Fluorobiphenyl (S)	%			84	62-125	
2-Fluorophenol (S)	%			87	59-125	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

LABORATORY CONTROL SAMPLE: 910493

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrobenzene-d5 (S)	%			102	57-125	
Phenol-d6 (S)	%			86	59-125	
Terphenyl-d14 (S)	%			93	64-125	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 910494 910495

Parameter	Units	10145454008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
2,4,5-Trichlorophenol	ug/kg	ND	500000	500000	ND	ND	84	87	47-125		30	
2,4,6-Trichlorophenol	ug/kg	ND	500000	500000	ND	ND	87	92	47-125		30	
2,4-Dichlorophenol	ug/kg	ND	500000	500000	ND	499000J	97	100	45-125		30	
2,4-Dimethylphenol	ug/kg	938000 J	500000	500000	1290000	1380000	70	89	30-144	7	30	
2,4-Dinitrophenol	ug/kg	ND	500000	500000	ND	ND	103	105	30-150		30	
2-Chlorophenol	ug/kg	ND	500000	500000	ND	ND	85	90	30-138		30	
2-Methylphenol(o-Cresol)	ug/kg	ND	500000	500000	536000J	542000J	107	108	46-125		30	
2-Nitrophenol	ug/kg	ND	500000	500000	497000J	500000J	99	100	46-125		30	
3&4-Methylphenol	ug/kg	ND	500000	500000	ND	ND	105	106	44-125		30	
4,6-Dinitro-2-methylphenol	ug/kg	ND	500000	500000	ND	ND	83	85	30-150		30	
4-Chloro-3-methylphenol	ug/kg	ND	500000	500000	510000J	500000J	102	100	46-125		30	
4-Nitrophenol	ug/kg	ND	500000	500000	ND	ND	68	68	30-147		30	
Pentachlorophenol	ug/kg	ND	500000	500000	ND	ND	37	40	30-150		30	
Phenol	ug/kg	ND	500000	500000	ND	ND	87	86	46-125		30	
2,4,6-Tribromophenol (S)	%						80	83	46-125			
2-Fluorobiphenyl (S)	%						80	82	62-125			
2-Fluorophenol (S)	%						82	84	59-125			
Nitrobenzene-d5 (S)	%						79	83	57-125			D3
Phenol-d6 (S)	%						83	84	59-125			
Terphenyl-d14 (S)	%						87	90	64-125			

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

QC Batch: OEXT/14538 Analysis Method: EPA 8270 by SIM
QC Batch Method: EPA 3550 Analysis Description: 8270 Soild PAH by SIM MSSV
Associated Lab Samples: 10145454008, 10145454017, 10145454022, 10145454023, 10145454024, 10145454025

METHOD BLANK: 910488 Matrix: Solid
Associated Lab Samples: 10145454008, 10145454017, 10145454022, 10145454023, 10145454024, 10145454025

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Acenaphthene	ug/kg	ND	10.0	12/27/10 21:56	
Acenaphthylene	ug/kg	ND	10.0	12/27/10 21:56	
Anthracene	ug/kg	ND	10.0	12/27/10 21:56	
Benzo(a)anthracene	ug/kg	ND	10.0	12/27/10 21:56	
Benzo(a)pyrene	ug/kg	ND	10.0	12/27/10 21:56	
Benzo(b)fluoranthene	ug/kg	ND	10.0	12/27/10 21:56	
Benzo(g,h,i)perylene	ug/kg	ND	10.0	12/27/10 21:56	
Benzo(k)fluoranthene	ug/kg	ND	10.0	12/27/10 21:56	
Chrysene	ug/kg	ND	10.0	12/27/10 21:56	
Dibenz(a,h)anthracene	ug/kg	ND	10.0	12/27/10 21:56	
Fluoranthene	ug/kg	ND	10.0	12/27/10 21:56	
Fluorene	ug/kg	ND	10.0	12/27/10 21:56	
Indeno(1,2,3-cd)pyrene	ug/kg	ND	10.0	12/27/10 21:56	
Naphthalene	ug/kg	ND	10.0	12/27/10 21:56	
Phenanthrene	ug/kg	ND	10.0	12/27/10 21:56	
Pyrene	ug/kg	ND	10.0	12/27/10 21:56	
2-Fluorobiphenyl (S)	%	94	39-125	12/27/10 21:56	
Terphenyl-d14 (S)	%	105	30-150	12/27/10 21:56	

LABORATORY CONTROL SAMPLE: 910489

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Acenaphthene	ug/kg	33.3	30.0	90	50-125	
Acenaphthylene	ug/kg	33.3	30.8	92	51-125	
Anthracene	ug/kg	33.3	30.8	92	45-125	
Benzo(a)anthracene	ug/kg	33.3	31.3	94	47-125	
Benzo(a)pyrene	ug/kg	33.3	33.8	101	50-125	
Benzo(b)fluoranthene	ug/kg	33.3	32.8	98	51-125	
Benzo(g,h,i)perylene	ug/kg	33.3	34.4	103	30-131	
Benzo(k)fluoranthene	ug/kg	33.3	38.3	115	48-137	
Chrysene	ug/kg	33.3	32.7	98	48-127	
Dibenz(a,h)anthracene	ug/kg	33.3	34.3	103	37-128	
Fluoranthene	ug/kg	33.3	32.1	96	51-125	
Fluorene	ug/kg	33.3	29.7	89	47-125	
Indeno(1,2,3-cd)pyrene	ug/kg	33.3	34.2	102	38-125	
Naphthalene	ug/kg	33.3	29.4	88	45-125	
Phenanthrene	ug/kg	33.3	30.5	92	48-125	
Pyrene	ug/kg	33.3	33.7	101	47-125	
2-Fluorobiphenyl (S)	%			91	39-125	
Terphenyl-d14 (S)	%			104	30-150	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 910490 910491

Parameter	Units	10145454008 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Acenaphthene	ug/kg	7530000	10000	10000	7650000	7730000	1170	1970	30-150	1	30	E
Acenaphthylene	ug/kg	157000	10000	10000	164000	163000	67	60	30-150	.5	30	
Anthracene	ug/kg	1770000	10000	10000	1800000	1830000	334	588	30-150	1	30	E
Benzo(a)anthracene	ug/kg	531000	10000	10000	534000	538000	28	65	30-150	.7	30	M1
Benzo(a)pyrene	ug/kg	169000	10000	10000	175000	176000	58	67	30-150	.5	30	
Benzo(b)fluoranthene	ug/kg	256000	10000	10000	269000	279000	131	230	30-150	4	30	M1
Benzo(g,h,i)perylene	ug/kg	45000	10000	10000	49100	49200	41	43	30-150	.3	30	
Benzo(k)fluoranthene	ug/kg	120000	10000	10000	119000	114000	-10	-57	30-150	4	30	M1
Chrysene	ug/kg	495000	10000	10000	502000	504000	74	97	30-150	.5	30	
Dibenz(a,h)anthracene	ug/kg	ND	10000	10000	ND	ND	0	0	30-150		30	M1
Fluoranthene	ug/kg	3110000	10000	10000	3140000	3170000	327	618	30-150	.9	30	E
Fluorene	ug/kg	3780000	10000	10000	3830000	3860000	470	807	30-150	.9	30	E
Indeno(1,2,3-cd)pyrene	ug/kg	40100	10000	10000	49400	48700	93	85	30-150	2	30	
Naphthalene	ug/kg	13700000	10000	10000	13400000	14600000	-3710	9090	30-150	9	30	E
Phenanthrene	ug/kg	7170000	10000	10000	7180000	6840000	96	-3350	30-150	5	30	E
Pyrene	ug/kg	2350000	10000	10000	2370000	2430000	184	768	30-150	2	30	E
2-Fluorobiphenyl (S)	%						41	40	39-125			
Terphenyl-d14 (S)	%						51	52	30-150			

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

QC Batch: OEXT/14535 Analysis Method: EPA 8270
QC Batch Method: EPA 3520 Analysis Description: 8270 Water MSSV
Associated Lab Samples: 10145454001, 10145454002, 10145454003, 10145454005, 10145454006, 10145454007, 10145454020, 10145454021, 10145454027, 10145454028, 10145454029

METHOD BLANK: 910398 Matrix: Water
Associated Lab Samples: 10145454001, 10145454002, 10145454003, 10145454005, 10145454006, 10145454007, 10145454020, 10145454021, 10145454027, 10145454028, 10145454029

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
2,4,5-Trichlorophenol	ug/L	ND	50.0	12/27/10 09:16	
2,4,6-Trichlorophenol	ug/L	ND	10.0	12/27/10 09:16	
2,4-Dichlorophenol	ug/L	ND	10.0	12/27/10 09:16	
2,4-Dimethylphenol	ug/L	ND	10.0	12/27/10 09:16	
2,4-Dinitrophenol	ug/L	ND	50.0	12/27/10 09:16	
2-Chlorophenol	ug/L	ND	10.0	12/27/10 09:16	
2-Methylphenol(o-Cresol)	ug/L	ND	10.0	12/27/10 09:16	
2-Nitrophenol	ug/L	ND	10.0	12/27/10 09:16	
3&4-Methylphenol	ug/L	ND	20.0	12/27/10 09:16	
4,6-Dinitro-2-methylphenol	ug/L	ND	50.0	12/27/10 09:16	
4-Chloro-3-methylphenol	ug/L	ND	10.0	12/27/10 09:16	
4-Nitrophenol	ug/L	ND	50.0	12/27/10 09:16	
Pentachlorophenol	ug/L	ND	23.0	12/27/10 09:16	
Phenol	ug/L	ND	10.0	12/27/10 09:16	
2,4,6-Tribromophenol (S)	%	72	58-125	12/27/10 09:16	
2-Fluorobiphenyl (S)	%	60	56-125	12/27/10 09:16	
2-Fluorophenol (S)	%	61	54-125	12/27/10 09:16	
Nitrobenzene-d5 (S)	%	69	53-125	12/27/10 09:16	D2
Phenol-d6 (S)	%	63	56-125	12/27/10 09:16	
Terphenyl-d14 (S)	%	74	61-125	12/27/10 09:16	

LABORATORY CONTROL SAMPLE & LCSD: 910399 910400

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
2,4,5-Trichlorophenol	ug/L	50	37.3J	41.2J	75	82	67-125		20	
2,4,6-Trichlorophenol	ug/L	50	36.2	40.6	72	81	64-125	12	20	
2,4-Dichlorophenol	ug/L	50	38.2	41.6	76	83	62-125	9	20	
2,4-Dimethylphenol	ug/L	50	32.7	32.6	65	65	50-125	.3	20	
2,4-Dinitrophenol	ug/L	50	30.6J	33.2J	61	66	30-150		20	
2-Chlorophenol	ug/L	50	36.3	38.1	73	76	62-125	5	20	
2-Methylphenol(o-Cresol)	ug/L	50	36.2	38.6	72	77	60-125	6	20	
2-Nitrophenol	ug/L	50	37.6	41.0	75	82	62-125	9	20	
3&4-Methylphenol	ug/L	50	35.7	38.4	71	77	61-125	7	20	
4,6-Dinitro-2-methylphenol	ug/L	50	31.4J	34.9J	63	70	43-143		20	
4-Chloro-3-methylphenol	ug/L	50	39.5	43.0	79	86	63-125	8	20	
4-Nitrophenol	ug/L	50	35.7J	40.3J	71	81	64-125		20	
Pentachlorophenol	ug/L	50	37.1	41.2	74	82	46-131	11	20	
Phenol	ug/L	50	33.7	36.7	67	73	64-125	9	20	
2,4,6-Tribromophenol (S)	%				72	80	58-125			
2-Fluorobiphenyl (S)	%				61	68	56-125			

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1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

LABORATORY CONTROL SAMPLE & LCSD: 910399 910400

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
2-Fluorophenol (S)	%				66	70	54-125			
Nitrobenzene-d5 (S)	%				74	79	53-125			
Phenol-d6 (S)	%				67	72	56-125			
Terphenyl-d14 (S)	%				73	80	61-125			

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

QC Batch: OEXT/14489 | Analysis Method: EPA 8270 by SIM
QC Batch Method: EPA 3510 | Analysis Description: 8270 Water PAH by SIM MSSV
Associated Lab Samples: 10145454001, 10145454002, 10145454003, 10145454005, 10145454006, 10145454007, 10145454009, 10145454010, 10145454011, 10145454012, 10145454013, 10145454014, 10145454015, 10145454016, 10145454018, 10145454019

METHOD BLANK: 907965 | Matrix: Water
Associated Lab Samples: 10145454001, 10145454002, 10145454003, 10145454005, 10145454006, 10145454007, 10145454009, 10145454010, 10145454011, 10145454012, 10145454013, 10145454014, 10145454015, 10145454016, 10145454018, 10145454019

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Acenaphthene	ug/L	ND	0.040	12/20/10 11:44	
Acenaphthylene	ug/L	ND	0.040	12/20/10 11:44	
Anthracene	ug/L	ND	0.040	12/20/10 11:44	
Benzo(a)anthracene	ug/L	ND	0.040	12/20/10 11:44	
Benzo(a)pyrene	ug/L	ND	0.040	12/20/10 11:44	
Benzo(b)fluoranthene	ug/L	ND	0.040	12/20/10 11:44	
Benzo(g,h,i)perylene	ug/L	ND	0.040	12/20/10 11:44	
Benzo(k)fluoranthene	ug/L	ND	0.040	12/20/10 11:44	
Chrysene	ug/L	ND	0.040	12/20/10 11:44	
Dibenz(a,h)anthracene	ug/L	ND	0.040	12/20/10 11:44	
Fluoranthene	ug/L	ND	0.040	12/20/10 11:44	
Fluorene	ug/L	ND	0.040	12/20/10 11:44	
Indeno(1,2,3-cd)pyrene	ug/L	ND	0.040	12/20/10 11:44	
Naphthalene	ug/L	ND	0.040	12/20/10 11:44	
Phenanthrene	ug/L	ND	0.040	12/20/10 11:44	
Pyrene	ug/L	ND	0.040	12/20/10 11:44	
2-Fluorobiphenyl (S)	%	65	43-125	12/20/10 11:44	
Terphenyl-d14 (S)	%	69	34-136	12/20/10 11:44	

LABORATORY CONTROL SAMPLE & LCSD: 907966 907967

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Acenaphthene	ug/L	1	0.82	0.89	82	89	49-125	8	20	
Acenaphthylene	ug/L	1	0.81	0.83	81	83	48-125	3	20	
Anthracene	ug/L	1	0.81	0.83	81	83	49-130	3	20	
Benzo(a)anthracene	ug/L	1	0.83	0.86	83	86	50-125	3	20	
Benzo(a)pyrene	ug/L	1	0.83	0.88	83	88	48-131	5	20	
Benzo(b)fluoranthene	ug/L	1	0.80	0.88	80	88	48-125	9	20	
Benzo(g,h,i)perylene	ug/L	1	0.89	0.96	89	96	34-136	8	20	
Benzo(k)fluoranthene	ug/L	1	0.79	0.83	79	83	46-142	6	20	
Chrysene	ug/L	1	0.83	0.89	83	89	39-150	7	20	
Dibenz(a,h)anthracene	ug/L	1	0.85	0.94	85	94	42-127	10	20	
Fluoranthene	ug/L	1	0.95	0.98	95	98	51-130	3	20	
Fluorene	ug/L	1	0.83	0.90	83	90	51-125	8	20	
Indeno(1,2,3-cd)pyrene	ug/L	1	0.88	0.95	88	95	43-125	8	20	
Naphthalene	ug/L	1	0.83	0.95	83	95	44-125	13	20	
Phenanthrene	ug/L	1	0.85	0.91	85	91	51-125	7	20	
Pyrene	ug/L	1	0.84	0.87	84	87	38-149	4	20	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

LABORATORY CONTROL SAMPLE & LCSD: 907966 907967

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
2-Fluorobiphenyl (S)	%				73	73	43-125			
Terphenyl-d14 (S)	%				80	82	34-136			

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

QC Batch: WET/21126 Analysis Method: SM 2540D
QC Batch Method: SM 2540D Analysis Description: 2540D Total Suspended Solids
Associated Lab Samples: 10145454001, 10145454002, 10145454003, 10145454005, 10145454006

METHOD BLANK: 909941 Matrix: Water
Associated Lab Samples: 10145454001, 10145454002, 10145454003, 10145454005, 10145454006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	10.0	12/22/10 13:50	

METHOD BLANK: 909945 Matrix: Water
Associated Lab Samples: 10145454001, 10145454002, 10145454003, 10145454005, 10145454006

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	10.0	12/22/10 13:50	

LABORATORY CONTROL SAMPLE: 909942

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Suspended Solids	mg/L	55.7	47.7	86	80-120	

SAMPLE DUPLICATE: 909943

Parameter	Units	10145454001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	25.4	24.4	4	20	

SAMPLE DUPLICATE: 909944

Parameter	Units	10145479001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	26.4	26.6	.8	20	

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QUALIFIERS

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is NELAP accredited. Contact your Pace PM for the current list of accredited analytes.

BATCH QUALIFIERS

Batch: MSSV/6156

[M5]	A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

D2	Samples evaluated to 1/2 the reporting limit.
D3	Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.
D4	Sample was diluted due to the presence of high levels of target analytes.
E	Analyte concentration exceeded the calibration range. The reported result is estimated.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
S4	Surrogate recovery not evaluated against control limits due to sample dilution.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 60147072-210 BNSF Somers
Pace Project No.: 10145454

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10145454001	**S-10-2 D**	EPA 3020	MPRP/24077	EPA 6020	ICPM/9750
10145454002	**S-10-2 I**	EPA 3020	MPRP/24077	EPA 6020	ICPM/9750
10145454003	**S-10-2 S UNFILTERED**	EPA 3020	MPRP/24077	EPA 6020	ICPM/9750
10145454004	**S-10-1 S UNFILTERED**	EPA 3020	MPRP/24077	EPA 6020	ICPM/9750
10145454005	**S-10-1 I**	EPA 3020	MPRP/24077	EPA 6020	ICPM/9750
10145454006	**S-10-1 D**	EPA 3020	MPRP/24077	EPA 6020	ICPM/9750
10145454008	**S-10-1 S FILTERED**	EPA 3550	OEXT/14539	EPA 8270	MSSV/6173
10145454017	**S-10-1-S UNFILTERED**	EPA 3550	OEXT/14539	EPA 8270	MSSV/6173
10145454008	**S-10-1 S FILTERED**	EPA 3550	OEXT/14538	EPA 8270 by SIM	MSSV/6157
10145454017	**S-10-1-S UNFILTERED**	EPA 3550	OEXT/14538	EPA 8270 by SIM	MSSV/6157
10145454022	**S-10-1 S FILTERED DILUTION**	EPA 3550	OEXT/14538	EPA 8270 by SIM	MSSV/6157
10145454023	**S-10-1 S FILTERED DILUTION 2**	EPA 3550	OEXT/14538	EPA 8270 by SIM	MSSV/6157
10145454024	**S-10-1 S DILUTION 1**	EPA 3550	OEXT/14538	EPA 8270 by SIM	MSSV/6157
10145454025	**S-10-1 S DILUTION 2**	EPA 3550	OEXT/14538	EPA 8270 by SIM	MSSV/6157
10145454001	**S-10-2 D**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454002	**S-10-2 I**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454003	**S-10-2 S UNFILTERED**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454005	**S-10-1 I**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454006	**S-10-1 D**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454007	**S-10-2 S FILTERED**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454020	**S-10-2 D DILUTION**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454021	**S-10-2 I DILUTION**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454027	**S-10-2 S UNFILTERED DILUTION**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454028	**S-10-1 I DILUTION**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454029	**S-10-2 S FILTERED DILUTION**	EPA 3520	OEXT/14535	EPA 8270	MSSV/6156
10145454001	**S-10-2 D**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454002	**S-10-2 I**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454003	**S-10-2 S UNFILTERED**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454005	**S-10-1 I**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454006	**S-10-1 D**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454007	**S-10-2 S FILTERED**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454009	**S-10-2-D DILUTION**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454010	**S-10-2-I DILUTION**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454011	**S-10-2-S UNFILTERED DILUTION**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454012	**S-10-1-I DILUTION 1**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454013	**S-10-1-I DILUTION 2**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454014	**S-10-1-D DILUTION 1**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454015	**S-10-1-D DILUTION 2**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454016	**S-10-2-S FILTERED DILUTION**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454018	**S-10-1 I DILUTION 3**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454019	**S-10-1 D DILUTION 3**	EPA 3510	OEXT/14489	EPA 8270 by SIM	MSSV/6138
10145454001	**S-10-2 D**	SM 2540D	WET/21126		
10145454002	**S-10-2 I**	SM 2540D	WET/21126		
10145454003	**S-10-2 S UNFILTERED**	SM 2540D	WET/21126		
10145454005	**S-10-1 I**	SM 2540D	WET/21126		
10145454006	**S-10-1 D**	SM 2540D	WET/21126		

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1153, 1154, 1155

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

10145454

Page: of

1384896

Section A Required Client Information:

Company: Aecom Environment
Address: 261 N. Broadway Ste 315
Billings, MT 59101
Email To: Shelly.Yang@aecom.com
Phone: 406 896-4582 Fax: 406 652-7485
Requested Due Date/TAT:

Section B Required Project Information:

Report To: Shelly Yang
Copy To:
Purchase Order No.: TT9101-K03
Project Name: BNSF Somers
Project Number: 60147072-210

Section C Invoice Information:

Attention: Dave Smith - BNSF
Company Name: 825 Great Northern Blvd Ste 105
Address: Helena, MT 59601
Pace Quote Reference:
Pace Project Manager: Carol Davy / Denise Jensen
Pace Profile #: 21538

REGULATORY AGENCY
☐ NPDES ☑ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: MT

Section D Required Client Information

Matrix Codes MATRIX / CODE: Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED Composite Start DATE	COLLECTED Composite Start TIME	COLLECTED Composite End/Grab DATE	COLLECTED Composite End/Grab TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	Phenols 8270	PAH 8270 SIM	TSS 1602	Zinc 6020	Phenols 8270 Filtered	PAH 8270 SIM Filtered	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	S-10-2 D	W	G	12/15	0955				6	X		X							X	X	X	X				001
2	S-10-2 I	W	G	12/15	1020				6	X		X							X	X	X	X				002
3	S-10-2 S	W	G	12/15	1057				8	X		X							X	X	X	X	X	X		003
4	S-10-1 S	W	G	12/15	1130				8	X		X							X	X	X	X	X	X		004
5	S-10-1 I	W	G	12/15	1200				6	X		X							X	X	X	X				005
6	S-10-1 D	W	G	12/15	1235				6	X		X							X	X	X	X				006
7																										
8																										
9																										
10																										
11																										
12																										

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Nancy Gilliland Aecom	12/15/10	1500	Fed Ex	12/15/10	1500	3.7	Y	Y	Y
				8744 3585 2031			5.7			
				8744 3585 2042			2.5			
				8744 3585 2053		1002	3.7			
				8744 35 [illegible]						

ORIGINAL

SAMPLER NAME AND SIGNATURE: [illegible] 12/16/10
PRINT Name of SAMPLER: Nancy Gilliland
SIGNATURE of SAMPLER: Nancy Gilliland DATE Signed (MM/DD/YY): 12/15/2010

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Sample Condition Upon Receipt

Pace Analytical

Client Name: Aecom **Project #** 10145454

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: See Back

Optional
Proj. Due Date:
Proj. Name:

Custody Seal on Cooler/Box Present: ☑ yes ☐ no **Seals intact:** ☑ yes ☐ no

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other _____ **Temp Blank: Yes** ✓ **No** _____

Thermometer Used 80344042 or 170425 **Type of Ice:** Wet Blue None ☐ Samples on ice, cooling process has begun

Cooler Temperature See Back **Biological Tissue is Frozen:** Yes No

Date and initials of person examining contents: 12/16/10 MSD

Temp should be above freezing to 6°C

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☑No ☐N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: WT		
All containers needing acid/base preservation have been checked. Noncompliance are noted in 13.	☑Yes ☐No ☐N/A	13. VI ☑ HNO3 ☐ H2SO4 ☐ NaOH ☐ HCl
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	Samp # 5-10-2D, 2F, 2S, 1S, 1F, 1D
Exceptions: VOA,Coliform, TOC, Oil and Grease, WI-DRO (water)	☐Yes ☑No	Initial when completed NSP Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased): _____		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ **Date:** 12/16/10

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DENR.

F-L213Rev.00, 05Aug2009

Pace Analytical Services, Inc.
1700 Elm Street SE, Suite 200, Minneapolis, MN 55414

Temps + Tracking #'s

8744 3585 2031	3.7
8744 3585 2042	5.7
8744 3585 2053	2.5
8744 3585 1815	3.8

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

December 30, 2010

Shelly Young
AECOM, Inc.
207 North Broadway, Suite 315
Billings, MT 59101

RE: Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Dear Shelly Young:
Enclosed are the analytical results for sample(s) received by the laboratory on December 16, 2010. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Sally Heinje for
Denise Jensen
denise.jensen@pacelabs.com
Project Manager

Enclosures

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CERTIFICATIONS

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Minnesota Certification IDs
1700 Elm Street SE Suite 200, Minneapolis, MN 55414
Alaska Certification #: UST-078
Alaska Certification #MN00064
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
EPA Region 8 Certification #: Pace
Florida/NELAP Certification #: E87605
Georgia Certification #: 959
Idaho Certification #: MN00064
Illinois Certification #: 200011
Iowa Certification #: 368
Kansas Certification #: E-10167
Louisiana Certification #: 03086
Louisiana Certification #: LA080009
Maine Certification #: 2007029
Maryland Certification #: 322
Michigan DEQ Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT CERT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New Mexico Certification #: Pace
New York Certification #: 11647
North Carolina Certification #: 530
North Dakota Certification #: R-036
North Dakota Certification #: R-036A
Ohio VAP Certification #: CL101
Oklahoma Certification #: D9921
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Tennessee Certification #: 02818
Texas Certification #: T104704192
Washington Certification #: C754
Wisconsin Certification #: 999407970

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SAMPLE SUMMARY

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10145476001	**S-10-1 S**	Water	12/15/10 11:30	12/16/10 10:20
10145476002	**S-10-2 S**	Water	12/15/10 10:57	12/16/10 10:20
10145476003	**TRIP BLANK**	Water	12/15/10 10:57	12/16/10 10:20

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SAMPLE ANALYTE COUNT

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Lab ID	Sample ID	Method	Analysts	Analytes Reported
10145476001	**S-10-1 S**	EPA 8260	ECB	70
10145476002	**S-10-2 S**	EPA 8260	ECB	70
10145476003	**TRIP BLANK**	EPA 8260	DJT	70

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PROJECT NARRATIVE

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Method: **EPA 8260**
Description: 8260 VOC
Client: AECOM
Date: December 30, 2010

General Information:
3 samples were analyzed for EPA 8260. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Surrogates:
All surrogates were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:
All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Sample: S-10-1 S **Lab ID: 10145476001** Collected: 12/15/10 11:30 Received: 12/16/10 10:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 VOC	Analytical Method: EPA 8260								
Acetone	ND	ug/L	5000	2500	500		12/21/10 08:35	67-64-1	
Benzene	**199J**	ug/L	500	40.0	500		12/21/10 08:35	71-43-2	
Bromobenzene	ND	ug/L	500	55.0	500		12/21/10 08:35	108-86-1	
Bromochloromethane	ND	ug/L	500	105	500		12/21/10 08:35	74-97-5	
Bromodichloromethane	ND	ug/L	500	75.0	500		12/21/10 08:35	75-27-4	
Bromoform	ND	ug/L	4000	95.0	500		12/21/10 08:35	75-25-2	
Bromomethane	ND	ug/L	2000	635	500		12/21/10 08:35	74-83-9	
2-Butanone (MEK)	ND	ug/L	2000	1000	500		12/21/10 08:35	78-93-3	
n-Butylbenzene	ND	ug/L	500	60.0	500		12/21/10 08:35	104-51-8	
sec-Butylbenzene	ND	ug/L	500	50.0	500		12/21/10 08:35	135-98-8	
tert-Butylbenzene	ND	ug/L	500	65.0	500		12/21/10 08:35	98-06-6	
Carbon tetrachloride	ND	ug/L	2000	95.0	500		12/21/10 08:35	56-23-5	
Chlorobenzene	ND	ug/L	500	65.0	500		12/21/10 08:35	108-90-7	
Chloroethane	ND	ug/L	500	160	500		12/21/10 08:35	75-00-3	
Chloroform	ND	ug/L	500	45.0	500		12/21/10 08:35	67-66-3	
Chloromethane	ND	ug/L	2000	180	500		12/21/10 08:35	74-87-3	
2-Chlorotoluene	ND	ug/L	500	250	500		12/21/10 08:35	95-49-8	
4-Chlorotoluene	ND	ug/L	500	50.0	500		12/21/10 08:35	106-43-4	
1,2-Dibromo-3-chloropropane	ND	ug/L	2000	240	500		12/21/10 08:35	96-12-8	
Dibromochloromethane	ND	ug/L	500	75.0	500		12/21/10 08:35	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/L	500	50.0	500		12/21/10 08:35	106-93-4	
Dibromomethane	ND	ug/L	2000	110	500		12/21/10 08:35	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	500	65.0	500		12/21/10 08:35	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	500	50.0	500		12/21/10 08:35	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	500	55.0	500		12/21/10 08:35	106-46-7	
Dichlorodifluoromethane	ND	ug/L	500	150	500		12/21/10 08:35	75-71-8	
1,1-Dichloroethane	ND	ug/L	500	40.0	500		12/21/10 08:35	75-34-3	
1,2-Dichloroethane	ND	ug/L	500	40.0	500		12/21/10 08:35	107-06-2	
1,1-Dichloroethene	ND	ug/L	500	100	500		12/21/10 08:35	75-35-4	
cis-1,2-Dichloroethene	ND	ug/L	500	115	500		12/21/10 08:35	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	500	55.0	500		12/21/10 08:35	156-60-5	
Dichlorofluoromethane	ND	ug/L	500	145	500		12/21/10 08:35	75-43-4	
1,2-Dichloropropane	ND	ug/L	500	50.0	500		12/21/10 08:35	78-87-5	
1,3-Dichloropropane	ND	ug/L	500	45.0	500		12/21/10 08:35	142-28-9	
2,2-Dichloropropane	ND	ug/L	2000	65.0	500		12/21/10 08:35	594-20-7	
1,1-Dichloropropene	ND	ug/L	500	55.0	500		12/21/10 08:35	563-58-6	
cis-1,3-Dichloropropene	ND	ug/L	2000	45.0	500		12/21/10 08:35	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	2000	55.0	500		12/21/10 08:35	10061-02-6	
Ethylbenzene	**500**	ug/L	500	40.0	500		12/21/10 08:35	100-41-4	
Hexachloro-1,3-butadiene	ND	ug/L	2000	255	500		12/21/10 08:35	87-68-3	
Isopropylbenzene (Cumene)	**55.4J**	ug/L	500	50.0	500		12/21/10 08:35	98-82-8	
p-Isopropyltoluene	ND	ug/L	500	45.0	500		12/21/10 08:35	99-87-6	
Methylene Chloride	**1520J**	ug/L	2000	1000	500		12/21/10 08:35	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	2000	1000	500		12/21/10 08:35	108-10-1	
Methyl-tert-butyl ether	ND	ug/L	500	55.0	500		12/21/10 08:35	1634-04-4	
Naphthalene	**54500**	ug/L	2000	205	500		12/21/10 08:35	91-20-3	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Sample: S-10-1 S **Lab ID: 10145476001** Collected: 12/15/10 11:30 Received: 12/16/10 10:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 VOC	Analytical Method: EPA 8260								
n-Propylbenzene	ND	ug/L	500	50.0	500		12/21/10 08:35	103-65-1	
Styrene	**174J**	ug/L	500	45.0	500		12/21/10 08:35	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	500	80.0	500		12/21/10 08:35	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	500	70.0	500		12/21/10 08:35	79-34-5	
Tetrachloroethene	ND	ug/L	500	75.0	500		12/21/10 08:35	127-18-4	
Toluene	**600**	ug/L	500	55.0	500		12/21/10 08:35	108-88-3	
1,2,3-Trichlorobenzene	ND	ug/L	500	80.0	500		12/21/10 08:35	87-61-6	
1,2,4-Trichlorobenzene	ND	ug/L	500	80.0	500		12/21/10 08:35	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	500	45.0	500		12/21/10 08:35	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	500	55.0	500		12/21/10 08:35	79-00-5	
Trichloroethene	ND	ug/L	500	70.0	500		12/21/10 08:35	79-01-6	
Trichlorofluoromethane	ND	ug/L	500	70.0	500		12/21/10 08:35	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	500	70.0	500		12/21/10 08:35	96-18-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/L	500	65.0	500		12/21/10 08:35	76-13-1	
1,2,4-Trimethylbenzene	**877**	ug/L	500	40.0	500		12/21/10 08:35	95-63-6	
1,3,5-Trimethylbenzene	**397J**	ug/L	500	50.0	500		12/21/10 08:35	108-67-8	
Vinyl chloride	ND	ug/L	200	55.0	500		12/21/10 08:35	75-01-4	
Xylene (Total)	**1300J**	ug/L	1500	125	500		12/21/10 08:35	1330-20-7	
m&p-Xylene	**895J**	ug/L	1000	75.0	500		12/21/10 08:35	179601-23-1	
o-Xylene	**406J**	ug/L	500	50.0	500		12/21/10 08:35	95-47-6	
Dibromofluoromethane (S)	107	%	75-130		500		12/21/10 08:35	1868-53-7	
1,2-Dichloroethane-d4 (S)	99	%	75-131		500		12/21/10 08:35	17060-07-0	
Toluene-d8 (S)	91	%	75-125		500		12/21/10 08:35	2037-26-5	
4-Bromofluorobenzene (S)	95	%	75-125		500		12/21/10 08:35	460-00-4	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Sample: S-10-2 S **Lab ID: 10145476002** Collected: 12/15/10 10:57 Received: 12/16/10 10:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 VOC	Analytical Method: EPA 8260								
Acetone	ND	ug/L	10.0	5.0	1		12/23/10 01:04	67-64-1	
Benzene	**59.8**	ug/L	1.0	0.080	1		12/23/10 01:04	71-43-2	
Bromobenzene	ND	ug/L	1.0	0.11	1		12/23/10 01:04	108-86-1	
Bromochloromethane	ND	ug/L	1.0	0.21	1		12/23/10 01:04	74-97-5	
Bromodichloromethane	ND	ug/L	1.0	0.15	1		12/23/10 01:04	75-27-4	
Bromoform	ND	ug/L	8.0	0.19	1		12/23/10 01:04	75-25-2	
Bromomethane	ND	ug/L	4.0	1.3	1		12/23/10 01:04	74-83-9	
2-Butanone (MEK)	ND	ug/L	4.0	2.0	1		12/23/10 01:04	78-93-3	
n-Butylbenzene	ND	ug/L	1.0	0.12	1		12/23/10 01:04	104-51-8	
sec-Butylbenzene	ND	ug/L	1.0	0.10	1		12/23/10 01:04	135-98-8	
tert-Butylbenzene	ND	ug/L	1.0	0.13	1		12/23/10 01:04	98-06-6	
Carbon tetrachloride	ND	ug/L	4.0	0.19	1		12/23/10 01:04	56-23-5	
Chlorobenzene	ND	ug/L	1.0	0.13	1		12/23/10 01:04	108-90-7	
Chloroethane	ND	ug/L	1.0	0.32	1		12/23/10 01:04	75-00-3	
Chloroform	ND	ug/L	1.0	0.090	1		12/23/10 01:04	67-66-3	
Chloromethane	ND	ug/L	4.0	0.36	1		12/23/10 01:04	74-87-3	
2-Chlorotoluene	ND	ug/L	1.0	0.50	1		12/23/10 01:04	95-49-8	
4-Chlorotoluene	ND	ug/L	1.0	0.10	1		12/23/10 01:04	106-43-4	
1,2-Dibromo-3-chloropropane	ND	ug/L	4.0	0.48	1		12/23/10 01:04	96-12-8	
Dibromochloromethane	ND	ug/L	1.0	0.15	1		12/23/10 01:04	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/L	1.0	0.10	1		12/23/10 01:04	106-93-4	
Dibromomethane	ND	ug/L	4.0	0.22	1		12/23/10 01:04	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	1.0	0.13	1		12/23/10 01:04	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	1.0	0.10	1		12/23/10 01:04	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	1.0	0.11	1		12/23/10 01:04	106-46-7	
Dichlorodifluoromethane	ND	ug/L	1.0	0.30	1		12/23/10 01:04	75-71-8	
1,1-Dichloroethane	ND	ug/L	1.0	0.080	1		12/23/10 01:04	75-34-3	
1,2-Dichloroethane	ND	ug/L	1.0	0.080	1		12/23/10 01:04	107-06-2	
1,1-Dichloroethene	ND	ug/L	1.0	0.20	1		12/23/10 01:04	75-35-4	
cis-1,2-Dichloroethene	ND	ug/L	1.0	0.23	1		12/23/10 01:04	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.11	1		12/23/10 01:04	156-60-5	
Dichlorofluoromethane	ND	ug/L	1.0	0.29	1		12/23/10 01:04	75-43-4	
1,2-Dichloropropane	ND	ug/L	1.0	0.10	1		12/23/10 01:04	78-87-5	
1,3-Dichloropropane	ND	ug/L	1.0	0.090	1		12/23/10 01:04	142-28-9	
2,2-Dichloropropane	ND	ug/L	4.0	0.13	1		12/23/10 01:04	594-20-7	
1,1-Dichloropropene	ND	ug/L	1.0	0.11	1		12/23/10 01:04	563-58-6	
cis-1,3-Dichloropropene	ND	ug/L	4.0	0.090	1		12/23/10 01:04	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	4.0	0.11	1		12/23/10 01:04	10061-02-6	
Ethylbenzene	**22.9**	ug/L	1.0	0.080	1		12/23/10 01:04	100-41-4	
Hexachloro-1,3-butadiene	ND	ug/L	4.0	0.51	1		12/23/10 01:04	87-68-3	
Isopropylbenzene (Cumene)	**0.64J**	ug/L	1.0	0.10	1		12/23/10 01:04	98-82-8	
p-Isopropyltoluene	ND	ug/L	1.0	0.090	1		12/23/10 01:04	99-87-6	
Methylene Chloride	ND	ug/L	4.0	2.0	1		12/23/10 01:04	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	4.0	2.0	1		12/23/10 01:04	108-10-1	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.11	1		12/23/10 01:04	1634-04-4	
Naphthalene	**41.6**	ug/L	4.0	0.41	1		12/23/10 01:04	91-20-3	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Sample: S-10-2 S **Lab ID: 10145476002** Collected: 12/15/10 10:57 Received: 12/16/10 10:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 VOC	Analytical Method: EPA 8260								
n-Propylbenzene	ND	ug/L	1.0	0.10	1		12/23/10 01:04	103-65-1	
Styrene	ND	ug/L	1.0	0.090	1		12/23/10 01:04	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0	0.16	1		12/23/10 01:04	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0	0.14	1		12/23/10 01:04	79-34-5	
Tetrachloroethene	ND	ug/L	1.0	0.15	1		12/23/10 01:04	127-18-4	
Toluene	**5.6**	ug/L	1.0	0.11	1		12/23/10 01:04	108-88-3	
1,2,3-Trichlorobenzene	ND	ug/L	1.0	0.16	1		12/23/10 01:04	87-61-6	
1,2,4-Trichlorobenzene	ND	ug/L	1.0	0.16	1		12/23/10 01:04	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	1.0	0.090	1		12/23/10 01:04	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	1.0	0.11	1		12/23/10 01:04	79-00-5	
Trichloroethene	ND	ug/L	1.0	0.14	1		12/23/10 01:04	79-01-6	
Trichlorofluoromethane	ND	ug/L	1.0	0.14	1		12/23/10 01:04	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	1.0	0.14	1		12/23/10 01:04	96-18-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/L	1.0	0.13	1		12/23/10 01:04	76-13-1	
1,2,4-Trimethylbenzene	**5.2**	ug/L	1.0	0.080	1		12/23/10 01:04	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.10	1		12/23/10 01:04	108-67-8	
Vinyl chloride	ND	ug/L	0.40	0.11	1		12/23/10 01:04	75-01-4	
Xylene (Total)	**86.5**	ug/L	3.0	0.25	1		12/23/10 01:04	1330-20-7	
m&p-Xylene	**32.9**	ug/L	2.0	0.15	1		12/23/10 01:04	179601-23-1	
o-Xylene	**53.6**	ug/L	1.0	0.10	1		12/23/10 01:04	95-47-6	
Dibromofluoromethane (S)	91	%	75-130		1		12/23/10 01:04	1868-53-7	
1,2-Dichloroethane-d4 (S)	92	%	75-131		1		12/23/10 01:04	17060-07-0	
Toluene-d8 (S)	90	%	75-125		1		12/23/10 01:04	2037-26-5	
4-Bromofluorobenzene (S)	96	%	75-125		1		12/23/10 01:04	460-00-4	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Sample: TRIP BLANK **Lab ID: 10145476003** Collected: 12/15/10 10:57 Received: 12/16/10 10:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 VOC	Analytical Method: EPA 8260								
Acetone	ND	ug/L	10.0	5.0	1		12/21/10 03:02	67-64-1	
Benzene	ND	ug/L	1.0	0.080	1		12/21/10 03:02	71-43-2	
Bromobenzene	ND	ug/L	1.0	0.11	1		12/21/10 03:02	108-86-1	
Bromochloromethane	ND	ug/L	1.0	0.21	1		12/21/10 03:02	74-97-5	
Bromodichloromethane	ND	ug/L	1.0	0.15	1		12/21/10 03:02	75-27-4	
Bromoform	ND	ug/L	8.0	0.19	1		12/21/10 03:02	75-25-2	
Bromomethane	ND	ug/L	4.0	1.3	1		12/21/10 03:02	74-83-9	
2-Butanone (MEK)	ND	ug/L	4.0	2.0	1		12/21/10 03:02	78-93-3	
n-Butylbenzene	ND	ug/L	1.0	0.12	1		12/21/10 03:02	104-51-8	
sec-Butylbenzene	ND	ug/L	1.0	0.10	1		12/21/10 03:02	135-98-8	
tert-Butylbenzene	ND	ug/L	1.0	0.13	1		12/21/10 03:02	98-06-6	
Carbon tetrachloride	ND	ug/L	4.0	0.19	1		12/21/10 03:02	56-23-5	
Chlorobenzene	ND	ug/L	1.0	0.13	1		12/21/10 03:02	108-90-7	
Chloroethane	ND	ug/L	1.0	0.32	1		12/21/10 03:02	75-00-3	
Chloroform	ND	ug/L	1.0	0.090	1		12/21/10 03:02	67-66-3	
Chloromethane	ND	ug/L	4.0	0.36	1		12/21/10 03:02	74-87-3	
2-Chlorotoluene	ND	ug/L	1.0	0.50	1		12/21/10 03:02	95-49-8	
4-Chlorotoluene	ND	ug/L	1.0	0.10	1		12/21/10 03:02	106-43-4	
1,2-Dibromo-3-chloropropane	ND	ug/L	4.0	0.48	1		12/21/10 03:02	96-12-8	
Dibromochloromethane	ND	ug/L	1.0	0.15	1		12/21/10 03:02	124-48-1	
1,2-Dibromoethane (EDB)	ND	ug/L	1.0	0.10	1		12/21/10 03:02	106-93-4	
Dibromomethane	ND	ug/L	4.0	0.22	1		12/21/10 03:02	74-95-3	
1,2-Dichlorobenzene	ND	ug/L	1.0	0.13	1		12/21/10 03:02	95-50-1	
1,3-Dichlorobenzene	ND	ug/L	1.0	0.10	1		12/21/10 03:02	541-73-1	
1,4-Dichlorobenzene	ND	ug/L	1.0	0.11	1		12/21/10 03:02	106-46-7	
Dichlorodifluoromethane	ND	ug/L	1.0	0.30	1		12/21/10 03:02	75-71-8	
1,1-Dichloroethane	ND	ug/L	1.0	0.080	1		12/21/10 03:02	75-34-3	
1,2-Dichloroethane	ND	ug/L	1.0	0.080	1		12/21/10 03:02	107-06-2	
1,1-Dichloroethene	ND	ug/L	1.0	0.20	1		12/21/10 03:02	75-35-4	
cis-1,2-Dichloroethene	ND	ug/L	1.0	0.23	1		12/21/10 03:02	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	1.0	0.11	1		12/21/10 03:02	156-60-5	
Dichlorofluoromethane	ND	ug/L	1.0	0.29	1		12/21/10 03:02	75-43-4	
1,2-Dichloropropane	ND	ug/L	1.0	0.10	1		12/21/10 03:02	78-87-5	
1,3-Dichloropropane	ND	ug/L	1.0	0.090	1		12/21/10 03:02	142-28-9	
2,2-Dichloropropane	ND	ug/L	4.0	0.13	1		12/21/10 03:02	594-20-7	
1,1-Dichloropropene	ND	ug/L	1.0	0.11	1		12/21/10 03:02	563-58-6	
cis-1,3-Dichloropropene	ND	ug/L	4.0	0.090	1		12/21/10 03:02	10061-01-5	
trans-1,3-Dichloropropene	ND	ug/L	4.0	0.11	1		12/21/10 03:02	10061-02-6	
Ethylbenzene	ND	ug/L	1.0	0.080	1		12/21/10 03:02	100-41-4	
Hexachloro-1,3-butadiene	ND	ug/L	4.0	0.51	1		12/21/10 03:02	87-68-3	
Isopropylbenzene (Cumene)	ND	ug/L	1.0	0.10	1		12/21/10 03:02	98-82-8	
p-Isopropyltoluene	ND	ug/L	1.0	0.090	1		12/21/10 03:02	99-87-6	
Methylene Chloride	ND	ug/L	4.0	2.0	1		12/21/10 03:02	75-09-2	
4-Methyl-2-pentanone (MIBK)	ND	ug/L	4.0	2.0	1		12/21/10 03:02	108-10-1	
Methyl-tert-butyl ether	ND	ug/L	1.0	0.11	1		12/21/10 03:02	1634-04-4	
Naphthalene	ND	ug/L	4.0	0.41	1		12/21/10 03:02	91-20-3	

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ANALYTICAL RESULTS

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Sample: TRIP BLANK **Lab ID: 10145476003** Collected: 12/15/10 10:57 Received: 12/16/10 10:20 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260 VOC	Analytical Method: EPA 8260								
n-Propylbenzene	ND	ug/L	1.0	0.10	1		12/21/10 03:02	103-65-1	
Styrene	ND	ug/L	1.0	0.090	1		12/21/10 03:02	100-42-5	
1,1,1,2-Tetrachloroethane	ND	ug/L	1.0	0.16	1		12/21/10 03:02	630-20-6	
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0	0.14	1		12/21/10 03:02	79-34-5	
Tetrachloroethene	ND	ug/L	1.0	0.15	1		12/21/10 03:02	127-18-4	
Toluene	ND	ug/L	1.0	0.11	1		12/21/10 03:02	108-88-3	
1,2,3-Trichlorobenzene	ND	ug/L	1.0	0.16	1		12/21/10 03:02	87-61-6	
1,2,4-Trichlorobenzene	ND	ug/L	1.0	0.16	1		12/21/10 03:02	120-82-1	
1,1,1-Trichloroethane	ND	ug/L	1.0	0.090	1		12/21/10 03:02	71-55-6	
1,1,2-Trichloroethane	ND	ug/L	1.0	0.11	1		12/21/10 03:02	79-00-5	
Trichloroethene	ND	ug/L	1.0	0.14	1		12/21/10 03:02	79-01-6	
Trichlorofluoromethane	ND	ug/L	1.0	0.14	1		12/21/10 03:02	75-69-4	
1,2,3-Trichloropropane	ND	ug/L	1.0	0.14	1		12/21/10 03:02	96-18-4	
1,1,2-Trichlorotrifluoroethane	ND	ug/L	1.0	0.13	1		12/21/10 03:02	76-13-1	
1,2,4-Trimethylbenzene	ND	ug/L	1.0	0.080	1		12/21/10 03:02	95-63-6	
1,3,5-Trimethylbenzene	ND	ug/L	1.0	0.10	1		12/21/10 03:02	108-67-8	
Vinyl chloride	ND	ug/L	0.40	0.11	1		12/21/10 03:02	75-01-4	
Xylene (Total)	ND	ug/L	3.0	0.25	1		12/21/10 03:02	1330-20-7	
m&p-Xylene	ND	ug/L	2.0	0.15	1		12/21/10 03:02	179601-23-1	
o-Xylene	ND	ug/L	1.0	0.10	1		12/21/10 03:02	95-47-6	
Dibromofluoromethane (S)	101	%	75-130		1		12/21/10 03:02	1868-53-7	
1,2-Dichloroethane-d4 (S)	102	%	75-131		1		12/21/10 03:02	17060-07-0	
Toluene-d8 (S)	98	%	75-125		1		12/21/10 03:02	2037-26-5	
4-Bromofluorobenzene (S)	99	%	75-125		1		12/21/10 03:02	460-00-4	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

QC Batch: MSV/16042 | Analysis Method: EPA 8260
QC Batch Method: EPA 8260 | Analysis Description: 8260 MSV 465 W
Associated Lab Samples: 10145476001

METHOD BLANK: 909035 | Matrix: Water
Associated Lab Samples: 10145476001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	12/21/10 00:48	
1,1,1-Trichloroethane	ug/L	ND	1.0	12/21/10 00:48	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	12/21/10 00:48	
1,1,2-Trichloroethane	ug/L	ND	1.0	12/21/10 00:48	
1,1,2-Trichlorotrifluoroethane	ug/L	ND	1.0	12/21/10 00:48	
1,1-Dichloroethane	ug/L	ND	1.0	12/21/10 00:48	
1,1-Dichloroethene	ug/L	ND	1.0	12/21/10 00:48	
1,1-Dichloropropene	ug/L	ND	1.0	12/21/10 00:48	
1,2,3-Trichlorobenzene	ug/L	ND	1.0	12/21/10 00:48	
1,2,3-Trichloropropane	ug/L	ND	1.0	12/21/10 00:48	
1,2,4-Trichlorobenzene	ug/L	ND	1.0	12/21/10 00:48	
1,2,4-Trimethylbenzene	ug/L	ND	1.0	12/21/10 00:48	
1,2-Dibromo-3-chloropropane	ug/L	ND	4.0	12/21/10 00:48	
1,2-Dibromoethane (EDB)	ug/L	ND	1.0	12/21/10 00:48	
1,2-Dichlorobenzene	ug/L	ND	1.0	12/21/10 00:48	
1,2-Dichloroethane	ug/L	ND	1.0	12/21/10 00:48	
1,2-Dichloropropane	ug/L	ND	1.0	12/21/10 00:48	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	12/21/10 00:48	
1,3-Dichlorobenzene	ug/L	ND	1.0	12/21/10 00:48	
1,3-Dichloropropane	ug/L	ND	1.0	12/21/10 00:48	
1,4-Dichlorobenzene	ug/L	ND	1.0	12/21/10 00:48	
2,2-Dichloropropane	ug/L	ND	4.0	12/21/10 00:48	
2-Butanone (MEK)	ug/L	ND	4.0	12/21/10 00:48	
2-Chlorotoluene	ug/L	ND	1.0	12/21/10 00:48	
4-Chlorotoluene	ug/L	ND	1.0	12/21/10 00:48	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	4.0	12/21/10 00:48	
Acetone	ug/L	ND	10.0	12/21/10 00:48	
Benzene	ug/L	ND	1.0	12/21/10 00:48	
Bromobenzene	ug/L	ND	1.0	12/21/10 00:48	
Bromochloromethane	ug/L	ND	1.0	12/21/10 00:48	
Bromodichloromethane	ug/L	ND	1.0	12/21/10 00:48	
Bromoform	ug/L	ND	8.0	12/21/10 00:48	
Bromomethane	ug/L	ND	4.0	12/21/10 00:48	
Carbon tetrachloride	ug/L	ND	4.0	12/21/10 00:48	
Chlorobenzene	ug/L	ND	1.0	12/21/10 00:48	
Chloroethane	ug/L	ND	1.0	12/21/10 00:48	
Chloroform	ug/L	ND	1.0	12/21/10 00:48	
Chloromethane	ug/L	ND	4.0	12/21/10 00:48	
cis-1,2-Dichloroethene	ug/L	ND	1.0	12/21/10 00:48	
cis-1,3-Dichloropropene	ug/L	ND	4.0	12/21/10 00:48	
Dibromochloromethane	ug/L	ND	1.0	12/21/10 00:48	
Dibromomethane	ug/L	ND	4.0	12/21/10 00:48	
Dichlorodifluoromethane	ug/L	ND	1.0	12/21/10 00:48	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

METHOD BLANK: 909035 Matrix: Water

Associated Lab Samples: 10145476001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Dichlorofluoromethane	ug/L	ND	1.0	12/21/10 00:48	
Ethylbenzene	ug/L	ND	1.0	12/21/10 00:48	
Hexachloro-1,3-butadiene	ug/L	ND	4.0	12/21/10 00:48	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	12/21/10 00:48	
m&p-Xylene	ug/L	ND	2.0	12/21/10 00:48	
Methyl-tert-butyl ether	ug/L	ND	1.0	12/21/10 00:48	
Methylene Chloride	ug/L	ND	4.0	12/21/10 00:48	
n-Butylbenzene	ug/L	ND	1.0	12/21/10 00:48	
n-Propylbenzene	ug/L	ND	1.0	12/21/10 00:48	
Naphthalene	ug/L	ND	4.0	12/21/10 00:48	
o-Xylene	ug/L	ND	1.0	12/21/10 00:48	
p-Isopropyltoluene	ug/L	ND	1.0	12/21/10 00:48	
sec-Butylbenzene	ug/L	ND	1.0	12/21/10 00:48	
Styrene	ug/L	ND	1.0	12/21/10 00:48	
tert-Butylbenzene	ug/L	ND	1.0	12/21/10 00:48	
Tetrachloroethene	ug/L	ND	1.0	12/21/10 00:48	
Toluene	ug/L	ND	1.0	12/21/10 00:48	
trans-1,2-Dichloroethene	ug/L	ND	1.0	12/21/10 00:48	
trans-1,3-Dichloropropene	ug/L	ND	4.0	12/21/10 00:48	
Trichloroethene	ug/L	ND	1.0	12/21/10 00:48	
Trichlorofluoromethane	ug/L	ND	1.0	12/21/10 00:48	
Vinyl chloride	ug/L	ND	0.40	12/21/10 00:48	
Xylene (Total)	ug/L	ND	3.0	12/21/10 00:48	
1,2-Dichloroethane-d4 (S)	%	99	75-131	12/21/10 00:48	
4-Bromofluorobenzene (S)	%	95	75-125	12/21/10 00:48	
Dibromofluoromethane (S)	%	103	75-130	12/21/10 00:48	
Toluene-d8 (S)	%	93	75-125	12/21/10 00:48	

LABORATORY CONTROL SAMPLE: 909036

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	49.2	98	75-125	
1,1,1-Trichloroethane	ug/L	50	48.0	96	68-130	
1,1,2,2-Tetrachloroethane	ug/L	50	44.5	89	71-125	
1,1,2-Trichloroethane	ug/L	50	47.4	95	75-125	
1,1,2-Trichlorotrifluoroethane	ug/L	50	49.1	98	60-141	
1,1-Dichloroethane	ug/L	50	45.0	90	75-125	
1,1-Dichloroethene	ug/L	50	46.9	94	69-125	
1,1-Dichloropropene	ug/L	50	48.5	97	69-125	
1,2,3-Trichlorobenzene	ug/L	50	52.0	104	72-129	
1,2,3-Trichloropropane	ug/L	50	44.9	90	69-127	
1,2,4-Trichlorobenzene	ug/L	50	52.3	105	75-125	
1,2,4-Trimethylbenzene	ug/L	50	52.0	104	75-125	
1,2-Dibromo-3-chloropropane	ug/L	50	46.1	92	64-135	
1,2-Dibromoethane (EDB)	ug/L	50	47.3	95	75-126	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

LABORATORY CONTROL SAMPLE: 909036

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2-Dichlorobenzene	ug/L	50	48.7	97	75-125	
1,2-Dichloroethane	ug/L	50	45.0	90	75-125	
1,2-Dichloropropane	ug/L	50	47.9	96	75-125	
1,3,5-Trimethylbenzene	ug/L	50	52.9	106	75-125	
1,3-Dichlorobenzene	ug/L	50	49.5	99	75-125	
1,3-Dichloropropane	ug/L	50	45.7	91	75-125	
1,4-Dichlorobenzene	ug/L	50	49.0	98	75-125	
2,2-Dichloropropane	ug/L	50	42.5	85	54-149	
2-Butanone (MEK)	ug/L	50	41.4	83	55-140	
2-Chlorotoluene	ug/L	50	49.5	99	75-125	
4-Chlorotoluene	ug/L	50	49.3	99	75-125	
4-Methyl-2-pentanone (MIBK)	ug/L	50	44.8	90	65-132	
Acetone	ug/L	125	94.2	75	36-126	
Benzene	ug/L	50	47.2	94	75-125	
Bromobenzene	ug/L	50	49.6	99	75-125	
Bromochloromethane	ug/L	50	47.3	95	75-125	
Bromodichloromethane	ug/L	50	49.3	99	75-125	
Bromoform	ug/L	50	50.9	102	72-131	
Bromomethane	ug/L	50	51.3	103	30-150	
Carbon tetrachloride	ug/L	50	48.9	98	61-140	
Chlorobenzene	ug/L	50	48.6	97	75-125	
Chloroethane	ug/L	50	41.9	84	56-137	
Chloroform	ug/L	50	45.6	91	75-125	
Chloromethane	ug/L	50	40.9	82	62-128	
cis-1,2-Dichloroethene	ug/L	50	47.9	96	75-125	
cis-1,3-Dichloropropene	ug/L	50	49.9	100	75-125	
Dibromochloromethane	ug/L	50	48.3	97	75-125	
Dibromomethane	ug/L	50	46.6	93	75-125	
Dichlorodifluoromethane	ug/L	50	42.6	85	54-141	
Dichlorofluoromethane	ug/L	50	44.9	90	70-128	
Ethylbenzene	ug/L	50	50.9	102	75-125	
Hexachloro-1,3-butadiene	ug/L	25	25.2	101	68-133	
Isopropylbenzene (Cumene)	ug/L	50	52.0	104	75-125	
m&p-Xylene	ug/L	100	103	103	75-125	
Methyl-tert-butyl ether	ug/L	50	43.4	87	73-132	
Methylene Chloride	ug/L	50	43.4	87	74-125	
n-Butylbenzene	ug/L	50	51.4	103	75-125	
n-Propylbenzene	ug/L	50	50.8	102	75-125	
Naphthalene	ug/L	50	50.7	101	69-130	
o-Xylene	ug/L	50	52.9	106	75-125	
p-Isopropyltoluene	ug/L	50	52.8	106	75-125	
sec-Butylbenzene	ug/L	50	51.8	104	75-125	
Styrene	ug/L	50	52.0	104	75-125	
tert-Butylbenzene	ug/L	50	52.6	105	73-125	
Tetrachloroethene	ug/L	50	51.0	102	72-125	
Toluene	ug/L	50	49.8	100	75-125	
trans-1,2-Dichloroethene	ug/L	50	47.6	95	70-125	
trans-1,3-Dichloropropene	ug/L	50	47.3	95	75-125	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

LABORATORY CONTROL SAMPLE: 909036

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Trichloroethene	ug/L	50	51.5	103	75-125	
Trichlorofluoromethane	ug/L	50	47.4	95	68-132	
Vinyl chloride	ug/L	50	43.7	87	62-132	
Xylene (Total)	ug/L	150	156	104	75-125	
1,2-Dichloroethane-d4 (S)	%			87	75-131	
4-Bromofluorobenzene (S)	%			95	75-125	
Dibromofluoromethane (S)	%			94	75-130	
Toluene-d8 (S)	%			98	75-125	

MATRIX SPIKE SAMPLE: 909071

Parameter	Units	10145695001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	50	52.2	104	72-133	
1,1,1-Trichloroethane	ug/L	ND	50	51.9	104	65-150	
1,1,2,2-Tetrachloroethane	ug/L	ND	50	48.9	98	63-138	
1,1,2-Trichloroethane	ug/L	ND	50	51.0	102	68-131	
1,1,2-Trichlorotrifluoroethane	ug/L	ND	50	61.3	123	47-150	
1,1-Dichloroethane	ug/L	ND	50	46.4	93	71-131	
1,1-Dichloroethene	ug/L	ND	50	51.9	104	66-145	
1,1-Dichloropropene	ug/L	ND	50	52.7	105	62-144	
1,2,3-Trichlorobenzene	ug/L	ND	50	54.7	109	66-139	
1,2,3-Trichloropropane	ug/L	ND	50	49.1	98	61-139	
1,2,4-Trichlorobenzene	ug/L	ND	50	54.7	109	68-139	
1,2,4-Trimethylbenzene	ug/L	ND	50	53.7	107	69-130	
1,2-Dibromo-3-chloropropane	ug/L	ND	50	51.3	103	53-150	
1,2-Dibromoethane (EDB)	ug/L	ND	50	51.2	102	69-133	
1,2-Dichlorobenzene	ug/L	ND	50	50.7	101	72-131	
1,2-Dichloroethane	ug/L	ND	50	47.2	94	62-148	
1,2-Dichloropropane	ug/L	ND	50	49.4	99	74-128	
1,3,5-Trimethylbenzene	ug/L	ND	50	53.9	108	65-134	
1,3-Dichlorobenzene	ug/L	ND	50	51.2	102	73-130	
1,3-Dichloropropane	ug/L	ND	50	49.4	99	71-130	
1,4-Dichlorobenzene	ug/L	ND	50	50.9	102	71-132	
2,2-Dichloropropane	ug/L	ND	50	45.3	91	50-150	
2-Butanone (MEK)	ug/L	ND	50	42.5	85	46-140	
2-Chlorotoluene	ug/L	ND	50	51.6	103	74-131	
4-Chlorotoluene	ug/L	ND	50	51.1	102	70-139	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	50	49.8	100	59-145	
Acetone	ug/L	ND	125	98.8	79	36-126	
Benzene	ug/L	9.3	50	57.8	97	70-133	
Bromobenzene	ug/L	ND	50	52.4	105	72-129	
Bromochloromethane	ug/L	ND	50	50.1	100	69-137	
Bromodichloromethane	ug/L	ND	50	51.6	103	73-134	
Bromoform	ug/L	ND	50	55.5	111	56-144	
Bromomethane	ug/L	ND	50	52.0	104	30-150	
Carbon tetrachloride	ug/L	ND	50	54.5	109	55-150	
Chlorobenzene	ug/L	ND	50	51.2	102	71-132	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

MATRIX SPIKE SAMPLE: 909071

Parameter	Units	10145695001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloroethane	ug/L	ND	50	42.6	85	50-150	
Chloroform	ug/L	ND	50	47.7	95	68-138	
Chloromethane	ug/L	ND	50	42.7	85	61-148	
cis-1,2-Dichloroethene	ug/L	ND	50	50.1	100	68-135	
cis-1,3-Dichloropropene	ug/L	ND	50	50.2	100	70-134	
Dibromochloromethane	ug/L	ND	50	52.2	104	67-135	
Dibromomethane	ug/L	ND	50	49.8	100	74-130	
Dichlorodifluoromethane	ug/L	ND	50	53.5	107	44-150	
Dichlorofluoromethane	ug/L	ND	50	46.6	93	67-145	
Ethylbenzene	ug/L	ND	50	54.2	108	66-133	
Hexachloro-1,3-butadiene	ug/L	ND	25	27.6	111	59-150	
Isopropylbenzene (Cumene)	ug/L	ND	50	56.3	113	71-140	
m&p-Xylene	ug/L	ND	100	110	110	63-130	
Methyl-tert-butyl ether	ug/L	ND	50	47.6	95	62-143	
Methylene Chloride	ug/L	ND	50	45.2	90	69-126	
n-Butylbenzene	ug/L	ND	50	54.6	109	73-140	
n-Propylbenzene	ug/L	ND	50	53.8	108	71-136	
Naphthalene	ug/L	ND	50	55.5	111	55-147	
o-Xylene	ug/L	ND	50	56.9	114	66-132	
p-Isopropyltoluene	ug/L	ND	50	56.1	112	69-138	
sec-Butylbenzene	ug/L	ND	50	54.6	109	73-140	
Styrene	ug/L	ND	50	54.4	109	68-138	
tert-Butylbenzene	ug/L	ND	50	56.0	112	70-138	
Tetrachloroethene	ug/L	ND	50	55.2	110	70-138	
Toluene	ug/L	ND	50	52.6	105	65-127	
trans-1,2-Dichloroethene	ug/L	ND	50	49.8	100	67-131	
trans-1,3-Dichloropropene	ug/L	ND	50	50.5	101	64-138	
Trichloroethene	ug/L	ND	50	54.2	108	70-133	
Trichlorofluoromethane	ug/L	ND	50	55.6	111	59-150	
Vinyl chloride	ug/L	ND	50	47.1	94	59-150	
Xylene (Total)	ug/L	ND	150	167	111	65-130	
1,2-Dichloroethane-d4 (S)	%				90	75-131	
4-Bromofluorobenzene (S)	%				97	75-125	
Dibromofluoromethane (S)	%				93	75-130	
Toluene-d8 (S)	%				100	75-125	

SAMPLE DUPLICATE: 909072

Parameter	Units	10145695002 Result	Dup Result	RPD	Max RPD	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,1-Trichloroethane	ug/L	ND	ND		30	
1,1,2,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,2-Trichloroethane	ug/L	ND	ND		30	
1,1,2-Trichlorotrifluoroethane	ug/L	ND	ND		30	
1,1-Dichloroethane	ug/L	ND	ND		30	
1,1-Dichloroethene	ug/L	ND	ND		30	
1,1-Dichloropropene	ug/L	ND	ND		30	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

SAMPLE DUPLICATE: 909072

Parameter	Units	10145695002 Result	Dup Result	RPD	Max RPD	Qualifiers
1,2,3-Trichlorobenzene	ug/L	ND	ND		30	
1,2,3-Trichloropropane	ug/L	ND	ND		30	
1,2,4-Trichlorobenzene	ug/L	ND	ND		30	
1,2,4-Trimethylbenzene	ug/L	ND	ND		30	
1,2-Dibromo-3-chloropropane	ug/L	ND	ND		30	
1,2-Dibromoethane (EDB)	ug/L	ND	ND		30	
1,2-Dichlorobenzene	ug/L	ND	ND		30	
1,2-Dichloroethane	ug/L	ND	ND		30	
1,2-Dichloropropane	ug/L	ND	ND		30	
1,3,5-Trimethylbenzene	ug/L	ND	ND		30	
1,3-Dichlorobenzene	ug/L	ND	ND		30	
1,3-Dichloropropane	ug/L	ND	ND		30	
1,4-Dichlorobenzene	ug/L	ND	ND		30	
2,2-Dichloropropane	ug/L	ND	ND		30	
2-Butanone (MEK)	ug/L	ND	ND		30	
2-Chlorotoluene	ug/L	ND	ND		30	
4-Chlorotoluene	ug/L	ND	ND		30	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	ND		30	
Acetone	ug/L	ND	ND		30	
Benzene	ug/L	ND	ND		30	
Bromobenzene	ug/L	ND	ND		30	
Bromochloromethane	ug/L	ND	ND		30	
Bromodichloromethane	ug/L	ND	ND		30	
Bromoform	ug/L	ND	ND		30	
Bromomethane	ug/L	ND	ND		30	
Carbon tetrachloride	ug/L	ND	ND		30	
Chlorobenzene	ug/L	ND	ND		30	
Chloroethane	ug/L	ND	ND		30	
Chloroform	ug/L	ND	ND		30	
Chloromethane	ug/L	ND	ND		30	
cis-1,2-Dichloroethene	ug/L	ND	ND		30	
cis-1,3-Dichloropropene	ug/L	ND	ND		30	
Dibromochloromethane	ug/L	ND	ND		30	
Dibromomethane	ug/L	ND	ND		30	
Dichlorodifluoromethane	ug/L	ND	ND		30	
Dichlorofluoromethane	ug/L	ND	ND		30	
Ethylbenzene	ug/L	ND	ND		30	
Hexachloro-1,3-butadiene	ug/L	ND	ND		30	
Isopropylbenzene (Cumene)	ug/L	ND	ND		30	
m&p-Xylene	ug/L	ND	ND		30	
Methyl-tert-butyl ether	ug/L	ND	ND		30	
Methylene Chloride	ug/L	ND	ND		30	
n-Butylbenzene	ug/L	ND	ND		30	
n-Propylbenzene	ug/L	ND	ND		30	
Naphthalene	ug/L	ND	ND		30	
o-Xylene	ug/L	ND	ND		30	
p-Isopropyltoluene	ug/L	ND	ND		30	
sec-Butylbenzene	ug/L	ND	ND		30	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

SAMPLE DUPLICATE: 909072

Parameter	Units	10145695002 Result	Dup Result	RPD	Max RPD	Qualifiers
Styrene	ug/L	ND	ND		30	
tert-Butylbenzene	ug/L	ND	ND		30	
Tetrachloroethene	ug/L	ND	ND		30	
Toluene	ug/L	ND	ND		30	
trans-1,2-Dichloroethene	ug/L	ND	ND		30	
trans-1,3-Dichloropropene	ug/L	ND	ND		30	
Trichloroethene	ug/L	ND	ND		30	
Trichlorofluoromethane	ug/L	ND	ND		30	
Vinyl chloride	ug/L	ND	ND		30	
Xylene (Total)	ug/L	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	97	100	3		
4-Bromofluorobenzene (S)	%	91	93	3		
Dibromofluoromethane (S)	%	107	107	.3		
Toluene-d8 (S)	%	93	93	.01		

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

QC Batch: MSV/16043 | Analysis Method: EPA 8260
QC Batch Method: EPA 8260 | Analysis Description: 8260 MSV 465 W
Associated Lab Samples: 10145476003

METHOD BLANK: 909069 | Matrix: Water
Associated Lab Samples: 10145476003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	12/21/10 02:37	
1,1,1-Trichloroethane	ug/L	ND	1.0	12/21/10 02:37	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	12/21/10 02:37	
1,1,2-Trichloroethane	ug/L	ND	1.0	12/21/10 02:37	
1,1,2-Trichlorotrifluoroethane	ug/L	ND	1.0	12/21/10 02:37	
1,1-Dichloroethane	ug/L	ND	1.0	12/21/10 02:37	
1,1-Dichloroethene	ug/L	ND	1.0	12/21/10 02:37	
1,1-Dichloropropene	ug/L	ND	1.0	12/21/10 02:37	
1,2,3-Trichlorobenzene	ug/L	ND	1.0	12/21/10 02:37	
1,2,3-Trichloropropane	ug/L	ND	1.0	12/21/10 02:37	
1,2,4-Trichlorobenzene	ug/L	ND	1.0	12/21/10 02:37	
1,2,4-Trimethylbenzene	ug/L	ND	1.0	12/21/10 02:37	
1,2-Dibromo-3-chloropropane	ug/L	ND	4.0	12/21/10 02:37	
1,2-Dibromoethane (EDB)	ug/L	ND	1.0	12/21/10 02:37	
1,2-Dichlorobenzene	ug/L	ND	1.0	12/21/10 02:37	
1,2-Dichloroethane	ug/L	ND	1.0	12/21/10 02:37	
1,2-Dichloropropane	ug/L	ND	1.0	12/21/10 02:37	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	12/21/10 02:37	
1,3-Dichlorobenzene	ug/L	ND	1.0	12/21/10 02:37	
1,3-Dichloropropane	ug/L	ND	1.0	12/21/10 02:37	
1,4-Dichlorobenzene	ug/L	ND	1.0	12/21/10 02:37	
2,2-Dichloropropane	ug/L	ND	4.0	12/21/10 02:37	
2-Butanone (MEK)	ug/L	ND	4.0	12/21/10 02:37	
2-Chlorotoluene	ug/L	ND	1.0	12/21/10 02:37	
4-Chlorotoluene	ug/L	ND	1.0	12/21/10 02:37	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	4.0	12/21/10 02:37	
Acetone	ug/L	ND	10.0	12/21/10 02:37	
Benzene	ug/L	ND	1.0	12/21/10 02:37	
Bromobenzene	ug/L	ND	1.0	12/21/10 02:37	
Bromochloromethane	ug/L	ND	1.0	12/21/10 02:37	
Bromodichloromethane	ug/L	ND	1.0	12/21/10 02:37	
Bromoform	ug/L	ND	8.0	12/21/10 02:37	
Bromomethane	ug/L	ND	4.0	12/21/10 02:37	
Carbon tetrachloride	ug/L	ND	4.0	12/21/10 02:37	
Chlorobenzene	ug/L	ND	1.0	12/21/10 02:37	
Chloroethane	ug/L	ND	1.0	12/21/10 02:37	
Chloroform	ug/L	ND	1.0	12/21/10 02:37	
Chloromethane	ug/L	ND	4.0	12/21/10 02:37	
cis-1,2-Dichloroethene	ug/L	ND	1.0	12/21/10 02:37	
cis-1,3-Dichloropropene	ug/L	ND	4.0	12/21/10 02:37	
Dibromochloromethane	ug/L	ND	1.0	12/21/10 02:37	
Dibromomethane	ug/L	ND	4.0	12/21/10 02:37	
Dichlorodifluoromethane	ug/L	ND	1.0	12/21/10 02:37	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

METHOD BLANK: 909069 Matrix: Water

Associated Lab Samples: 10145476003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Dichlorofluoromethane	ug/L	ND	1.0	12/21/10 02:37	
Ethylbenzene	ug/L	ND	1.0	12/21/10 02:37	
Hexachloro-1,3-butadiene	ug/L	ND	4.0	12/21/10 02:37	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	12/21/10 02:37	
m&p-Xylene	ug/L	ND	2.0	12/21/10 02:37	
Methyl-tert-butyl ether	ug/L	ND	1.0	12/21/10 02:37	
Methylene Chloride	ug/L	ND	4.0	12/21/10 02:37	
n-Butylbenzene	ug/L	ND	1.0	12/21/10 02:37	
n-Propylbenzene	ug/L	ND	1.0	12/21/10 02:37	
Naphthalene	ug/L	ND	4.0	12/21/10 02:37	
o-Xylene	ug/L	ND	1.0	12/21/10 02:37	
p-Isopropyltoluene	ug/L	ND	1.0	12/21/10 02:37	
sec-Butylbenzene	ug/L	ND	1.0	12/21/10 02:37	
Styrene	ug/L	ND	1.0	12/21/10 02:37	
tert-Butylbenzene	ug/L	ND	1.0	12/21/10 02:37	
Tetrachloroethene	ug/L	ND	1.0	12/21/10 02:37	
Toluene	ug/L	ND	1.0	12/21/10 02:37	
trans-1,2-Dichloroethene	ug/L	ND	1.0	12/21/10 02:37	
trans-1,3-Dichloropropene	ug/L	ND	4.0	12/21/10 02:37	
Trichloroethene	ug/L	ND	1.0	12/21/10 02:37	
Trichlorofluoromethane	ug/L	ND	1.0	12/21/10 02:37	
Vinyl chloride	ug/L	ND	0.40	12/21/10 02:37	
Xylene (Total)	ug/L	ND	3.0	12/21/10 02:37	
1,2-Dichloroethane-d4 (S)	%	100	75-131	12/21/10 02:37	
4-Bromofluorobenzene (S)	%	103	75-125	12/21/10 02:37	
Dibromofluoromethane (S)	%	102	75-130	12/21/10 02:37	
Toluene-d8 (S)	%	103	75-125	12/21/10 02:37	

LABORATORY CONTROL SAMPLE: 909070

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	48.1	96	75-125	
1,1,1-Trichloroethane	ug/L	50	48.6	97	68-130	
1,1,2,2-Tetrachloroethane	ug/L	50	48.9	98	71-125	
1,1,2-Trichloroethane	ug/L	50	48.7	97	75-125	
1,1,2-Trichlorotrifluoroethane	ug/L	50	44.8	90	60-141	
1,1-Dichloroethane	ug/L	50	47.1	94	75-125	
1,1-Dichloroethene	ug/L	50	48.9	98	69-125	
1,1-Dichloropropene	ug/L	50	50.5	101	69-125	
1,2,3-Trichlorobenzene	ug/L	50	51.9	104	72-129	
1,2,3-Trichloropropane	ug/L	50	50.7	101	69-127	
1,2,4-Trichlorobenzene	ug/L	50	45.4	91	75-125	
1,2,4-Trimethylbenzene	ug/L	50	53.0	106	75-125	
1,2-Dibromo-3-chloropropane	ug/L	50	50.0	100	64-135	
1,2-Dibromoethane (EDB)	ug/L	50	49.4	99	75-126	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

LABORATORY CONTROL SAMPLE: 909070

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2-Dichlorobenzene	ug/L	50	49.1	98	75-125	
1,2-Dichloroethane	ug/L	50	47.8	96	75-125	
1,2-Dichloropropane	ug/L	50	48.5	97	75-125	
1,3,5-Trimethylbenzene	ug/L	50	51.3	103	75-125	
1,3-Dichlorobenzene	ug/L	50	49.1	98	75-125	
1,3-Dichloropropane	ug/L	50	48.9	98	75-125	
1,4-Dichlorobenzene	ug/L	50	49.2	98	75-125	
2,2-Dichloropropane	ug/L	50	43.4	87	54-149	
2-Butanone (MEK)	ug/L	50	53.7	107	55-140	
2-Chlorotoluene	ug/L	50	50.0	100	75-125	
4-Chlorotoluene	ug/L	50	50.4	101	75-125	
4-Methyl-2-pentanone (MIBK)	ug/L	50	45.9	92	65-132	
Acetone	ug/L	125	101	81	36-126	
Benzene	ug/L	50	49.5	99	75-125	
Bromobenzene	ug/L	50	49.7	99	75-125	
Bromochloromethane	ug/L	50	50.2	100	75-125	
Bromodichloromethane	ug/L	50	49.1	98	75-125	
Bromoform	ug/L	50	49.7	99	72-131	
Bromomethane	ug/L	50	39.1	78	30-150	
Carbon tetrachloride	ug/L	50	48.7	97	61-140	
Chlorobenzene	ug/L	50	47.3	95	75-125	
Chloroethane	ug/L	50	48.0	96	56-137	
Chloroform	ug/L	50	48.1	96	75-125	
Chloromethane	ug/L	50	39.9	80	62-128	
cis-1,2-Dichloroethene	ug/L	50	49.9	100	75-125	
cis-1,3-Dichloropropene	ug/L	50	48.9	98	75-125	
Dibromochloromethane	ug/L	50	49.5	99	75-125	
Dibromomethane	ug/L	50	48.2	96	75-125	
Dichlorodifluoromethane	ug/L	50	41.7	83	54-141	
Dichlorofluoromethane	ug/L	50	47.4	95	70-128	
Ethylbenzene	ug/L	50	51.3	103	75-125	
Hexachloro-1,3-butadiene	ug/L	25	22.9	91	68-133	
Isopropylbenzene (Cumene)	ug/L	50	50.7	101	75-125	
m&p-Xylene	ug/L	100	102	102	75-125	
Methyl-tert-butyl ether	ug/L	50	50.4	101	73-132	
Methylene Chloride	ug/L	50	47.1	94	74-125	
n-Butylbenzene	ug/L	50	54.3	109	75-125	
n-Propylbenzene	ug/L	50	51.7	103	75-125	
Naphthalene	ug/L	50	45.9	92	69-130	
o-Xylene	ug/L	50	50.1	100	75-125	
p-Isopropyltoluene	ug/L	50	53.4	107	75-125	
sec-Butylbenzene	ug/L	50	51.8	104	75-125	
Styrene	ug/L	50	52.0	104	75-125	
tert-Butylbenzene	ug/L	50	50.6	101	73-125	
Tetrachloroethene	ug/L	50	46.3	93	72-125	
Toluene	ug/L	50	48.6	97	75-125	
trans-1,2-Dichloroethene	ug/L	50	49.1	98	70-125	
trans-1,3-Dichloropropene	ug/L	50	49.9	100	75-125	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

LABORATORY CONTROL SAMPLE: 909070

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Trichloroethene	ug/L	50	48.5	97	75-125	
Trichlorofluoromethane	ug/L	50	47.2	94	68-132	
Vinyl chloride	ug/L	50	44.3	89	62-132	
Xylene (Total)	ug/L	150	152	101	75-125	
1,2-Dichloroethane-d4 (S)	%			95	75-131	
4-Bromofluorobenzene (S)	%			100	75-125	
Dibromofluoromethane (S)	%			100	75-130	
Toluene-d8 (S)	%			101	75-125	

MATRIX SPIKE SAMPLE: 909505

Parameter	Units	10145657001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	50	53.4	107	72-133	
1,1,1-Trichloroethane	ug/L	ND	50	56.5	113	65-150	
1,1,2,2-Tetrachloroethane	ug/L	ND	50	55.1	110	63-138	
1,1,2-Trichloroethane	ug/L	ND	50	54.7	109	68-131	
1,1,2-Trichlorotrifluoroethane	ug/L	ND	50	61.9	124	47-150	
1,1-Dichloroethane	ug/L	ND	50	53.0	106	71-131	
1,1-Dichloroethene	ug/L	ND	50	57.5	115	66-145	
1,1-Dichloropropene	ug/L	ND	50	59.4	119	62-144	
1,2,3-Trichlorobenzene	ug/L	ND	50	57.0	114	66-139	
1,2,3-Trichloropropane	ug/L	ND	50	54.8	110	61-139	
1,2,4-Trichlorobenzene	ug/L	ND	50	50.5	101	68-139	
1,2,4-Trimethylbenzene	ug/L	ND	50	58.2	116	69-130	
1,2-Dibromo-3-chloropropane	ug/L	ND	50	55.7	111	53-150	
1,2-Dibromoethane (EDB)	ug/L	ND	50	54.1	108	69-133	
1,2-Dichlorobenzene	ug/L	ND	50	52.0	104	72-131	
1,2-Dichloroethane	ug/L	ND	50	53.2	106	62-148	
1,2-Dichloropropane	ug/L	ND	50	53.6	107	74-128	
1,3,5-Trimethylbenzene	ug/L	ND	50	55.2	110	65-134	
1,3-Dichlorobenzene	ug/L	ND	50	53.1	106	73-130	
1,3-Dichloropropane	ug/L	ND	50	53.6	107	71-130	
1,4-Dichlorobenzene	ug/L	ND	50	52.4	105	71-132	
2,2-Dichloropropane	ug/L	ND	50	49.6	99	50-150	
2-Butanone (MEK)	ug/L	ND	50	56.7	113	46-140	
2-Chlorotoluene	ug/L	ND	50	53.8	108	74-131	
4-Chlorotoluene	ug/L	ND	50	54.3	109	70-139	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	50	52.2	104	59-145	
Acetone	ug/L	ND	125	115	92	36-126	
Benzene	ug/L	ND	50	55.7	111	70-133	
Bromobenzene	ug/L	ND	50	53.1	106	72-129	
Bromochloromethane	ug/L	ND	50	51.8	104	69-137	
Bromodichloromethane	ug/L	ND	50	54.5	109	73-134	
Bromoform	ug/L	ND	50	54.3	109	56-144	
Bromomethane	ug/L	ND	50	45.1	90	30-150	
Carbon tetrachloride	ug/L	ND	50	57.5	115	55-150	
Chlorobenzene	ug/L	ND	50	51.3	103	71-132	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

MATRIX SPIKE SAMPLE: 909505

Parameter	Units	10145657001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloroethane	ug/L	ND	50	53.6	107	50-150	
Chloroform	ug/L	ND	50	53.4	107	68-138	
Chloromethane	ug/L	ND	50	45.8	92	61-148	
cis-1,2-Dichloroethene	ug/L	ND	50	55.8	112	68-135	
cis-1,3-Dichloropropene	ug/L	ND	50	52.6	105	70-134	
Dibromochloromethane	ug/L	ND	50	54.3	109	67-135	
Dibromomethane	ug/L	ND	50	54.4	109	74-130	
Dichlorodifluoromethane	ug/L	ND	50	58.8	118	44-150	
Dichlorofluoromethane	ug/L	ND	50	54.2	108	67-145	
Ethylbenzene	ug/L	ND	50	57.3	115	66-133	
Hexachloro-1,3-butadiene	ug/L	ND	25	25.8	103	59-150	
Isopropylbenzene (Cumene)	ug/L	ND	50	56.8	114	71-140	
m&p-Xylene	ug/L	ND	100	114	114	63-130	
Methyl-tert-butyl ether	ug/L	ND	50	57.3	115	62-143	
Methylene Chloride	ug/L	ND	50	51.5	103	69-126	
n-Butylbenzene	ug/L	ND	50	60.0	120	73-140	
n-Propylbenzene	ug/L	ND	50	57.6	115	71-136	
Naphthalene	ug/L	ND	50	52.3	105	55-147	
o-Xylene	ug/L	ND	50	54.9	110	66-132	
p-Isopropyltoluene	ug/L	ND	50	58.6	117	69-138	
sec-Butylbenzene	ug/L	ND	50	58.2	116	73-140	
Styrene	ug/L	ND	50	56.4	113	68-138	
tert-Butylbenzene	ug/L	ND	50	55.4	111	70-138	
Tetrachloroethene	ug/L	ND	50	52.1	104	70-138	
Toluene	ug/L	ND	50	52.7	105	65-127	
trans-1,2-Dichloroethene	ug/L	ND	50	56.2	112	67-131	
trans-1,3-Dichloropropene	ug/L	ND	50	55.1	110	64-138	
Trichloroethene	ug/L	ND	50	55.1	110	70-133	
Trichlorofluoromethane	ug/L	ND	50	60.8	122	59-150	
Vinyl chloride	ug/L	ND	50	52.9	106	59-150	
Xylene (Total)	ug/L	ND	150	169	113	65-130	
1,2-Dichloroethane-d4 (S)	%				100	75-131	
4-Bromofluorobenzene (S)	%				100	75-125	
Dibromofluoromethane (S)	%				98	75-130	
Toluene-d8 (S)	%				97	75-125	

SAMPLE DUPLICATE: 909506

Parameter	Units	10145657004 Result	Dup Result	RPD	Max RPD	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,1-Trichloroethane	ug/L	ND	ND		30	
1,1,2,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,2-Trichloroethane	ug/L	ND	ND		30	
1,1,2-Trichlorotrifluoroethane	ug/L	ND	ND		30	
1,1-Dichloroethane	ug/L	ND	ND		30	
1,1-Dichloroethene	ug/L	ND	ND		30	
1,1-Dichloropropene	ug/L	ND	ND		30	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

SAMPLE DUPLICATE: 909506

Parameter	Units	10145657004 Result	Dup Result	RPD	Max RPD	Qualifiers
1,2,3-Trichlorobenzene	ug/L	ND	ND		30	
1,2,3-Trichloropropane	ug/L	ND	ND		30	
1,2,4-Trichlorobenzene	ug/L	ND	ND		30	
1,2,4-Trimethylbenzene	ug/L	ND	ND		30	
1,2-Dibromo-3-chloropropane	ug/L	ND	ND		30	
1,2-Dibromoethane (EDB)	ug/L	ND	ND		30	
1,2-Dichlorobenzene	ug/L	ND	ND		30	
1,2-Dichloroethane	ug/L	ND	ND		30	
1,2-Dichloropropane	ug/L	ND	ND		30	
1,3,5-Trimethylbenzene	ug/L	ND	ND		30	
1,3-Dichlorobenzene	ug/L	ND	ND		30	
1,3-Dichloropropane	ug/L	ND	ND		30	
1,4-Dichlorobenzene	ug/L	ND	ND		30	
2,2-Dichloropropane	ug/L	ND	ND		30	
2-Butanone (MEK)	ug/L	ND	ND		30	
2-Chlorotoluene	ug/L	ND	ND		30	
4-Chlorotoluene	ug/L	ND	ND		30	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	ND		30	
Acetone	ug/L	ND	ND		30	
Benzene	ug/L	ND	ND		30	
Bromobenzene	ug/L	ND	ND		30	
Bromochloromethane	ug/L	ND	ND		30	
Bromodichloromethane	ug/L	ND	ND		30	
Bromoform	ug/L	ND	ND		30	
Bromomethane	ug/L	ND	ND		30	
Carbon tetrachloride	ug/L	ND	ND		30	
Chlorobenzene	ug/L	ND	ND		30	
Chloroethane	ug/L	ND	ND		30	
Chloroform	ug/L	ND	ND		30	
Chloromethane	ug/L	ND	ND		30	
cis-1,2-Dichloroethene	ug/L	ND	ND		30	
cis-1,3-Dichloropropene	ug/L	ND	ND		30	
Dibromochloromethane	ug/L	ND	ND		30	
Dibromomethane	ug/L	ND	ND		30	
Dichlorodifluoromethane	ug/L	ND	ND		30	
Dichlorofluoromethane	ug/L	ND	ND		30	
Ethylbenzene	ug/L	ND	ND		30	
Hexachloro-1,3-butadiene	ug/L	ND	ND		30	
Isopropylbenzene (Cumene)	ug/L	ND	ND		30	
m&p-Xylene	ug/L	ND	ND		30	
Methyl-tert-butyl ether	ug/L	ND	ND		30	
Methylene Chloride	ug/L	ND	ND		30	
n-Butylbenzene	ug/L	ND	ND		30	
n-Propylbenzene	ug/L	ND	ND		30	
Naphthalene	ug/L	ND	ND		30	
o-Xylene	ug/L	ND	ND		30	
p-Isopropyltoluene	ug/L	ND	ND		30	
sec-Butylbenzene	ug/L	ND	ND		30	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

SAMPLE DUPLICATE: 909506

Parameter	Units	10145657004 Result	Dup Result	RPD	Max RPD	Qualifiers
Styrene	ug/L	ND	ND		30	
tert-Butylbenzene	ug/L	ND	ND		30	
Tetrachloroethene	ug/L	ND	ND		30	
Toluene	ug/L	ND	ND		30	
trans-1,2-Dichloroethene	ug/L	ND	ND		30	
trans-1,3-Dichloropropene	ug/L	ND	ND		30	
Trichloroethene	ug/L	ND	ND		30	
Trichlorofluoromethane	ug/L	ND	ND		30	
Vinyl chloride	ug/L	ND	ND		30	
Xylene (Total)	ug/L	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	100	105	5		
4-Bromofluorobenzene (S)	%	101	103	2		
Dibromofluoromethane (S)	%	98	103	5		
Toluene-d8 (S)	%	98	96	1		

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

QC Batch: MSV/16064 | Analysis Method: EPA 8260
QC Batch Method: EPA 8260 | Analysis Description: 8260 MSV 465 W
Associated Lab Samples: 10145476002

METHOD BLANK: 910117 | Matrix: Water
Associated Lab Samples: 10145476002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	1.0	12/22/10 22:07	
1,1,1-Trichloroethane	ug/L	ND	1.0	12/22/10 22:07	
1,1,2,2-Tetrachloroethane	ug/L	ND	1.0	12/22/10 22:07	
1,1,2-Trichloroethane	ug/L	ND	1.0	12/22/10 22:07	
1,1,2-Trichlorotrifluoroethane	ug/L	ND	1.0	12/22/10 22:07	
1,1-Dichloroethane	ug/L	ND	1.0	12/22/10 22:07	
1,1-Dichloroethene	ug/L	ND	1.0	12/22/10 22:07	
1,1-Dichloropropene	ug/L	ND	1.0	12/22/10 22:07	
1,2,3-Trichlorobenzene	ug/L	ND	1.0	12/22/10 22:07	
1,2,3-Trichloropropane	ug/L	ND	1.0	12/22/10 22:07	
1,2,4-Trichlorobenzene	ug/L	ND	1.0	12/22/10 22:07	
1,2,4-Trimethylbenzene	ug/L	ND	1.0	12/22/10 22:07	
1,2-Dibromo-3-chloropropane	ug/L	ND	4.0	12/22/10 22:07	
1,2-Dibromoethane (EDB)	ug/L	ND	1.0	12/22/10 22:07	
1,2-Dichlorobenzene	ug/L	ND	1.0	12/22/10 22:07	
1,2-Dichloroethane	ug/L	ND	1.0	12/22/10 22:07	
1,2-Dichloropropane	ug/L	ND	1.0	12/22/10 22:07	
1,3,5-Trimethylbenzene	ug/L	ND	1.0	12/22/10 22:07	
1,3-Dichlorobenzene	ug/L	ND	1.0	12/22/10 22:07	
1,3-Dichloropropane	ug/L	ND	1.0	12/22/10 22:07	
1,4-Dichlorobenzene	ug/L	ND	1.0	12/22/10 22:07	
2,2-Dichloropropane	ug/L	ND	4.0	12/22/10 22:07	
2-Butanone (MEK)	ug/L	ND	4.0	12/22/10 22:07	
2-Chlorotoluene	ug/L	ND	1.0	12/22/10 22:07	
4-Chlorotoluene	ug/L	ND	1.0	12/22/10 22:07	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	4.0	12/22/10 22:07	
Acetone	ug/L	ND	10.0	12/22/10 22:07	
Benzene	ug/L	ND	1.0	12/22/10 22:07	
Bromobenzene	ug/L	ND	1.0	12/22/10 22:07	
Bromochloromethane	ug/L	ND	1.0	12/22/10 22:07	
Bromodichloromethane	ug/L	ND	1.0	12/22/10 22:07	
Bromoform	ug/L	ND	8.0	12/22/10 22:07	
Bromomethane	ug/L	ND	4.0	12/22/10 22:07	
Carbon tetrachloride	ug/L	ND	4.0	12/22/10 22:07	
Chlorobenzene	ug/L	ND	1.0	12/22/10 22:07	
Chloroethane	ug/L	ND	1.0	12/22/10 22:07	
Chloroform	ug/L	ND	1.0	12/22/10 22:07	
Chloromethane	ug/L	ND	4.0	12/22/10 22:07	
cis-1,2-Dichloroethene	ug/L	ND	1.0	12/22/10 22:07	
cis-1,3-Dichloropropene	ug/L	ND	4.0	12/22/10 22:07	
Dibromochloromethane	ug/L	ND	1.0	12/22/10 22:07	
Dibromomethane	ug/L	ND	4.0	12/22/10 22:07	
Dichlorodifluoromethane	ug/L	ND	1.0	12/22/10 22:07	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

METHOD BLANK: 910117 Matrix: Water

Associated Lab Samples: 10145476002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Dichlorofluoromethane	ug/L	ND	1.0	12/22/10 22:07	
Ethylbenzene	ug/L	ND	1.0	12/22/10 22:07	
Hexachloro-1,3-butadiene	ug/L	ND	4.0	12/22/10 22:07	
Isopropylbenzene (Cumene)	ug/L	ND	1.0	12/22/10 22:07	
m&p-Xylene	ug/L	ND	2.0	12/22/10 22:07	
Methyl-tert-butyl ether	ug/L	ND	1.0	12/22/10 22:07	
Methylene Chloride	ug/L	ND	4.0	12/22/10 22:07	
n-Butylbenzene	ug/L	ND	1.0	12/22/10 22:07	
n-Propylbenzene	ug/L	ND	1.0	12/22/10 22:07	
Naphthalene	ug/L	ND	4.0	12/22/10 22:07	
o-Xylene	ug/L	ND	1.0	12/22/10 22:07	
p-Isopropyltoluene	ug/L	ND	1.0	12/22/10 22:07	
sec-Butylbenzene	ug/L	ND	1.0	12/22/10 22:07	
Styrene	ug/L	ND	1.0	12/22/10 22:07	
tert-Butylbenzene	ug/L	ND	1.0	12/22/10 22:07	
Tetrachloroethene	ug/L	ND	1.0	12/22/10 22:07	
Toluene	ug/L	ND	1.0	12/22/10 22:07	
trans-1,2-Dichloroethene	ug/L	ND	1.0	12/22/10 22:07	
trans-1,3-Dichloropropene	ug/L	ND	4.0	12/22/10 22:07	
Trichloroethene	ug/L	ND	1.0	12/22/10 22:07	
Trichlorofluoromethane	ug/L	ND	1.0	12/22/10 22:07	
Vinyl chloride	ug/L	ND	0.40	12/22/10 22:07	
Xylene (Total)	ug/L	ND	3.0	12/22/10 22:07	
1,2-Dichloroethane-d4 (S)	%	95	75-131	12/22/10 22:07	
4-Bromofluorobenzene (S)	%	91	75-125	12/22/10 22:07	
Dibromofluoromethane (S)	%	101	75-130	12/22/10 22:07	
Toluene-d8 (S)	%	91	75-125	12/22/10 22:07	

LABORATORY CONTROL SAMPLE: 910118

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	50	49.8	100	75-125	
1,1,1-Trichloroethane	ug/L	50	44.8	90	68-130	
1,1,2,2-Tetrachloroethane	ug/L	50	47.6	95	71-125	
1,1,2-Trichloroethane	ug/L	50	48.5	97	75-125	
1,1,2-Trichlorotrifluoroethane	ug/L	50	45.3	91	60-141	
1,1-Dichloroethane	ug/L	50	41.6	83	75-125	
1,1-Dichloroethene	ug/L	50	43.3	87	69-125	
1,1-Dichloropropene	ug/L	50	44.1	88	69-125	
1,2,3-Trichlorobenzene	ug/L	50	55.1	110	72-129	
1,2,3-Trichloropropane	ug/L	50	46.2	92	69-127	
1,2,4-Trichlorobenzene	ug/L	50	55.4	111	75-125	
1,2,4-Trimethylbenzene	ug/L	50	50.4	101	75-125	
1,2-Dibromo-3-chloropropane	ug/L	50	49.4	99	64-135	
1,2-Dibromoethane (EDB)	ug/L	50	50.5	101	75-126	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

LABORATORY CONTROL SAMPLE: 910118

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,2-Dichlorobenzene	ug/L	50	49.5	99	75-125	
1,2-Dichloroethane	ug/L	50	46.4	93	75-125	
1,2-Dichloropropane	ug/L	50	45.9	92	75-125	
1,3,5-Trimethylbenzene	ug/L	50	50.8	102	75-125	
1,3-Dichlorobenzene	ug/L	50	48.5	97	75-125	
1,3-Dichloropropane	ug/L	50	47.4	95	75-125	
1,4-Dichlorobenzene	ug/L	50	48.7	97	75-125	
2,2-Dichloropropane	ug/L	50	43.7	87	54-149	
2-Butanone (MEK)	ug/L	50	48.0	96	55-140	
2-Chlorotoluene	ug/L	50	46.2	92	75-125	
4-Chlorotoluene	ug/L	50	47.4	95	75-125	
4-Methyl-2-pentanone (MIBK)	ug/L	50	46.5	93	65-132	
Acetone	ug/L	125	122	98	36-126	
Benzene	ug/L	50	43.7	87	75-125	
Bromobenzene	ug/L	50	49.5	99	75-125	
Bromochloromethane	ug/L	50	48.4	97	75-125	
Bromodichloromethane	ug/L	50	49.8	100	75-125	
Bromoform	ug/L	50	56.5	113	72-131	
Bromomethane	ug/L	50	49.3	99	30-150	
Carbon tetrachloride	ug/L	50	46.3	93	61-140	
Chlorobenzene	ug/L	50	47.7	95	75-125	
Chloroethane	ug/L	50	38.0	76	56-137	
Chloroform	ug/L	50	43.9	88	75-125	
Chloromethane	ug/L	50	39.0	78	62-128	
cis-1,2-Dichloroethene	ug/L	50	45.8	92	75-125	
cis-1,3-Dichloropropene	ug/L	50	50.5	101	75-125	
Dibromochloromethane	ug/L	50	51.1	102	75-125	
Dibromomethane	ug/L	50	49.9	100	75-125	
Dichlorodifluoromethane	ug/L	50	39.9	80	54-141	
Dichlorofluoromethane	ug/L	50	40.9	82	70-128	
Ethylbenzene	ug/L	50	48.2	96	75-125	
Hexachloro-1,3-butadiene	ug/L	25	26.4	106	68-133	
Isopropylbenzene (Cumene)	ug/L	50	51.0	102	75-125	
m&p-Xylene	ug/L	100	99.4	99	75-125	
Methyl-tert-butyl ether	ug/L	50	47.2	94	73-132	
Methylene Chloride	ug/L	50	43.0	86	74-125	
n-Butylbenzene	ug/L	50	49.6	99	75-125	
n-Propylbenzene	ug/L	50	47.8	96	75-125	
Naphthalene	ug/L	50	54.6	109	69-130	
o-Xylene	ug/L	50	51.3	103	75-125	
p-Isopropyltoluene	ug/L	50	51.8	104	75-125	
sec-Butylbenzene	ug/L	50	49.4	99	75-125	
Styrene	ug/L	50	51.7	103	75-125	
tert-Butylbenzene	ug/L	50	50.8	102	73-125	
Tetrachloroethene	ug/L	50	49.2	98	72-125	
Toluene	ug/L	50	47.0	94	75-125	
trans-1,2-Dichloroethene	ug/L	50	43.7	87	70-125	
trans-1,3-Dichloropropene	ug/L	50	49.8	100	75-125	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

LABORATORY CONTROL SAMPLE: 910118

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Trichloroethene	ug/L	50	50.1	100	75-125	
Trichlorofluoromethane	ug/L	50	44.6	89	68-132	
Vinyl chloride	ug/L	50	39.6	79	62-132	
Xylene (Total)	ug/L	150	151	100	75-125	
1,2-Dichloroethane-d4 (S)	%			90	75-131	
4-Bromofluorobenzene (S)	%			95	75-125	
Dibromofluoromethane (S)	%			93	75-130	
Toluene-d8 (S)	%			96	75-125	

MATRIX SPIKE SAMPLE: 911420

Parameter	Units	10145796001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	50	53.6	107	72-133	
1,1,1-Trichloroethane	ug/L	ND	50	54.4	109	65-150	
1,1,2,2-Tetrachloroethane	ug/L	ND	50	48.7	97	63-138	
1,1,2-Trichloroethane	ug/L	ND	50	51.0	102	68-131	
1,1,2-Trichlorotrifluoroethane	ug/L	ND	50	66.9	134	47-150	
1,1-Dichloroethane	ug/L	ND	50	46.2	92	71-131	
1,1-Dichloroethene	ug/L	ND	50	54.0	108	66-145	
1,1-Dichloropropene	ug/L	ND	50	54.2	108	62-144	
1,2,3-Trichlorobenzene	ug/L	ND	50	60.5	121	66-139	
1,2,3-Trichloropropane	ug/L	ND	50	48.7	97	61-139	
1,2,4-Trichlorobenzene	ug/L	ND	50	61.3	123	68-139	
1,2,4-Trimethylbenzene	ug/L	ND	50	53.7	107	69-130	
1,2-Dibromo-3-chloropropane	ug/L	ND	50	52.3	105	53-150	
1,2-Dibromoethane (EDB)	ug/L	ND	50	52.2	104	69-133	
1,2-Dichlorobenzene	ug/L	ND	50	53.2	106	72-131	
1,2-Dichloroethane	ug/L	ND	50	49.2	98	62-148	
1,2-Dichloropropane	ug/L	ND	50	49.6	99	74-128	
1,3,5-Trimethylbenzene	ug/L	ND	50	54.8	110	65-134	
1,3-Dichlorobenzene	ug/L	ND	50	53.1	106	73-130	
1,3-Dichloropropane	ug/L	ND	50	48.4	97	71-130	
1,4-Dichlorobenzene	ug/L	ND	50	52.6	105	71-132	
2,2-Dichloropropane	ug/L	ND	50	51.1	102	50-150	
2-Butanone (MEK)	ug/L	ND	50	46.2	92	46-140	
2-Chlorotoluene	ug/L	ND	50	51.5	103	74-131	
4-Chlorotoluene	ug/L	ND	50	52.1	104	70-139	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	50	48.9	98	59-145	
Acetone	ug/L	ND	125	97.3	78	36-126	
Benzene	ug/L	ND	50	49.5	99	70-133	
Bromobenzene	ug/L	ND	50	54.1	108	72-129	
Bromochloromethane	ug/L	ND	50	52.1	104	69-137	
Bromodichloromethane	ug/L	ND	50	53.0	106	73-134	
Bromoform	ug/L	ND	50	57.5	115	56-144	
Bromomethane	ug/L	ND	50	54.8	110	30-150	
Carbon tetrachloride	ug/L	ND	50	57.4	115	55-150	
Chlorobenzene	ug/L	ND	50	51.6	103	71-132	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

MATRIX SPIKE SAMPLE: 911420

Parameter	Units	10145796001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloroethane	ug/L	ND	50	42.5	85	50-150	
Chloroform	ug/L	ND	50	48.7	97	68-138	
Chloromethane	ug/L	ND	50	44.7	89	61-148	
cis-1,2-Dichloroethene	ug/L	ND	50	51.0	102	68-135	
cis-1,3-Dichloropropene	ug/L	ND	50	52.8	106	70-134	
Dibromochloromethane	ug/L	ND	50	52.6	105	67-135	
Dibromomethane	ug/L	ND	50	51.0	102	74-130	
Dichlorodifluoromethane	ug/L	ND	50	57.9	116	44-150	
Dichlorofluoromethane	ug/L	ND	50	47.2	94	67-145	
Ethylbenzene	ug/L	ND	50	53.8	108	66-133	
Hexachloro-1,3-butadiene	ug/L	ND	25	31.3	125	59-150	
Isopropylbenzene (Cumene)	ug/L	ND	50	58.1	116	71-140	
m&p-Xylene	ug/L	ND	100	109	109	63-130	
Methyl-tert-butyl ether	ug/L	ND	50	49.1	98	62-143	
Methylene Chloride	ug/L	ND	50	45.7	91	69-126	
n-Butylbenzene	ug/L	ND	50	58.4	117	73-140	
n-Propylbenzene	ug/L	ND	50	55.5	111	71-136	
Naphthalene	ug/L	ND	50	58.4	117	55-147	
o-Xylene	ug/L	ND	50	56.6	113	66-132	
p-Isopropyltoluene	ug/L	ND	50	59.2	118	69-138	
sec-Butylbenzene	ug/L	ND	50	58.1	116	73-140	
Styrene	ug/L	ND	50	51.5	103	68-138	
tert-Butylbenzene	ug/L	ND	50	59.1	118	70-138	
Tetrachloroethene	ug/L	ND	50	57.3	115	70-138	
Toluene	ug/L	ND	50	51.9	104	65-127	
trans-1,2-Dichloroethene	ug/L	ND	50	51.3	103	67-131	
trans-1,3-Dichloropropene	ug/L	ND	50	51.0	102	64-138	
Trichloroethene	ug/L	ND	50	55.9	112	70-133	
Trichlorofluoromethane	ug/L	ND	50	57.9	116	59-150	
Vinyl chloride	ug/L	ND	50	48.5	97	59-150	
Xylene (Total)	ug/L	ND	150	166	111	65-130	
1,2-Dichloroethane-d4 (S)	%				88	75-131	
4-Bromofluorobenzene (S)	%				94	75-125	
Dibromofluoromethane (S)	%				90	75-130	
Toluene-d8 (S)	%				95	75-125	

SAMPLE DUPLICATE: 911419

Parameter	Units	10145622001 Result	Dup Result	RPD	Max RPD	Qualifiers
1,1,1,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,1-Trichloroethane	ug/L	ND	ND		30	
1,1,2,2-Tetrachloroethane	ug/L	ND	ND		30	
1,1,2-Trichloroethane	ug/L	ND	ND		30	
1,1,2-Trichlorotrifluoroethane	ug/L	ND	ND		30	
1,1-Dichloroethane	ug/L	ND	ND		30	
1,1-Dichloroethene	ug/L	ND	ND		30	
1,1-Dichloropropene	ug/L	ND	ND		30	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

SAMPLE DUPLICATE: 911419

Parameter	Units	10145622001 Result	Dup Result	RPD	Max RPD	Qualifiers
1,2,3-Trichlorobenzene	ug/L	ND	ND		30	
1,2,3-Trichloropropane	ug/L	ND	ND		30	
1,2,4-Trichlorobenzene	ug/L	ND	ND		30	
1,2,4-Trimethylbenzene	ug/L	ND	0.52J		30	
1,2-Dibromo-3-chloropropane	ug/L	ND	ND		30	
1,2-Dibromoethane (EDB)	ug/L	ND	ND		30	
1,2-Dichlorobenzene	ug/L	ND	ND		30	
1,2-Dichloroethane	ug/L	ND	ND		30	
1,2-Dichloropropane	ug/L	ND	ND		30	
1,3,5-Trimethylbenzene	ug/L	ND	ND		30	
1,3-Dichlorobenzene	ug/L	ND	ND		30	
1,3-Dichloropropane	ug/L	ND	ND		30	
1,4-Dichlorobenzene	ug/L	ND	ND		30	
2,2-Dichloropropane	ug/L	ND	ND		30	
2-Butanone (MEK)	ug/L	4.9	5.2	5	30	
2-Chlorotoluene	ug/L	ND	ND		30	
4-Chlorotoluene	ug/L	ND	ND		30	
4-Methyl-2-pentanone (MIBK)	ug/L	ND	ND		30	
Acetone	ug/L	128	127	.7	30	
Benzene	ug/L	ND	ND		30	
Bromobenzene	ug/L	ND	ND		30	
Bromochloromethane	ug/L	ND	ND		30	
Bromodichloromethane	ug/L	ND	ND		30	
Bromoform	ug/L	ND	ND		30	
Bromomethane	ug/L	ND	ND		30	
Carbon tetrachloride	ug/L	ND	ND		30	
Chlorobenzene	ug/L	ND	ND		30	
Chloroethane	ug/L	ND	ND		30	
Chloroform	ug/L	ND	ND		30	
Chloromethane	ug/L	ND	ND		30	
cis-1,2-Dichloroethene	ug/L	ND	ND		30	
cis-1,3-Dichloropropene	ug/L	ND	ND		30	
Dibromochloromethane	ug/L	ND	ND		30	
Dibromomethane	ug/L	ND	ND		30	
Dichlorodifluoromethane	ug/L	ND	ND		30	
Dichlorofluoromethane	ug/L	ND	ND		30	
Ethylbenzene	ug/L	ND	ND		30	
Hexachloro-1,3-butadiene	ug/L	ND	ND		30	
Isopropylbenzene (Cumene)	ug/L	ND	ND		30	
m&p-Xylene	ug/L	ND	ND		30	
Methyl-tert-butyl ether	ug/L	ND	ND		30	
Methylene Chloride	ug/L	ND	ND		30	
n-Butylbenzene	ug/L	ND	ND		30	
n-Propylbenzene	ug/L	ND	ND		30	
Naphthalene	ug/L	6.2	6.2	.7	30	
o-Xylene	ug/L	ND	ND		30	
p-Isopropyltoluene	ug/L	ND	ND		30	
sec-Butylbenzene	ug/L	ND	ND		30	

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QUALITY CONTROL DATA

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

SAMPLE DUPLICATE: 911419

Parameter	Units	10145622001 Result	Dup Result	RPD	Max RPD	Qualifiers
Styrene	ug/L	ND	ND		30	
tert-Butylbenzene	ug/L	ND	ND		30	
Tetrachloroethene	ug/L	ND	ND		30	
Toluene	ug/L	ND	0.89J		30	
trans-1,2-Dichloroethene	ug/L	ND	ND		30	
trans-1,3-Dichloropropene	ug/L	ND	ND		30	
Trichloroethene	ug/L	ND	ND		30	
Trichlorofluoromethane	ug/L	ND	ND		30	
Vinyl chloride	ug/L	ND	ND		30	
Xylene (Total)	ug/L	ND	ND		30	
1,2-Dichloroethane-d4 (S)	%	102	99	4		
4-Bromofluorobenzene (S)	%	92	92	.4		
Dibromofluoromethane (S)	%	100	101	.9		
Toluene-d8 (S)	%	91	92	1		

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QUALIFIERS

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is NELAP accredited. Contact your Pace PM for the current list of accredited analytes.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 60147072-210 BNSF-Somers
Pace Project No.: 10145476

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10145476001	**S-10-1 S**	EPA 8260	MSV/16042		
10145476002	**S-10-2 S**	EPA 8260	MSV/16064		
10145476003	**TRIP BLANK**	EPA 8260	MSV/16043		

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

1311998

Section A Required Client Information:

Company: Aecom
Address: 207 N. Broadway Ste 315, Billings, MT 59101
Email To: Shelly.Yang@aecom.com
Phone: 406-896-4582 Fax: 406-657-7485
Requested Due Date/TAT:

Section B Required Project Information:

Report To: Shelly Yang
Copy To:
Purchase Order No.: TT9101-K03
Project Name: DNST-Somers
Project Number: 60147072-210

Section C Invoice Information:

Attention: Dave Smith BNSF
Company Name: 825 Great Northern Blvd Ste 105
Address: Helena, MT 59601
Pace Quote Reference:
Pace Project Manager: Denise Jensen
Pace Profile #: 21538

REGULATORY AGENCY: ☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER ☐ UST ☐ RCRA ☐ OTHER

Site Location STATE:

Section D Required Client Information

Matrix Codes (MATRIX / CODE): Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	VOC 8260	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	S-10-1 S	W	G	12/15	1130				3				X						X		001
2	S-10-2 S	W	G	12/15	1057				3				X						X		002
3	Trip Blank								1										X		003
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

VOM 12/16/10

10145476

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Nancy Gilliland	12/15/10	1500	FedEx 8713 0295 1370		1500
	AECOM					
	FedEx	12/16/10	1020	Jeff Brown / Pace	12/16/10	1020

SAMPLE CONDITIONS	Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	2.8	Y	Y	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Nancy Gilliland

SIGNATURE of SAMPLER: Nancy Gilliland

DATE Signed (MM/DD/YY): 12/15/10

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

Sample Condition Upon Receipt

Pace Analytical

Client Name: Aecom Project # 10145416

Courier: ☒ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 871302991370

[redacted]

Custody Seal on Cooler/Box Present: ☒ yes ☐ no Seals intact: ☒ yes ☐ no

Packing Material: ☒ Bubble Wrap ☒ Bubble Bags ☐ None ☐ Other _____ Temp Blank: Yes X No ____

Thermometer Used 13883045 Type of Ice: (Wet) Blue None ☒ Samples on ice, cooling process has begun

Cooler Temperature 2.8 Biological Tissue is Frozen: Yes No Date and Initials of person examining contents: JG 12/16/10

Temp should be above freezing to 6°C Comments:

Chain of Custody Present:	☒Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☒Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☒Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☒Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☒Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☒No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☒No ☐N/A	7.
Sufficient Volume:	☒Yes ☐No ☐N/A	8.
Correct Containers Used:	☒Yes ☐No ☐N/A	9.
-Pace Containers Used:	☒Yes ☐No ☐N/A	
Containers Intact:	☒Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☒N/A	11.
Sample Labels match COC:	☒Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: Water		
All containers needing acid/base preservation have been checked. Noncompliance are noted in 13.	☐Yes ☐No ☒N/A	13. ☐ HNO3 ☐ H2SO4 ☐ NaOH ☐ HCl Samp #
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☒N/A	
Exceptions: VOA, Coliform, TOC, Oil and Grease, WI-DRO (water)	☒Yes ☐No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☒N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☒No ☐N/A	15.
Trip Blank Present:	☒Yes ☐No ☐N/A	16.
Trip Blank Custody Seals Present	☒Yes ☐No ☐N/A	
Pace Trip Blank Lot # (if purchased): 111610-1		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: 12/16/10

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Appendix B

Agency Building Surveys

INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
This form must be completed for each residence involved in indoor air testing.

Preparer's Name _____Roger Hoogerheide_____

Date/Time Prepared _____12/13/10 11:00 – 12:00__

Preparer's Affiliation Phone No. _____(406) 457-5031_____

Purpose of Investigation
Discuss upcoming indoor air and crawl space air monitoring with occupants and property owners and collect pre-assessment information for this upcoming sampling event scheduled for early to mid-January.

1. OCCUPANT:

Interviewed: Y / N

Last Name: __Ortiz_____

First Name: ____Richard_____

Address: ____512 Somers Road_____

Home Phone: __(406) 857-3297_____

Office Phone: _____

Number of Occupants/persons at this location ___1____ Age of Occupants_____69_____

Has been in the home since 1990 and rented 544 Somers for three years prior

2. OWNER OR LANDLORD: (Check if same as occupant)

Interviewed: Y / N

Last Name: _____

First Name: _____

Address: _____

Home Phone: _____

Office Phone: _____

3. BUILDING CHARACTERISTICS

Residential is (Circle appropriate response)

Ranch	2-family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log home	Other

Other characteristics:

Number of Floors 1 Building Age don't know but heard anectdotally that buildings were moved off hill in the 1940s to house workers at tie treating plant.

Area of Building in square feet didn't know but has same floor plan as others which is assumed to be 30 x 25 feet

Is the building insulated? Y / N

New windows, new siding

How sealed is the building? Sealed / Average / Not Sealed

General description of building construction materials (note if ties from treating plant were used in construction)

wood

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other
c. Basement floor:	concrete	dirt	stone	other
d. Basement floor:	uncovered	covered	covered with	
e. Concrete floor:	unsealed	sealed	sealed with	
f. Foundation walls:	poured	block	stone	other wood
g. Foundation walls:	unsealed	sealed	sealed with	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	

j. Sump present? Y / N

k. Water in sump? Y / N not applicable

Basement/Lowest level depth below grade: ____44 inches to shelf levels and 80 inches at bottom. About 40 inches in access from outside

Identify all potential soil gas entry points and their approximate size (e.g., cracks, voids, pipes, utility ports, sumps, drain holes, etc.). Include these points on the building diagram.

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply - - note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other

Specify the location ___furnace located in crawlspace accessed from outside_____

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: __gas_____
Include these points on the floor plan diagram

Air conditioning: Central Air Window units Open Windows None
Include these points on the floor plan diagram

Are there air distribution ducts present? Y / N

Furnace distribution ducts
Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram

Specify the location _____

Is there a whole house fan? yes / no _____
Include these points on the floor plan diagram

What is the rated size of the fan? _____

Estimate the average time doors and windows are open to allow fresh outside air into the building. Note rooms that frequently have open windows or doors.

Infrequently during summer months only

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level General use of Each Floor (e.g. family room, bedroom, laundry, workshop, storage)

Basement

1st Floor

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. **Is there an attached garage** Y / N

b. **Does the garage have a separate heating unit** Y / N NA

c. **Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car)** Y / N NA
Please specify

d. Has the building ever had a fire? Y / N When?

e. **Is a kerosene or unvented gas space heater present?** Y / N Where?

f. Is there a kitchen exhaust fan? Y / N Where is it vented? _____

g. Is the stove gas or electric? _____gas_____ **Is the oven gas or electric?** ____gas_____

h. Is there an automatic dishwasher? Y / N

i. Is smoking allowed in the building? Y / N
If yes, how frequently?

j. Has the house ever been fumigated or sprayed for pests?
If yes, give date, type and location of treatment.

No

k. **Is there a workshop or hobby/craft area?** Y / N Where & Type?

l. **Have cleaning products been used recently?** Y / N When & Type?

See photos

m. **Have cosmetic products been used recently?** Y / N When & Type?

n. **Has painting/staining been done in the last 6 months?** Y / N Where & When? _____

o. **Is there new carpet, drapes or other textiles?** Y / N Where & When? _____

p. **Have air fresheners been used recently?** Y / N When & Type? ___Has plug in type but don't know brand name. Candle is lit in home_

q. **Is there a bathroom exhaust fan?** Y / N If yes, where vented?_____

r. **Is there a clothes dryer?** Y / N **If yes, is it vented outside?** Y / N

s. **Has there been a pesticide application?** Y / N When & Type?_____

t. **Are there odors in the building?** Y / N

If yes, please describe:

An inventory of all products used or stored in the home should be performed. Any products that contain volatile organic compounds or chemicals similar to the target compounds should be listed. The attached product inventory form should be used for this purpose.

See photos

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist)

Resident is retired for past 18 months but used to work in a tannery where acids and solvents were used as part of the work

If yes, are their clothes washed at work? Y / N

Do any of the occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No

Yes, use dry-cleaning infrequently (monthly or less) Unknown

Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N
Include these points on the floor plan diagram

Date of Installation:

Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply: Public Water Drilled Well Driven Well Dug Well Other:

If public water supply is the water treated and how is it treated?

Sewage Disposal: Public Sewer Septic Tank Leach Field Dry Well Other:

Distance from home to septic system _____ **Type of septic tank additives** _____

10. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution/ventilation sources. If the building does not have a basement, please note.

Basement:

First floor

11. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s).

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

HOUSEHOLD PRODUCTS INVENTORY FORM

Product Description (commercial name, dispenser type, container size, manufacturer, etc.)

Comments:

INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
This form must be completed for each residence involved in indoor air testing.

Preparer's Name _____Roger Hoogerheide_____

Date/Time Prepared _____12/12/10_____

Preparer's Affiliation Phone No. _____(406) 457-5031_____

Purpose of Investigation
Discuss upcoming indoor air and crawl space air monitoring with occupants and property owners and collect pre-assessment information for this upcoming sampling event scheduled for early to mid-January.

1. OCCUPANT:

Interviewed: Y / N

Last Name: _Hamilton_____

First Name: ___Jeremy & Jennifer_____

Address: ____520 Somers Road_____

Home Phone: _____406-393-2079_____

Office Phone: _____

Number of Occupants/persons at this location ___3____ Age of Occupants__31, 25, 4____

In January, it will be third year of renting the home.

2. OWNER OR LANDLORD: (Check if same as occupant)

Interviewed: Y / N

Last Name: __Abel_____

First Name: ___Tom and Shari_____

Address: _____

Home Phone: ___(406) 752-7665_____

Office Phone: _____

3. BUILDING CHARACTERISTICS

Residential is (Circle appropriate response)

Ranch	2-family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log home	Other

Other characteristics:

Number of Floors 1 Building Age see writeup for 544 Somers

Area of Building in square feet 30 x 25

Is the building insulated? Y / N

How sealed is the building? Sealed / Average / Not Sealed

General description of building construction materials (note if ties from treating plant were used in construction)

Wood. Property owner noted that creosote ties were used for the foundation.

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other
c. Basement floor:	concrete	dirt	stone	other
d. Basement floor:	uncovered	covered	covered with	
e. Concrete floor:	unsealed	sealed	sealed with	
f. Foundation walls:	poured	block	stone	other wood
g. Foundation walls:	unsealed	sealed	sealed with	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	

j. Sump present? Y / N

k. Water in sump? Y / N not applicable

Basement/Lowest level depth below grade: _____5_____ (feet)

Identify all potential soil gas entry points and their approximate size (e.g., cracks, voids, pipes, utility ports, sumps, drain holes, etc.). Include these points on the building diagram.

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply - - note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other forced air

Have electric fireplace as well as a portable electric heater

Specify the location _____

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: ____gas_____
Include these points on the floor plan diagram

Air conditioning: Central Air Window units Open Windows None
Include these points on the floor plan diagram

Are there air distribution ducts present? Y / N

Probably but not noted during assessment

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram

Specify the location _____

Is there a whole house fan? yes / no _____
Include these points on the floor plan diagram

What is the rated size of the fan? _____

Estimate the average time doors and windows are open to allow fresh outside air into the building. Note rooms that frequently have open windows or doors.

Windows are nailed and painted shut and cannot be opened. Back door is used to provides fresh air

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level General use of Each Floor (e.g. family room, bedroom, laundry, workshop, storage)

Basement

1st Floor

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. **Is there an attached garage** Y / N

b. **Does the garage have a separate heating unit** Y / N NA

c. **Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car)** Y / N Please specify NA

d. Has the building ever had a fire? Y / N When?

e. **Is a kerosene or unvented gas space heater present?** Y / N Where?

f. Is there a kitchen exhaust fan? Y / N Where is it vented? _____

g. Is the stove gas or electric? ____electric_____ **Is the oven gas or electric?** ___electric_____

h. Is there an automatic dishwasher? Y / N

i. Is smoking allowed in the building? Y / N
If yes, how frequently?

Jeremy and Jennifer smoke but always smoke outside because they have a 4 year old living in the house

j. **Has the house ever been fumigated or sprayed for pests? NO**
If yes, give date, type and location of treatment.

k. **Is there a workshop or hobby/craft area?** Y / N Where & Type?

l. **Have cleaning products been used recently?** Y / N When & Type?

See photos

m. **Have cosmetic products been used recently?** Y / N When & Type?

n. **Has painting/staining been done in the last 6 months?** Y / N Where & When? _____

o. **Is there new carpet, drapes or other textiles?** Y / N Where & When? _____

p. **Have air fresheners been used recently?** Y / N When & Type? _____

Candles and febreeze

q. **Is there a bathroom exhaust fan?** Y / N If yes, where vented?_____

r. **Is there a clothes dryer?** Y / N **If yes, is it vented outside?** Y / N

s. **Has there been a pesticide application?** Y / N When & Type?_____

t. **Are there odors in the building?** Y / N

Musty smell in home and smell when the electric fireplace is truned on but we assume these are not a result of vapor intrusion.

If yes, please describe:

An inventory of all products used or stored in the home should be performed. Any products that contain volatile organic compounds or chemicals similar to the target compounds should be listed. The attached product inventory form should be used for this purpose.

See photos

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist)

If yes, what types of solvents are used?

If yes, are their clothes washed at work? Y / N

Do any of the occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No

Yes, use dry-cleaning infrequently (monthly or less) Unknown

Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N
Include these points on the floor plan diagram

Date of Installation:

Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply: Public Water Drilled Well Driven Well Dug Well Other:

If public water supply is the water treated and how is it treated?

Sewage Disposal: Public Sewer Septic Tank Leach Field Dry Well Other:

Distance from home to septic system _____ **Type of septic tank additives** _____

10. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution/ventilation sources. If the building does not have a basement, please note.

Basement:

First floor

11. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s).

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

HOUSEHOLD PRODUCTS INVENTORY FORM

Product Description (commercial name, dispenser type, container size, manufacturer, etc.)

Comments:

INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
This form must be completed for each residence involved in indoor air testing.

Preparer's Name _____Roger Hoogerheide_____

Date/Time Prepared _____12/13/10 12:00 -12:30 12/21/10 3:00 – 3:15

Preparer's Affiliation Phone No. _____(406) 457-5031_____

Purpose of Investigation
Discuss upcoming indoor air and crawl space air monitoring with occupants and property owners and collect pre-assessment information for this upcoming sampling event scheduled for early to mid-January.

1. OCCUPANT:

Interviewed: Y / N

Last Name: __Carney_____

First Name: ___Lonnie_____

Address: ____528 Somers Road_____

Home Phone: ____(406) 752-7665_____
Will be in California taking care of her brother until March

Office Phone: _____

Number of Occupants/persons at this location ___1_____ Age of Occupants_____62

Been living in home for past year

2. OWNER OR LANDLORD: (Check if same as occupant)

Interviewed: Y / N

Last Name: __Abel_____

First Name: ___Tom and Shari_____

Address: _____

Home Phone: ___(406) 752-7665_____

Office Phone: _____

3. BUILDING CHARACTERISTICS

Residential is (Circle appropriate response)

Ranch	2-family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log home	Other

Other characteristics:

Number of Floors 1 Building Age Etsimates home was built in the 1940s.

Area of Building in square feet 30 x 25

Is the building insulated? Y / N

Insulation is up to code in the ceilings (blown into roof) but not the walls. Placed insulation around perimeter of the crawl space.

How sealed is the building? Sealed / Average / Not Sealed

General description of building construction materials (note if ties from treating plant were used in construction)

Wood.

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other
c. Basement floor:	concrete	dirt	stone	other
d. Basement floor:	uncovered	covered	covered with	

Owner stated that a vapor barrier was placed on fllor but no barrier was noted during the assessment.

e. Concrete floor:	unsealed	sealed	sealed with	
f. Foundation walls:	poured	block	stone	other wood
g. Foundation walls:	unsealed	sealed	sealed with	

Not known

h. The basement is: wet damp dry moldy

i. The basement is: finished unfinished partially finished

j. Sump present? Y / N

k. Water in sump? Y / N not applicable

Basement/Lowest level depth below grade: _____3_____ (feet)

Identify all potential soil gas entry points and their approximate size (e.g., cracks, voids, pipes, utility ports, sumps, drain holes, etc.). Include these points on the building diagram.

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply - - note primary)

Hot air circulation Heat pump Hot water baseboard

Space heaters Stream radiation Radiant floor

Electric baseboard Wood stove Outdoor wood boiler Other

Specify the location _____See photos_____

The primary type of fuel used is:

Natural Gas Fuel Oil Kerosene

Electric Propane Solar

Wood Coal

Domestic hot water tank fueled by: ___electric_____
Include these points on the floor plan diagram

Air conditioning: Central Air Window units Open Windows None
Include these points on the floor plan diagram

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram

Specify the location _____

Is there a whole house fan? yes / no _____
Include these points on the floor plan diagram

What is the rated size of the fan? _____

Estimate the average time doors and windows are open to allow fresh outside air into the building. Note rooms that frequently have open windows or doors.

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level General use of Each Floor (e.g. family room, bedroom, laundry, workshop, storage)

Basement

1st Floor

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. **Is there an attached garage** Y / N

b. **Does the garage have a separate heating unit** Y / N NA

c. **Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car)** Y / N NA Please specify

d. Has the building ever had a fire? Y / N When?

e. **Is a kerosene or unvented gas space heater present?** Y / N Where?

f. Is there a kitchen exhaust fan? Y / N Where is it vented? _____

g. Is the stove gas or electric? _____ **Is the oven gas or electric?** _____

h. Is there an automatic dishwasher? Y / N

i. Is smoking allowed in the building? Y / N
If yes, how frequently?

j. Has the house ever been fumigated or sprayed for pests?
If yes, give date, type and **l**ocation of treatment.

k. **Is there a workshop or hobby/craft area?** Y / N Where & Type?

l. **Have cleaning products been used recently?** Y / N When & Type? See photos

m. **Have cosmetic products been used recently?** Y / N When & Type? May use them once every other months (i.e., nail polish remover)

n. **Has painting/staining been done in the last 6 months?** Y / N Where & When? _____

o. **Is there new carpet, drapes or other textiles?** Y / N Where & When? _Bought an area rug within the last three months?_____

p. **Have air fresheners been used recently?** Y / N When & Type? ____Look by the dog bed near the front door____

q. **Is there a bathroom exhaust fan?** Y / N If yes, where vented?_____

r. **Is there a clothes dryer?** Y / N **If yes, is it vented outside?** Y / N See photo

s. **Has there been a pesticide application?** Y / N When & Type?_____

t. **Are there odors in the building?** Y / N

If yes, please describe:

An inventory of all products used or stored in the home should be performed. Any products that contain volatile organic compounds or chemicals similar to the target compounds should be listed. The attached product inventory form should be used for this purpose.

See photos

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist)

If yes, what types of solvents are used?

If yes, are their clothes washed at work? Y / N

Do any of the occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No

Yes, use dry-cleaning infrequently (monthly or less) Unknown

Used dry cleaning once in the past year to have her wool coat dry cleaned.

Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N
Include these points on the floor plan diagram

Date of Installation:

Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply: Public Water Drilled Well Driven Well Dug Well Other:

If public water supply is the water treated and how is it treated?

Sewage Disposal: Public Sewer Septic Tank Leach Field Dry Well Other:

Distance from home to septic system _____ **Type of septic tank additives** _____

10. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution/ventilation sources. If the building does not have a basement, please note.

Basement:

First floor

11. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s).

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

HOUSEHOLD PRODUCTS INVENTORY FORM

Product Description (commercial name, dispenser type, container size, manufacturer, etc.)

Comments:

Appendix C

Laboratory Methods TO-15 and TO-17

COLUMBIA ANALYTICAL SERVICES, INC – SIMI VALLEY, CALIFORNIA

Summary of Calibration and Internal Quality Control Procedures for U.S. EPA Method TO-15			
Quality Control Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
BFB Tuning Verification	Once every 24-hours or analytical batch	Ion abundance criteria as described in Table 3 of Method TO-15	1) Repeat BFB analysis 2) Retune instrument
Initial Calibration (ICAL) – minimum of five levels	Initially or if continuing calibration no longer meets criteria	1) <30% RSD with 2 exceptions up to 40% [AFCEE: only ≤30% RSD] 2) Area response at each calibration level within 40% of IS mean area response over the ICAL range. 3) Retention time for each IS within 20s of the mean retention time over the ICAL range.	1) May repeat 1 point (if 5 levels) or 2 points (if 6 levels) 2) Inspect the system for problems and perform required maintenance 3) Repeat initial calibration Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Initial Calibration Verification (ICV)	Following every ICAL	Percent difference of +/-30%	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Problem must be corrected. Samples may not be analyzed until there is a valid ICV.
Continuing Calibration Verification (CCV)	Once every 24 hours, if an ICAL has not been performed (within the last 24 hours).	Percent difference of +/-30% Note: If CCV is biased high and analyte is ND (not detected) results are acceptable. It will be noted in case narrative	1) Reanalyze CCV 2) Identify and correct problem; re-analyze or if necessary qualify the data. 3) Repeat initial calibration if CCV corrective action is unsuccessful.
Internal Standards (IS)	All samples, duplicates, blanks and standards	1) RT must be <20 sec from most recent valid calibration (ICAL midpoint or CCV) 2) Area response +/-40% of IS area response of most recent valid calibration (ICAL midpoint or CCV)	1) Identify and correct the problem 2) Reanalyze the sample unless obvious matrix interference exists. 3) Problem persists, qualify data.
Surrogate Standards	All samples, duplicates, blanks and standards	70-130% recovery [AFCEE: 60-140%]	1) Identify and correct the problem 2) Reanalyze the sample unless obvious matrix interference exists 3) Problem persists, qualify data.
Laboratory Method Blank (MB)	Once every analytical batch of 20 or fewer samples	No analyte detected equal to or above the method reporting limit (MRL) [DoD: No analytes > ½ MRL; common lab contaminants none detected > MRL]	1) Reanalyze blank 2) Identify and correct problem 3) Reanalyze blank and affected samples 4) Qualify data

COLUMBIA ANALYTICAL SERVICES, INC – SIMI VALLEY, CALIFORNIA

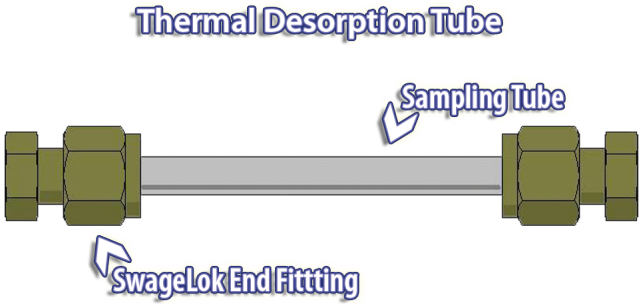
Summary of Calibration and Internal Quality Control Procedures for U.S. EPA Method TO-15			
Quality Control Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Laboratory Control Sample (LCS)	Once every analytical batch of 20 or fewer samples	Percent recovery (%R) within laboratory generated limits [AFCEE, AZ: 70-130% recovery]	1) Reanalyze 2) Identify and correct the problem 3) Qualify data *DoD projects require corrective action for all exceedances.
Laboratory Duplicate (LD)	Once every analytical batch of 20 or fewer samples	Relative percent difference (RPD) within +/-25% for positive hits	1) Analyze third aliquot 2) Flag data if third aliquot unacceptable
Holding Time (HT)	N/A	SUMMA Canisters - 30 days [EPA Region 9 - 14 days] Tedlar Bags - 72 hours [not included in AFCEE Manual]	Contact client and qualify data
Method Reporting Limit (MRL)	DoD: Quarterly LOQ/MRL Verification Required	At or above the low standard of the current initial calibration AFCEE: Minimum 2x method detection limit	N/A
Method Detection Limit (MDL) with Limit of Detection Verification	Initially and once per 12 month period DoD: Quarterly LOD Verification Required	Limit of Detection Verification - Response with a minimum signal to noise ratio of 3:1	N/A
Report results between MDL and MRL	N/A	Upon request [Required for AFCEE and DoD projects; verify with Client QAPP]	Qualify results as estimated

AFCEE – Air Force Center for Environmental Excellence, Appendix C: QAPP, Final Version 4.0.02, May 2006.
DoD – Department of Defense Quality Systems Manual for Environmental Laboratories, Final Version 4.1, April 2009.
AZ – Requirements for State of Arizona compliance samples.
Summary complies with Method TO-15 and 2003 NELAC Standard.

Volatile Organic Compounds by Thermal Desorption

EPA Method TO-17 is used for the sampling of volatile organic compounds in ambient air using a solid sorbent packed into a tube. The compounds are introduced into a gas chromatograph via thermal desorption, and are then identified and quantified by mass spectrometry. Refer to the method for further details *(http://www.epa.gov/ttn/amtic/files/ambient/airtox/to-17ar.pdf)*.

Equipment



1. Air sampling pump capable of sampling between 20 ml/min to 100 ml/min with the sampling medium in-line.
2. Airflow calibrator (ex., bubble meter, Bios DryCal flow meter, etc.)
3. Thermal desorption tube – preconditioned from laboratory. Tubes may be stored at room temperature prior to use. After sampling, tubes must be stored cold, and must be shipped cold to the laboratory.
4. Field blank - A field blank should be included in the sampling event. Field blanks should be subjected to exactly the same handling as the samples (open, seal, and transport), except that no air is drawn through them.
5. Wrenches – Two adjustable wrenches

Equipment Ambient and Indoor Sampling Guidelines

Sampling Flow Rate - 100 mL/min

Sampling Time - approximately 40 minutes

Air Volume - 4 L. ***Do Not Exceed Maximum Volume.***

For other sources or applications, please consult with lab to determine optimal flow rates and sampling interval.

Prior to sampling, allow the tubes to equilibrate to ambient temperature in the packaging in which they arrived from the lab.

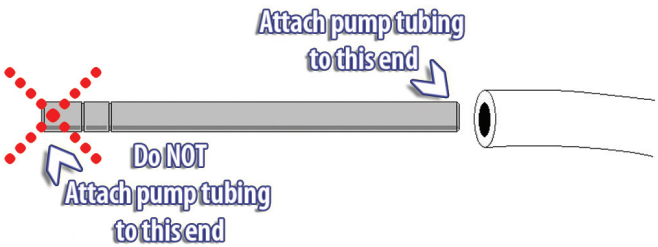
Columbia Analytical Services™

If sampling pump is not received pre-calibrated

- Using an airflow calibrator, calibrate pump with representative media inline, following directions provided from vendor. Use the calibration tube provided from the lab. **Do not use a sample tube.**

If sampling pump is received pre-calibrated

1. Remove the sample tubes from the shipping container.
2. Record the serial number for the tube. DO NOT write/scratch any additional information or put labels or tape on the tube.
3. Using the adjustable wrenches, remove the two Swagelok fittings from the ends of the tube.
4. Locate the end of the sampling tube with the two grooves. This is the INLET, the end through which the sample air will be drawn.
5. Place the other end of the tube into the tubing attached to the sampling pump.
6. Set up the sampling tube in the sampling location.
7. Turn the pump on and note the starting time and date.
8. If collecting a field blank, uncap the field blank tube to expose it to field conditions, and then immediately reseal the tube. Place the field blank tube back in the storage container.



9. Sample at a known flow rate for the recommended period of time, approximately 40 minutes. **Do not exceed maximum recommended volume of 4 L.**
10. At the end of the sampling period, retrieve the sampler, turn the pump off and record the final sampling time.
11. Install the Swagelok fitting on each end of the tube. Tighten firmly with wrenches, no more than 1/4 turn past finger tight. **Do not overtighten the fittings.**
12. Place the tubes in a clean, plastic tubes (provided), then put the tubes in a ziplock bag.

Equipment Storage and Shipping Instructions

1. Carefully pack sample tubes and field blank in a cooler containing FROZEN blue ice packs.Be sure to include all pertinent information (e.g. sample identification, sampling date, time and sample volume, etc.,) on the Chain of Custody form that is submitted with the samples.
2. Ship the cooler to the laboratory using an overnight courier service (FedEx, UPS, etc.). If unable to ship the samples back to the laboratory that day, store the samples in sealed containers at 4° C.

STANDARD OPERATING PROCEDURE

for

Determination of Volatile Organic Compounds in Ambient Air Using Active or Passive Sampling Onto Sorbent Tubes

SOP Code: VOA-TO17

Revision: 3

Effective Date: 7-7-10

Approved by: _____ Chris Parnell – Team Leader (Volatile GC MS) Date 6/30/10

_____ Chaney Humphrey – Quality Assurance Program Manager Date 6/30/10

_____ Kelly Horiuchi – Laboratory Manager Date 06/30/10

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2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Annual review of this SOP has been performed and the SOP still reflects current practice.

Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL

NUMBER: _____

INITIALS: _____ DATE: _____

Standard Operating Procedure for Determination of Volatile Organic Compounds in Ambient Air Using Active or Passive Sampling Onto Sorbent Tubes

1.0 SCOPE AND APPLICATION

This procedure is based on and incorporates the requirements detailed in EPA Compendium Method TO-17 and describes a sorbent tube/thermal desorption/gas chromatography-based monitoring method for volatile organic compounds (VOCs) in ambient air at low parts per billion (ppbv) to high parts per million (ppmv) concentration levels. This method is used to quantify a wide range of volatile organic compounds (VOCs) over a wide volatility range.

The target compound list is the same as listed in Compendium Method TO-15. However, only a portion of these compounds has been monitored by the use of solid adsorbents. Therefore, this method provides performance criteria to demonstrate acceptable performance of the method for monitoring a given compound or set of compounds. Table 2 lists compounds that can be determined by this procedure along with their method reporting limits (MRLs). The reported MRL may be adjusted higher; however, the capability of achieving lower MRLs for specific project requirements must be thoroughly demonstrated and documented. Additional compounds may be analyzed according to this procedure as described in the referenced methods as long as the requirements of this document are adhered to; however, if a compound is not listed in the method, it must be reported as a modification.

Note 1: A number of compounds selected as target analytes are not included in the TO-17 Method; therefore the Florida Department of Health instructed the laboratory to reference this Standard Operating Procedure (SOP) when reporting results for these analytes. However, the FL DOH did not approve of the SOP Code for this purpose, so CASS TO-17/GC-MS is to be referenced. Therefore, VOA-TO17 is otherwise known as CASS TO-17/GC-MS and shall be referenced, where necessary (on quantitation reports).

2.0 METHOD SUMMARY

The monitoring procedure involves pulling a volume of air through a sorbent packing to collect VOCs followed by a thermal desorption GC/MS analytical procedure. The selection of a sorbent or sorbent mix depends on the target compound list, data quality objectives and sampling environment.

The analytical portion of the method is the same as Compendium Method TO-15 and involves using a high-resolution gas chromatograph (GC) coupled to a mass spectrometer (MS). The GC/MS utilizes a linear quadrupole system, which allows for it to be operated by either continuously scanning a wide range of mass to charge ratios (SCAN mode) or by selective ion monitoring (SIM mode) which consists of monitoring a small number of ions from a specified compound list.

The sorbent tube is purged with dry, inert gas before analysis to remove any water vapor and air. The sorbent tube is then thermally desorbed (in reverse direction of sampling) onto a low-volume secondary trap where the analytes are refocused. The secondary trap is then rapidly thermally desorbed and the analytes directly transferred onto the head of the GC capillary column. The target analytes are separated by the column using a ramped oven temperature program and detected and measured by mass spectrometry.

Mass spectra for individual peaks in the total ion chromatogram are examined with respect to the fragmentation pattern of ions corresponding to various VOCs including the intensity of primary and secondary ions. The fragmentation pattern is compared with standards and stored spectra taken under similar conditions, in order to identify the compound. For any given compound, the intensity of the primary fragment is compared with the system response of the primary fragment for known amounts of the compound to establish the concentration that exists in the sample.

3.0 DEFINITIONS

3.1 Sorbent Tube (also referred to as "tube" and "sample tube")

Stainless steel, glass lined (or fused silica lined) stainless steel tube, typically ¼ inch O.D. and 3.5 inches long (Perkin Elmer type), with the central portion packed with greater than 200mg of solid adsorbent material, depending on density and packing bed length. The tube is used to concentrate VOCs from air.

3.2 Thermal Desorption

The use of heat and flow of inert (carrier) gas to extract volatiles from a solid or liquid matrix directly into the carrier gas and transfer them to downstream system elements such as the analytical column.

3.3 MS-SCAN

Mass spectrometric mode of operation in which the gas chromatograph (GC) is coupled to a mass spectrometer (MS) programmed to SCAN all ions repeatedly over a specified mass range.

3.4 MS-SIM

Mass spectrometric mode of operation in which the GC is coupled to an MS that is programmed to scan a selected number of ions repeatedly [i.e., selected ion monitoring (SIM) mode].

3.5 Analytical Sequence

The analytical sequence describes exactly how the field and QC samples in an analytical batch are to be analyzed.

3.6 Neat Stock Standard

A purchased, single component assayed reference material having a stated purity used to prepare working calibration standards.

3.7 Stock Standards Solution

A concentrated solution of one or more target analytes at a known concentration purchased from a reputable, approved commercial vendor. Stock standard solutions are used to prepare working calibration standards.

3.8 Intermediate Calibration Standard

A solution of one or more target analytes at a known concentration prepared either from one or more neat stock standards or from one or more stock standards solutions.

3.9 Working Calibration Standard

A solution of all the target analytes at a known concentration prepared either from one or more intermediate calibration standards and/or from one or more stock standard solutions.

3.10 Calibration or Standard Curve

A calibration or standard curve is a graph that plots the concentration of a compound (or an analyte) versus the instrument response to the compound.

3.11 Initial Calibration Verification (ICV) Standard

A solution prepared in the laboratory containing known concentration(s) of analytes of interest. The solution is prepared from neat stock standards and/or stock standards solutions which are from a different source than the standards used to prepare the working calibration standards.

3.12 Continuing Calibration Verification (CCV) Standard

A working calibration standard which is analyzed at specific intervals in order to verify that the instrument continues to meet the calibration criteria.

3.13 Field Sample

A sample collected and delivered to the laboratory for analysis.

3.14 Manual Integration

This term applies to a data file in which setpoints have been changed and reintegration has occurred under the changed setpoints; baselines have been adjusted; peak integration start and stop "ticks" have been changed; peak area, or peak height, are changed after the time of data collection and data file generation.

3.15 Batch Quality Control (QC)

Batch QC refers to the QC samples that are analyzed in an analytical batch of field samples and includes the Method Blank (MB), Laboratory Control Sample (LCS) and Duplicate (LCSD).

3.16 Internal Standard Calibration

Compares the instrument responses from the target compound in the sample to the responses of specific standards (called internal standards), which are added to the sample or sample preparation prior to analysis. The ratio of the peak area (or height) of the target compound in the sample or sample preparation is compared to a similar ratio derived for each calibration standard.

3.17 May

This action, activity, or procedural step is neither required nor prohibited.

3.18 Must

This action, activity, or procedural step is required.

3.19 Shall

This action, activity, or procedural step is required.

3.20 Should

This action, activity, or procedural step is suggested, but not required.

3.21 SOP

Standard Operating Procedure

3.22 Service Request

A form generated, at the time of sample receipt, which details pertinent information such as client name, address, contact, client and laboratory sample identifications, sampling and receipt dates and times, requested analyses, sample type, sample volume or exposure time, and the service request number (unique number for each submitted job) and serves as an inter-laboratory "custody" form which accompanies all samples throughout the laboratory.

3.23 Cryogen

A refrigerant used to obtain sub-ambient temperatures in the VOC concentrator and/or in front of the analytical column. Liquid nitrogen (cryogen) is used for this purpose and it has a boiling point of –195.8°C.

4.0 INTERFERENCES

4.1 Sorbent Artifacts

Typical artifact levels for ¼ inch O.D. tubes of 3.5" length range from 0.01ng and 0.1ng for carbonaceous sorbent and Tenax respectively. An exception is the presence of benzene from graphitized carbon blacks and carbon molecular sieves, which may be difficult to reduce below 0.5ng per tube. Artifact levels are around 10ng for Chromosorb Century series and other porous polymer sorbents. However, these types of sorbent can still be used for low ppb monitoring if MS detectors are used or if the blank profile of the tube demonstrates that none of the sorbent artifacts interfere analytically with the compounds of interest.

The long-term storage of blank tubes will show levels of artifacts (0.01ng after 1 to 2 months and 0.1ng after 6 months) such as: Carbotrap/pack C, Carbotrap/pack B, Carbosieve SIII multi-bed tubes, and Tenax GR tubes. Artifact levels for porous polymers are higher – for example 5ng for Chromosorb 106 after 1 week.

Benzaldehyde, phenol and acetophenone artifacts are reported to be formed via oxidation of the polymer Tenax when sampling high concentration (100-500ppb) ozone atmospheres.

Stringent tube conditioning and careful tube capping and storage procedures are essential for minimizing artifacts. System and sorbent tube conditioning must be carried out using more stringent conditions of temperature, gas flow and time than those required for sample analysis. A reasonable objective is to reduce artifacts to 10% or less of individual analyte masses retained during sampling.

4.2 Water

The capacity of the analytical instrumentation to accommodate the amount of water vapor collected on tubes is usually the limitation in obtaining successful results, particularly for GC/MSD applications. There are several approaches to reducing water interference during air monitoring using sorbent tubes. The first is to minimize water collection by selecting, where possible, a hydrophobic sorbent for the sample tube. This is possible for compounds ranging in volatility from n-C5. Tenax, Carbopack or one of the other hydrophobic sorbents listed in the TO-17 method (Table 2) should be used. The sampling volumes may also need to be reduced when the relative humidity is above 90%. The thermal desorber should allow for splitting of the sample before and/or after refocusing. Dry purging the sample tube with inert, dry gas prior to desorption is perhaps the most common water management tool. The desorber allows for a variable dry purge time and flowrate before thermal desorption. The tube may be heated while dry purging if the elevated temperature will not cause breakthrough of the target analytes or internal standards. A cold trap packed with multiple sorbents may be used which allows trapping of very volatile compounds at ambient temperatures while allowing most of the water to pass through.

4.3 Analytical System

The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory tube blanks under the same conditions as sample tubes.

4.4 Carbon Dioxide

Excessive levels of carbon dioxide present in a sample may interfere with analysis by freezing up the refocusing trap during initial desorption if using subambient cold trap temperatures. The CO_2 can usually be removed sufficiently by dry purging the sample tube prior to desorption. Ambient levels of CO_2 in sample air will not cause problems.

4.5 Glassware

Interferences caused by contaminants in solvents, reagents, glassware, and other sample processing hardware which results in discrete artifacts and/or elevated baselines in the detector profiles should be minimized. All glassware associated with this method must be scrupulously cleaned to avoid possible contamination. The cleaning shall be performed in accordance with the procedure outlined in the ***SOP for Glassware Cleaning***. The use of high purity water, reagents, and solvents helps to minimize these problems.

4.6 Particulates

It may be necessary to connect a particulate filter (a 2 micron Teflon filter or short clean tube containing a loose plug of clean glass wool) to the sampling end of the tube in areas of extremely high particulate concentrations. Some compounds of interest may, however, be trapped on the Teflon or on the glass wool. Particulates trapped on the sorbent tube have the potential to act as a source or sink for volatiles, and may remain on the tube through several cycles of sampling and desorption. Replacement of the particulate filter is therefore recommended after each usage.

5.0 SAFETY

Each compound, mixture of compounds, standards, and surrogates, as well as samples, should be treated as a potential health hazard. Exposure to these chemicals should be reduced to the lowest level possible through the use of gloves (to minimize absorption through the skin) and hoods (to minimize inhalation). Refer to the laboratory's Environmental, Health and Safety Manual as it makes reference to the safe handling of chemicals, MSDS location, and the laboratory waste management plan for the safe disposal of chemicals and samples.

5.1 Material Safety Data Sheets (MSDS)

The analyst should consult MSDS for compounds being handled in the course of this procedure, and be familiar with proper safety precautions to be followed when handling hazardous chemicals. Care should be taken when handling standard material in a neat or highly concentrated form.

5.2 Liquid Nitrogen

Liquid nitrogen can cause serious tissue damage (frostbite) with only a few seconds of contact. Valves should be opened slowly so leaky fittings can be identified. Neoprene or leather gloves should be worn when turning valves and handling tubing and fittings that have been in contact with the cryogen.

5.3 Protective Clothing

Personal protective clothing (safety glasses, gloves and lab coat) are required when preparing standards and handling standard material in neat form.

5.4 Pressurized Gases

The use of pressurized gases is required for this procedure. Care should be taken when moving cylinders. All gas cylinders must be secured to a wall or an immovable counter with a chain or a cylinder clamp when not in use. The regulator should never remain on

small "D" size cylinders following use. Sources of flammable gases (i.e. pressurized hydrogen) should be clearly labeled.

5.5 Syringes

The proper use of syringes should be part of employee training for this SOP. Care should be taken to avoid personal injury as a result or improper handling techniques.

6.0 SAMPLE COLLECTION, CONTAINERS, PRESERVATION, AND STORAGE

New sampling tubes, even preconditioned purchased tubes, must be thermally conditioned and checked prior to deployment to the field. The most common sorbents and their maximum and suggested conditioning temperatures and flows are listed in Table 2 of Method TO-17. Conditioned tubes must be batch tested (a minimum of one in ten) using the parameters to be used for sample analysis. Tubes must be free of target analytes below the desired reporting limit.

Following the tube conditioning procedure, tubes must be sealed with Swagelok-type fittings and PTFE ferrules and wrapped and placed in an airtight container. Additionally, tubes shall be kept in a refrigerator (organic solvent-free) at <4°C if not to be used within a day (method blank tubes or tubes for field use). Additionally, they must be shipped to the field in a cooler packed with blue ice.

Field samples should be refrigerated at <4°C in a clean environment during storage and analyzed within 30 days of sample collection (within one week for limonene, carene, *bis*-chloromethyl ether and labile sulfur or nitrogen-containing volatiles). Samples taken on tubes containing multiple sorbent beds should be analyzed as soon as possible (within two weeks) after sampling unless it is known in advance that storage will not cause significant sample recovery errors.

7.0 APPARATUS AND EQUIPMENT

7.1 Gas Chromatograph (GC)

An instrument capable of temperature programming, with a column oven that may be cooled to sub-ambient temperature at the start of the gas chromatographic run to result in the resolution of the VOCs.

- Hewlett Packard 5890 Series II Plus
- Agilent 6890 Series
- Agilent 7890 Series
- Shimadzu 2010 Plus GC

7.2 Thermal Desorber

An instrument capable of two-stage thermal desorption, where the sample tube is thermally desorbed onto a refocusing trap, then rapidly transferred to the GC analytical

column. The analytes should be desorbed from the sample tube and refocusing trap in backflush mode, i.e. in the opposite direction of flow during sampling.

The desorber should be capable of leak checking the sample tube and flow path, and of splitting the sample flow both before and after refocusing. It should also be equipped with a gas-loop internal standard addition option that loads an aliquot of the gas-phase internal standard onto the front of the sample tube before desorption.

- Perkin-Elmer TurboMatrix Automated Thermal Desorber
- Markes Unity/Ultra Series 2 Automated Thermal Desorber

7.3 Mass Spectrometer (MS)

A MS capable of scanning from 34 to 350 amu every second or less, using 70 volts (nominal) electron energy in the electron impact ionization mode. The mass spectrometer must be capable of producing a mass spectrum for Bromofluorobenzene (BFB) which meets all of the criteria when 50ng or less of BFB is injected onto the GC/MS system.

Agilent 5973 Network Mass Selective Detector or equivalent
Agilent 5975 Mass Selective Detector or equivalent
Shimadzu QP2010 Plus Mass Spectrometer

7.3.1 Ionization Gauge Controller

Granville-Phillips 330 Ionization Gauge Controller: 330001/2/3
Hewlett Packard Ionization Gauge Controller: 59864B

7.4 Analytical Column

Any analytical column capable of separating the compounds of interest may be used. The capillary column should be directly coupled to the source of the mass spectrometer. The following are suggested columns; an alternative column may be used as long as sufficient peak resolution and separation is achieved.

Column: J& W DB-1 MS Fused Silica Capillary Column
60m x 0.25mm ID
1.0 micron film thickness

OR

Restek Rxi-1ms Fused Silica Capillary Column
60m x 0.25mm ID
1.0 micron film thickness

7.5 Data Systems

IBM-compatible PC with Windows 95/98/NT/XP and Hewlett Packard Chemstation software including EnviroQuant with Extracted Ion Current Profile (EICP), National Institute of Standards and Technology (NIST) library or equivalent. The Shimadzu system uses GCMS solution. ver. 2.50 or newer.

7.6 Tube Spiking Apparatus

A device that allows a sorbent tube to be connected to a heated inlet with a septum port and a flow of inert gas. A GC injection port with a glass or fused silica-lined insert works well. A ¼" teflon union with teflon ferrules is used to connect the tube to the port, and a flow of high purity helium or nitrogen is set at 50 – 100 ml/min. The inlet is heated to 50-200C depending on the boiling points of the analytes being spiked.

7.7 Sample Collection Tubes

Perkin-Elmer type stainless steel, glass, or glass-lined stainless steel tubes, 3.5" x 0.25". The tubes are packed with solid sorbent material, typically 60/80 mesh, held in place with stainless steel gauze and/or glass wool plugs. A steel retaining spring is used in the back of the stainless steel tubes. The front end (sampling inlet) is marked by two inscribed rings (stainless steel tubes) or a glass frit (glass tubes).

7.8 Diffusion Caps

Diffusion caps are needed when tubes are used for passive diffusion sampling. The caps are placed on the inlet end of the tube and are held in place by a viton o-ring. The tube is then placed in a fixed location for as long as four weeks, during which VOCs are adsorbed into the sorbent bed by diffusion at a very slow rate. The caps are available with a silicone membrane that reduces water adsorption during the sampling period.

7.9 Gas Collection Devices

- Lab Commerce, Aerosphere Model S6L, 6.0L Summa Passivated Canisters or equivalent. Used for preparing standards.

7.10 Dynamic Dilution System

- Entech Dynamic Diluter Model 4620A
- Toshiba laptop computer Model 2210CDT/6.0 and Software NT460

8.0 STANDARDS, REAGENTS, AND CONSUMABLE MATERIALS

8.1 Reagents

8.1.1 UHP Grade Helium (99.999%)(GC carrier gas and tube-spiking sweep gas)
8.1.2 UHP/Zero Grade Air (TurboMatrix pneumatics gas)
8.1.3 Purge & Trap Grade Methanol
8.1.4 Cryogen - Liquid nitrogen from bulk tank (used to cool preconcentrator traps)

8.2 Standards

Calibration and QC standards are prepared by spiking known amounts of target analytes onto pre-cleaned tubes of the same sorbent as the sample tubes. Standards may be gas-phase or stocks prepared in solvents (usually methanol).

8.2.1 Instrument Performance Check, Internal Standard and Surrogate Spiking Standard
Prepare a standard mixture of p-Bromofluorobenzene (BFB is used as both a tune check and surrogate compound), bromochloromethane, chlorobenzene-d5, and 1,4-difluorobenzene at 50 µg/l each in humidified zero air in a Summa canister. This canister is connected to the thermal desorber Internal Standard Option inlet using a small regulator to reduce the canister outlet pressure to 10psig. Other concentrations may be used depending on the application and the size of the sample loop.

8.2.1.1 An intermediate standard is prepared from neat compounds in a small glass vial by combining equal mass amounts of each neat compound using a microliter syringe.

Step 1: This cocktail is prepared by combining 25mg (25,000 µg) of each neat compound. Take the density of each compound into account to determine the actual amount of each compound to spike into the cocktail by using the following equation.

$$V_s = \frac{A}{d} \qquad \textbf{(Equation 1)}$$

Where:

V_s Actual spike amount (µl)
A Desired amount for each compound (µg)
d Density (µg/µl); refer to Table 3 for the density

Example: Calculate the actual amount of p-bromofluorobenzene to add to the cocktail:

$$V_s = \frac{25000\mu g}{1543\mu g / \mu l} = 16.2\mu l$$

Step 2: The concentration of each compound in the cocktail is determined by the following equation.

$$C = \frac{A}{V} \qquad \textbf{(Equation 2)}$$

Where:

C Concentration of cocktail (µg/µl)
A Amount of each compound (µg)
V Final volume of cocktail (total spike amounts of each compd., µl)

Example:

$$C = \frac{50000\mu g}{144.2\mu l} = 346.7\mu g / \mu l$$

Step 3: Prepare the Summa canister standard by spiking a small amount of the neat mix directly into the can while filling with humid zero air. Use a tee with a septum on one port, spiking the neat mix in while the can is still under vacuum, then fill to 83.3 psig. This gives a final volume in the can of 40 liters. Calculate the spike volume using the following equation:

$$V_s = \frac{V_c C}{d} \qquad \textbf{(Equation 3)}$$

Where:

V_s Spike volume (µl)
V_c Final canister volume (l)
C Desired canister conc. (µg/l)
d Density of each compound in neat mix (µg/µl)

Example: For a 50 µg/l standard in a six-liter Summa canister at 83.3 psig:

$$Vs = \frac{(50\mu g/l)(40l)}{(346.7\mu g/\mu l)} = 5.77\mu l$$

Density (µg/µl)	Compound
1934.4	Bromochloromethane
1307	1,2-Dichloroethane-d4
1170.1	1,4-Difluorobenzene
943	Toluene-d8
1157	Chlorobenzene-d5
1543	p-Bromofluorobenzene

The final volume of the Summa canister is calculated using the following equation:

$$V_f = (PDF)(V_i) = \frac{(P_{atm} + P_f)}{(P_{atm+P_i})}(V_i) \qquad \textbf{(Equation 4)}$$

Where:

V_f Pressurized canister volume (l)

PDF Pressure Dilution Factor, where PDF = $\frac{P_{atm} + P_f}{P_{atm} + P_i}$

P_f Final Canister Pressure (psig)

P_i Initial Canister Pressure before dilution (1 atm, in psig)

V_i Volume of canister @ 1atm (l)

Example:

$$V_f = \frac{(14.7 + 83.3)}{14.7 + 0}(6.0l) = 40l$$

8.2.2 Initial Calibration (ICAL) Standards Calibration standard stocks for spiking tubes may be prepared in several ways, either in the gas phase (static dilution bottles, Summa canisters, certified cylinders) or in solvents (methanol or water stocks). The choice depends on the analytes of interest and the sorbent being used for sampling. If methanol stocks are used, it is necessary to prepare them at concentrations that allow for a very small spiking volume, usually less than ten microliters. Strong adsorbents such as carbon molecular sieves may require

spiking volumes of one microliter or less if no inlet split is used during desorption.

8.2.2.1 A gas-phase stock standard is prepared from neat compounds in a glass static dilution bottle (SDB). It may be more practical to prepare equi-mass mixes (compounds in equal mass amounts) from the neat compounds before preparing the SDB.

Step 1: A neat mix is prepared by combining 25mg (25,000µg) or more of each neat compound in a glass vial with a teflon-lined cap. Calculate the microliter volume of each compound needed using **Equation 1**.

Example: Calculate the actual volume of benzene to add to a cocktail containing 50000µg of each compound:

$$V_s = \frac{50000\mu g}{876.5\mu g / \mu l} = 57.0\mu l$$

Step 2: The concentration of each compound in the cocktail is determined using **Equation 2**.

8.2.2.2 A gas-phase standard is prepared by spiking an aliquot of a neat cocktail into an SDB. The SDB is then heated from a minimum of one hour at 60°C to completely volatilize all components. The spike amount is determined by using the following equation.

$$V_S = \frac{V_{SDB} C_{SDB}}{C_S} \qquad \textbf{(Equation 5)}$$

Where:

V_S Spike volume required (µl)
C_{SDB} Desired concentration (µg/ml)
C_S Concentration of compound in cocktail (µg/µl)
V_{SDB} Actual volume of SDB (ml)

8.2.2.3 Working Standards are prepared by spiking an aliquot of standard stock onto a clean sorbent tube while flushing with clean diluent gas at 50-100 ml/min.

Calculate the spike volume needed using the following equation:

$$V_S = \frac{A}{C_{SDB}}$$ **(Equation 6)**

Where:

V_S Spike Volume needed (ml)
A Desired Mass Amount (µg)
C_{SDB} Conc. of SDB (µg/ml)

8.2.3 Initial Calibration Verification (ICV) - (Laboratory Control Sample - LCS) Prepare a second source standard (either a different manufacturer or lot from the same manufacturer as the initial calibration standard) with all the analytes used in the calibration standard.

8.2.4 Continuing Calibration Verification Standard The CCV is the same standard used for the initial calibration.

8.3 Storage and Expiration Dates

- Neat Stock Liquids – are stored at -10°C to -20°C for a period of three years or as specified by the manufacturer.
- Equi-Mass Primary Stock Standard – is a cocktail or soup of neat compounds (containing compounds in equal mass amounts) used in preparing intermediate gas phase standards and shall be stored in the freezer at -10°C to -20°C for up to six months. This is assuming that the soup is sealed with a septum-containing screw cap or Mininert™ valve. The selection of the compounds for the soup should be performed in accordance with the guidelines in Volume 6.5 of the *Tekmar-Dohrmann* Application Note.
- Stock Standards purchased in cylinders must be stored at laboratory temperature for a period of 2 years or as specified by the manufacturer.
- Intermediate Calibration Standards prepared by static dilution may be stored at room temperature, but must be heated in an oven at 60°C for at least one hour before using to ensure analyte vaporization. To increase the useful lifetime of an SDB standard, remove volumes of 25ml or less. The volume removed can be manipulated by increasing the SDB concentration or by adjusting the canister final volume/pressure. Depending upon the volume removed, an SDB intermediate standard is stable for approximately two months as long as new working standards made from this standard continue to meet acceptance criteria. The guidelines for the storage and expiration date for the intermediate calibration standards are stated in Volume 6.5 of the *Tekmar-Dohrmann* Application Note.
- Calibration Standards prepared in canisters may be stored at laboratory conditions for thirty days in an atmosphere free of potential contaminants. Upon preparation,

canister standards should be allowed to sit for approximately 24 hours prior to use in order for equilibration to take place. Shorter equilibration periods may be necessary and acceptable as long as performance criteria are met.

9.0 PREVENTIVE MAINTENANCE

A maintenance log will be kept documenting maintenance performed on each analytical system. The serial numbers of each instrument shall be recorded, and each log entry must include a description of the maintenance performed and be initialed by the analyst performing or observing/authorizing maintenance by an outside contractor.

The instrument maintenance log must be kept current. An entry shall be made in the appropriate log every time maintenance is performed (no matter the extent). The entry in the log must include:

(a) the date of maintenance
(b) who did the maintenance
(c) description of the maintenance
(d) proof that the maintenance activity was successful.

A notation of a successful tune and continuing calibration or initial calibration and the file number that accompanies the data will serve as proof that the maintenance is complete and the instrument is in working order.

The extent of the maintenance is not important, however, it is important that a notation be included for each maintenance activity such as changing a column, tuning the instrument, changing the pump oil, cleaning the source, or ordering a part. In addition, a notation should be made in the logbook stating that no samples were analyzed during the days that the instrument was down and no active maintenance was being conducted (i.e., where no other notation was made in the logbook for those days).

9.1 Automated Thermal Desorber

Routine maintenance includes periodic changing of the PTFE-fiber filters and Viton o-rings. Filters should be replaced whenever the o-rings are replaced (fixed-seal and mobile-seal units) and when the cold trap is replaced or removed for maintenance. Under normal usage, this should be a minimum of once every two months. Refer to the TurboMatrix ATD Instrument Manual for instructions. The most common symptom of failing o-rings is a failure of the tube leak-check procedure on the ATD. Dirty filters are indicated by contamination in blanks or system carryover. Also, periodic replacement of the multi-sorbent packing in the cold trap is required. After repacking the trap it should be baked out (Cold Trap Bake mode) at 20C above the inject temperature until the CO_2

peak is minimized in system blanks and all contamination peaks are gone. Pre-packed cold traps are available from Perkin-Elmer and Markes.

On the Turbomatrix, the cold trap must be installed using PTFE ferrules instead of graphite or graphite/vespel ferrules. The latter two materials will allow significant air leaks into the GC. The PTFE ferrule must be retightened or replaced anytime the desorber is turned off and the heaters are allowed to cool. The cold trap is fragile and must be handled carefully to avoid breaking. When removing it, it is helpful to first heat the swagelok fitting gently with a heat gun. This softens the ferrule and allows the trap to be removed without much force. On the Unity Series 2, the seal is made with an o-ring. The o-ring only needs to be replaced when a leak is indicated by the leak check procedure. There are pictures and a short video in the Unity online help that show trap replacement.

9.2 GC System

Column performance is monitored by observing both peak shapes and column bleed. Over time, the column will exhibit a poor overall performance, as contaminated sample matrices are analyzed. The length of time for this to occur will depend on the samples analyzed. When a noticeable decrease in column performance is evident and other maintenance options do not result in improvement, the column should be replaced (see Section 7.4). Whenever GC maintenance is performed, care should be taken to minimize the introduction of air or oxygen into the column.

Clipping off a small portion of the head of the column often improves chromatographic performance. When cutting off any portion of the column, make sure the cut is straight and "clean" (uniform, without fragmentation) by using the proper column-cutting tool. When removing any major portion of the column, which will affect the retention times and elution characteristics, a change in instrument conditions may be required to facilitate nominal analytical activity.

Performance can also be due to ineffective column ferrules, which should be replaced when a tight seal around the column is no longer possible. This can be detected with the use of a leak detector.

9.3 Mass Spectrometer

The Mass Selective Detector (MSD) ion source requires periodic cleaning to maintain proper performance. Symptoms of a dirty ion source include difficulty keeping the MSD in tune and fluctuating internal standard areas. The vacuum system should be serviced every six months, including changing the pump oil and checking the molecular sieve in the backstreaming trap.

9.4 Instrument Tuning

The instrument is tuned with guidance from the procedure described in the HP Operations Manual, when necessary. The tune shall meet the tune criteria described in this document.

10.0 RESPONSIBILITIES

It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP may perform analysis, interpretation and peer review of the results. The supervisor/manager must also ensure that method proficiency is documented initially and whenever significant changes in the instrument type, personnel, matrix or test method are made. The department supervisor/manager or designee shall perform final review and sign-off of the data.

11.0 PROCEDURE

Sufficient raw data records must be retained of the analysis, instrument calibrations and method detection limit studies including: analysis/calibration date and time, test method, instrument, sample identification, analyte identification, analyst's initials, concentrations and responses, as well as standards used for the analysis and calibrations, all manual calculations including sample dilutions and manual integrations to permit reconstruction of analyses. Make sure that all information entered and reported on the quantitation report and instrument run log is complete and accurate. Retain all daily QC per sequence on file for future reference including tune checks, opening standards, method blanks, laboratory control samples, laboratory duplicates, and initial calibrations and initial calibration verifications. Additionally, all passing QC tube checks must also be retained on file.

Note: *All data records must explicitly connect data to the initial instrument calibration. This includes all samples, continuing calibrations and QC samples.*

11.1 Sample Preparation

11.1.1 Sample Tubes

Sample tubes must be removed from cold storage and allowed to warm up to room temperature prior to analysis. Remove the Swage-Lok storage caps and replace with analytical caps before loading tubes onto autosampler. Check for sample integrity, i.e. loose retaining gauze, loose sorbent pieces at front and back, deformation of tube ends from over tightening caps, or particulate on inlet gauze. Clean as necessary (without solvents), but be careful not to dislodge retaining

gauze. Note any sample integrity findings on the *Sample Prep. And Analysis Observations* (yellow) sheet.

11.2 Data System Setup

For the HP Chemstation, load the appropriate acquisition method for the GC/MS in the top window of the Chemstation program. Operating and acquisition parameters will change depending on the target analytes. Typical GC/MS operating parameters for VOCs are given in Section 11.4.2.

For the Shimadzu system with the Markes desorber, consult the online help or user manual for basic operation instructions. Choose the appropriate desorption method for the tube type and analytes, set up the sequence, and load the tubes into the correct trays in the Ultra autosampler. Then set up the GC/MS acquisition parameters. The desorber will not inject a sample unless the GC/MS is in ready mode.

11.3 Analytical Sequence

For this internal standard calibration method analysis, a CCV standard is to be analyzed every 24 hours. That is, the last analysis in the sequence must be started within 24 hours from the time of the initiation of the sequence. The initiation is considered to be the injection of the BFB tune standard.

The analytical sequence must be completed for the analysis of ≤20 field samples. A tube blank (MB) shall be run to monitor for system contamination. There must be at a minimum a laboratory control sample and duplicate (LCS/LCSD) analyzed in each batch to assess batch precision. The concentration of the LCS (ICV standard) should be at the lower end of the calibration curve as an indication that the system allows for good recovery at those concentrations. The following generalized analytical sequence is to be followed:

Analytical Sequence Guideline

With Calibration	Tune Check[1]
	Calibration Standards (5 Levels Minimum)
	ICV Standard[2] (Acts as the ICV and LCS)
	Tube Blank
	Up to 20 Field Samples
With Continuing Calibration	Tune Check[1]
	CCV Standard[4]
	Tube Blank
	LCS/LCSD[3]
	Up to 20 Field Samples

[1] The introduction of the tune check standard is the start of the 24 hour analysis window. The instrument performance check solution must be analyzed initially and once per 24 hour time period of operation. The BFB from the CCV run may be used for this purpose.
[2] In this scenario, the ICV may also be evaluated as the LCS, as long as an LCSD is also analyzed.
[3] An LCS/LCSD shall be analyzed at a rate of 1 in 20 or fewer samples. The LCS is the second source calibration check standard analyzed at the lower end of the calibration curve.
[4] A CCV must be analyzed at the beginning of every analytical sequence.

11.4 Conditions

11.4.1 Thermal Desorber Conditions The suggested settings and system parameters for Tenax and multibed tubes are as follows:

Perkin Elmer TurboMatrix ATD:

Desorb	Tenax TA	Carbopack/Carbosieve
Transfer Line:	200°C	200°C
Valve Temp:	200°C	200°C
Dry Purge:	1-5 min.	5-20 min
Dry Purge Flow:	50-100 ml/min	50-100 ml/min
Desorb Temp.:	280°C	330°C to 350°C
Desorb Flow Rate:	25-100 ml/min	25-100 ml/min
Desorb Time:	10 minutes	10 to 15 minutes
Inlet Split:	As needed	As needed
Refocusing Trap		
Temperature:	-10°C to 25°C (depending on trap packing)	
Injection Temp.:	290°C	
Injection Time:	3.0 min	
Outlet Split	3:1 minimum (split flow:column flow)	

Markes Unity/Ultra Series 2:

Desorb	Tenax TA	Carbopack/Carbosieve
Transfer Line:	140°C	140°C
Valve Temp:	140°C	140°C
Dry Purge:	1-5 min.	5-20 min
Dry Purge Flow:	50-100 ml/min	50-100 ml/min
Desorb Temp.:	280°C	330°C to 350°C
Desorb Flow Rate:	25-100 ml/min	25-100 ml/min
Desorb Time:	10 minutes	10 to 15 minutes
Inlet Split:	As needed	As needed
Refocusing Trap		
Temperature:	20°C (depending on trap packing)	
Injection Temp.:	300°C	

Injection Time:	3.0 min
Outlet Split	Can be run splitless; typically 5:1 minimum

Adsorbent Tube Reconditioning Conditions

Temperature:	at least 20°C above sample desorb temperature
Initial Bakeout:	2 hours or until clean blank is obtained

11.4.2 GC/MS System

Optimize GC conditions for compound separation and sensitivity.

Item	Condition
Carrier Gas	Helium
Flow Rate	1.0-1.5mL/minute (head pressure ~ 17 psi)
Temperature Program	Initial Temperature: 40°C Initial Hold Temperature: 3 minutes Ramp Rate: 5°C/min to 125°C 2nd Ramp: 20°C/min to 240°C for 6 min hold
Detector B (MSD *Interface):*	270°C
Electron Energy	70 Volts (nominal)
Mass Range	33 to 300 amu (SCAN mode)
Mass Range	Scan masses corresponding to the target analytes (SIM mode)
Scan Time	To give at least 10 scans per peak, not to exceed 1 second per scan.

Note: *The instrument may be operated in Selective Ion Monitoring (SIM) mode if requested by the client.*

11.5 Instrument Performance Check

Since the BFB tuning compound is included in the internal standard and surrogate standard canister and an autosampler is used, it is necessary to establish that a given GC/MS meets tuning and standard mass spectral abundance criteria prior to the reduction and approval of any data collection. The 24-hour time period for GC/MS instrument performance check and standards calibration (initial calibration or continuing calibration verification criteria) begins at the injection of the BFB, which shall be documented in laboratory records. Upon completion of the successful BFB tune, the tune report must be printed and retained on file for future reference.

The following is the procedure to follow when performing the instrument performance check.

- Inject 50ng or less (on column). The IS canister is at 50µg/l, and the IS loop is 0.5 ml, which gives a 25 ng spike onto each tube. The amount on column is reduced by the split ratios set up in the method. It may be necessary to analyze the BFB tuning check with a lower overall split ratio than the samples to get adequate mass on column.
- Three scans (peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged.
- Background subtraction is conducted using a single scan prior to the elution of BFB.

All subsequent standards, samples and QC samples associated with a BFB analysis must use identical instrument conditions. Refer to Table 1 for the acceptance criteria and Section 16.1 for the required corrective action.

11.6 Initial Calibration

Refer to Section 12.2 for the technical requirements for performing an initial calibration.

11.6.1 Calibration Points Analyze a minimum of five levels of the calibration standard (analyze low to high) that span the monitoring range of interest of the samples. The range is typically within 1ng-200ng per tube. The dynamic range is dependent on the sensitivity of the particular instrument as well as the required reporting limit for a given project and may be adjusted accordingly.

The initial calibration is performed to determine instrument sensitivity and the linearity of the GC/MS response for the target compounds. One of the calibration points from the initial calibration curve must be at the same concentration as the continuing calibration verification standard. Also, one of the standards must be at or below the method reporting limit for the compounds of interest or the MRL must be adjusted accordingly.

11.6.2 Recalibration The GC/MS system must be recalibrated following any instrument maintenance which may change or effect the sensitivity or linearity of the instrument or if the continuing calibration verification acceptance criteria have not been met as specified in Section 12.4.

11.6.3 Analytical Window If time remains in the 24-hour tune window after meeting the acceptance criteria for the initial calibration, samples may be analyzed according to the procedure described in this document (see Section 11.3). If time does not remain in the analytical window, a new sequence shall commence with

the analysis of the instrument performance check compound (BFB) and the continuing calibration verification standard.

11.6.4 Procedure The system should be operated using temperature and flow rate parameters equivalent to those in Section 11.4. Use the standard prepared in accordance with Section 8.2.2 of this SOP. Attach the internal standard/surrogate canister to the designated inlet on the desorber and open the canister valve.

Use the same tube media used for field sampling. Prepare the calibration tubes by spiking with the appropriate volume of calibration stock standard for each level. Allow the spike to be swept completely onto the adsorbent bed of the tube before removing from the injector port. Place the tubes in order from low to high concentration on the autosampler and analyze using the same parameters that will be used for samples.

Analyte responses (target ion areas) are tabulated and recorded using the Enviroquant program. Quantitation ions for the target compounds are shown in Table 2 and the primary ion should be used unless interferences are present, in which case the secondary ion may be used. Refer to Section 13.1 for the required calculations and Section 12.2.1 for the acceptance criteria.

11.6.5 Initial Calibration Review Analyst's calculation and assessment along with a peer review of all ICAL data and documentation as stated in Attachment B is required before the ICAL may be used to analyze samples. In the case where samples are placed on the autosampler and allowed to run overnight, the sample results may only be reported if the ICAL is reviewed and found to be acceptable. The ICAL checklist in Attachment B must be used to document the review and approval process.

Analyte concentrations, which are not "real", not to be reported, or otherwise marked off the initial calibration, should be followed by a short explanation regarding the reason for the omission.

11.6.6 Initial Calibration File An ICAL file is to be created for each initial calibration performed per instrument into which is placed the following ICAL documents. The file shall remain in the laboratory and be filed by instrument and date.

- ICAL Checklist filled out, reviewed and approved
- BFB tune analysis report
- Blank analysis quantitation report
- Calibration status report (aka Calibration History)
- Relative Response Factor Report / Percent Relative Standard Deviation

- Quantitation report for each calibration standard (including manual integration documentation – before and after manual integration)
- ICV quantitation report and %recovery report.

11.7 Initial Calibration Verification Standard

Verify the initial calibration by analyzing an initial calibration verification standard (ICV). This standard shall be obtained or prepared from materials acquired from a different manufacturer or lot from that of the initial calibration and prepared according to Section 8.2.3.

Inject an aliquot of the ICV standard onto the same type of tube used for the ICAL and analyze under the same conditions. Refer to Section 13.3 for the required calculations and Section 12.3 for the acceptance criteria.

11.8 Continuing Calibration Verification Standard

Verify the calibration each working day, where necessary (e.g., an ICAL was not analyzed or the 24-hour tune window has closed) by analyzing a continuing calibration verification (CCV) standard prepared from the calibration standard stock, in the same manner as the ICAL standards. The concentration of the calibration verification may be varied within the established calibration range.

Refer to Section 13.2 for the required calculations and Section 12.4 for the acceptance criteria.

11.9 Method Blank

A clean tube of the type used for calibration and samples must be analyzed after the CCV standard to demonstrate that the system is free of contaminants that would interfere with sample analysis. Place a pre-cleaned tube on the autosampler and analyze using the same parameters used for standards and samples. If stored cold, allow the tube to warm to room temperature first.

11.10 Laboratory Control Sample and Duplicate (LCS/LCSD)

The laboratory control sample is an analysis of the initial calibration verification standard. Inject the LCS (ICV) onto a pre-cleaned tube (same media type as for ICAL and samples) at a concentration below the midpoint of the calibration curve. Make sure that all of the pertinent information is included on the quantitation report including the sample identification (LCS), concentration, standard used, and analyst. Since it is not possible to analyze a true laboratory sample duplicate, a duplicate LCS should be analyzed with each batch to assess method precision.

11.11 Sample Analysis

11.11.1 Procedure Prior to analysis, all sample tubes should be at temperature equilibrium with the laboratory. After achieving acceptable results for the tuning check, CCV standard, and blank, load the sample tubes onto the autosampler carousel and set up the Turbomatrix method and sequence. Use the same method as used for all standards and blanks.
After analysis, check all target compounds using the QEdit routine in Enviroquant, making sure all extracted ion chromatogram peaks are integrated properly (see Section 11.12).

Note: *The secondary ion quantitation is only allowed if there is sample matrix interference with the primary ion. If the secondary ion quantitation is performed, document the reasons in the instrument run logbook and/or on the quantitation report (initial and date any notation).*

Refer to Section 13.5 for the required calculations and check the internal standard peak areas and retention times as well as applicable surrogate recoveries to see if they meet acceptance criteria (see Section 12.6).

SCAN Mode

The instrument is normally operated in the SCAN mode, where the following procedure may be followed.

- Upon sample injection onto the column, the GC/MS system is operated so that the MS scans the atomic range from 34 to 300 amu. At least ten scans per eluting chromatographic peak should be acquired. Scanning allows identification of unknown compounds in the sample through searching of library spectra. See operating conditions in Section 11.4.
- Each run is approximately 30 to 45 minutes long between injections. Generate a quantitation report for each run.
- If reporting Tentatively Identified Compounds (TICs), refer to Section 11.11.2 for identification criteria.

SIM Mode

When the client requests SIM mode, select SIM instead of SCAN mode and identify a minimum of two ions per analyte of interest. Also, a minimum of two ions for each internal standard and surrogate compound should be selected.

11.11.2 Tentatively Identified Compounds When requested, a mass spectral library search may be made for the purpose of tentatively identifying sample components not associated with the calibration standards. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system mass spectral library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

Certain programs may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification. The following guidelines are used for making tentative identifications.

- Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.
- The relative intensities of the major ions should agree within ±20%. For example, for an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance should be between 30 and 70%.
- Molecular ions present in the reference spectrum should be present in the sample spectrum.
- Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.
- Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.
- The concentration of the tentatively identified compound is estimated by assuming a response factor of 1.0 and comparing the response of the tentatively identified compound to the response of the 2nd internal standard.

11.12 Manual Integration

The integration for each peak shall be checked to ensure that it has been integrated properly. Assuming an incorrect automatic integration the analyst shall conduct the manual integration in accordance with the *SOP for Manual Integration of Chromatographic Peaks* including all documentation and reviews associated with the process. The review shall include the analyst and reviewer initialing and dating the manual integration as an indication of acceptability and approval.

11.13 Storing Electronic Data

The initial calibration data must be stored in a quantitation method (on the server) using a unique filename and may not be overwritten at any time in order to maintain an accurate audit trail. There are multiple quantitation methods, which are subsets of the compound list in Table 2. Therefore, files will be named with an eight-character notation indicating the compound list and the date of the corresponding initial calibration. In addition, all data files including method blanks, continuing calibration verification, laboratory control samples and client submitted samples files are saved in a unique sub-directory on the server.

12.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

This section of the standard operating procedure contains technical acceptance criteria and references to preferred corrective actions per the guidelines of the specified test method. Corrective actions shall follow the procedures outlined in the *SOP for Corrective Action*, where appropriate. Refer to Section 17.0 for requirements and guidelines for reporting out of control results.

To the extent possible, samples shall be reported only if all of the quality control measures are acceptable. If a quality control measure is found to be out of control, and the data must be reported, all samples associated with the out of control quality control measure shall be reported with the appropriate data qualifier(s).

12.1 Instrument Performance Check

The GC/MS system must meet the mass spectra ion abundance criteria listed in Table 1. The appropriate corrective action is described in Section 16.1. Results of the BFB tune check as well as any actual tuning must be recorded and a copy of the tune report maintained on file.

12.2 Initial Instrument Calibration

Initial calibration requirements are as follows:

1. A minimum of 5 concentrations must be used to calculate the calibration curve.
2. Highest concentration, together with the lowest concentration, defines the calibration range.
3. Lowest concentration must be at or below the method reporting limit.
4. A blank should be analyzed prior to beginning the analysis of the calibration standards.
5. The initial calibration event may not be interrupted by maintenance.
6. Only one value per concentration may be used.
7. Analyze calibration standards from low to high concentration.
8. All ICAL analyses must be completed within the 24-hour tune window.

9. If 5 calibration standards are in the ICAL, one standard may be re-analyzed. If 6 to 10 calibration standards are in the ICAL, two calibration standards may be re-analyzed.
10. Point dropping policy

- Minimum of 5 consecutive concentrations must be used to calculate the calibration curve.
- Lowest concentration must be at or below the MRL and may not be dropped unless the MRL is changed to the concentration of the remaining lowest standard.
- Points at the high end may be dropped, but doing so lowers the calibration range.
- Points may not be dropped from the interior of the curve unless an assignable cause (i.e., gross dilution error, missing internal standards, purge malfunction, standard preparation error, or instrument malfunction) is accounted for and documented. In these instances, all the analytes in that calibration standard must be dropped from the calibration curve as the corrective action.
- If a point or a calibration standard is dropped, the reason must be documented (and the results maintained with the documentation for the final ICAL).
- A calibration standard may be re-analyzed if the first analysis of the standard has been dropped and other requirements in this policy are met (i.e., still within 24 hours).
- Once the ICAL has been used to calculate and report sample results, it is not to be changed.

12.2.1 Acceptance Criteria Refer to the following acceptance criteria for the initial calibration.

- The RRT for each target compound at each calibration level must be within 0.06RRT units of the mean RRT for the compound.
- The calculated %RSD for the RRF for each compound in the calibration standard must be less than 30% with at most two exceptions up to a limit of 40% (this may not be true for all projects).
- For each Internal Standard the area response (Y) at each calibration level must be within 40% of the mean area response $\overline{Y}$ over the initial calibration range.
- The retention time shift for each of the internal standards at each calibration level must be within 20s of the mean retention time over the initial calibration range for each internal standard.
- All of the following information must be retained to permit reconstruction of the initial instrument calibration: calibration date, test method, instrument, analysis date, analyte identification, analyst's initials, concentration and responses, and response factors.

- All initial instrument calibrations must be verified with an acceptable ICV (refer to Section 12.3.1).

12.2.2 Corrective Action See Section 16.2.

12.3 Initial Calibration Verification

12.3.1 Acceptance Criteria The percent recovery for each compound in the ICV must be between 70%-130%.

Note: Wider limits of 50%-150% may be used in special circumstances for compounds that have been determined to be problematic. The use of limits other than 70%-130% must be reported as a modification to the method.

12.3.2 Corrective Action Refer to Section 16.3.

12.4 Continuing Calibration Verification

12.4.1 Acceptance Criteria The percent difference for each target analyte must be within plus or minus 30% of the initial calibration average RRFs.

12.4.2 Corrective Action Refer to and Section 16.4.

12.5 Method Blank

12.5.1 Acceptance Criteria

- The area response for each internal standard in the blank must be within ±40 percent of the area response for each internal standard in the mid-level standard of the ICAL if the method blank follows the ICAL. If the method blank follows a CCV then the area response for each internal standard in the blank must be within ±40 percent of the area response of the CCV.
- The retention time for each internal standard in the blank must be within ±0.33 minutes of the retention time for each internal standard in the mid-level standard of the ICAL if the method blank follows the ICAL. If the method blank follows a CCV then the retention time for each internal standard in the blank must be within ±0.33 minutes of the retention time of the CCV.
- The method blank result for any target analyte should not be greater than the reporting limit and should not contain additional compounds with elution characteristics and mass spectral features that would interfere with identification and measurement of a method analyte.

12.5.2 Corrective Action Refer to Section 16.9.

12.6 Sample Analysis

Sample results must be quantitated from the initial instrument calibration and may not be quantitated from any continuing instrument calibration verification. Samples out of holding time must be handled according to Section 16.10.

12.6.1 Acceptance Criteria

The following are the technical acceptance criteria for sample analysis:

- The field sample must be analyzed on a GC/MS system meeting the BFB tuning, initial calibration, initial calibration verification technical acceptance criteria described in Sections 12.1 through 12.4.
- All target analyte peaks must be within the initial calibration range (Section 17.6.3) or reported with the appropriate data qualifier.
- The retention time for each internal standard must be within ±20 seconds of the retention time of the internal standard in the most recent valid calibration.
- Acceptable surrogate recoveries are based on a fixed window at 70 - 140%.
- The area response for any internal standard must be within the range of 60 - 140% of the area of the most recent valid calibration (CCV or mid-point from the initial calibration, whichever is most current).

Note 1: If the most recent valid calibration is an initial calibration, internal standard area responses and retention times in the sample are evaluated against the corresponding internal standard area responses and RTs in the mid level standard of the initial calibration.

Note 2: Surrogate compound recoveries are requested by a number of clients and may be reported, but the use of surrogates is not addressed in Method TO-17 or TO-15. The surrogate compound is spiked onto the tubes at the same time as the internal standards, and is used as a system monitoring compound.

12.6.2 Corrective Action Refer to Section 16.0 for the corresponding corrective actions.

12.7 Laboratory Control Sample

12.7.1 Acceptance Criteria All analytes should have a 70-130% recovery, and an RPD of 25% or less.

Note: Wider limits of 50%-150% may be used in special circumstances for compounds that have been determined to be problematic. The use of limits other than 70%-130% must be reported as a modification to the method.

12.7.2 Corrective Action Refer to Section 16.7.

12.8 Method Detection and Reporting Limits

A method detection limit study or MDL/LOD verification shall be performed annually on each instrument for which results are to be reported below the MRL. The MDL shall be performed in accordance with the procedure outlined in the *SOP for Performing Method Detection Limit Studies and Establishing Limits of Detection and Quantitation.* The higher detection limit (from all of the instruments where this method is to be performed) for each analyte must be selected and used as the uniform method detection limit for that analyte regardless of the instrument of analysis. The quantitation limit or reporting limit for this method shall be at or above the concentration of the lowest initial calibration standard.

13.0 DATA REDUCTION AND REPORTING

The essential information to be associated with analysis, such as computer data files, run logs, etc. shall include: Sample ID code, date and time of analysis, instrument operating conditions/parameters (or reference to such data), analysis type, all manual calculations including dilutions and manual integrations, analyst's initials, sample preparation, standard and reagent origin, receipt, preparation, and use, as well as calibration criteria, frequency and acceptance criteria, data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions.

13.1 Initial Calibration

- Calculate the RRF for each target compound relative to the appropriate internal standard (refer to Table 2) using equation number 1 in Section 13.7.1.
- Calculate the mean RRF (using equation number 2) for each compound by averaging the values obtained from each concentration.
- Using RRFs from the initial calibration, calculate the %RSD for all target compounds using the equations 3 & 4 in Sections 13.7.3 and 13.7.4.
- Calculate the RRT for each compound over the initial calibration range using equation number 9 in Section 13.7.9.
- Calculate the mean RRT for each analyte target compound over the initial calibration range using equation number 10 in Section 13.7.10.
- Tabulate the area response (Y) of the primary ions listed in Table 2 and the corresponding concentration for each compound and internal standard.

- Calculate the mean area response $\overline{Y}$ for each internal standard compound over the initial calibration range using equation number 11 in Section 13.7.11.
- Calculate the mean of the retention times for each internal standard over the initial calibration range using equation number 12 in Section 13.7.12.

Refer to Section 12.2.1 for the acceptance criteria.

13.2 Continuing Calibration Verification

- The area response of the primary quantitation ion is used unless interference is observed. Calculate the relative response factor (RRF) of each target compound using equation number 1.
- Calculate the percent difference (%D) in the RRF of the CCV compared to the mean RRF in the most recent initial calibration using equation number 5 in Section 13.7.5.

Refer to Section 12.4.1 for the acceptance criteria.

13.3 Initial Calibration Verification and Laboratory Control Sample

- Calculate the percent recovery using equation number 13 (13.7.13). Refer to Section 12.3.1 for the acceptance criteria for the ICV and 12.7.1 for the LCS criteria.

13.4 Duplicate Analysis

- The relative percent difference of the LCS/LCSD must be calculated using equation number 14 (13.7.14). Refer to Section 12.7.1 for the acceptance criteria.

13.5 Sample Analysis

- Calculate the retention time difference.
- Calculate surrogate recoveries using equation number 13.
- Calculate the change in area response using equation number 14.
- Calculate analyte concentrations (ng on column) using equation number 6 in Section 13.7.6.
- Calculate the final sample concentration using equation numbers 7 and 8 in Sections 13.7.7 and 13.7.8.

13.6 Method Blank

- Calculate the retention time difference
- Calculate the change in area response using equation number 14.

- Calculate analyte concentrations (ng on column) using equation number 6 in Section 13.7.6.
- Calculate the final sample concentration using equation numbers 7 and 8 in Sections 13.7.7 and 13.7.8.

13.7 Calculations

13.7.1 Equation Number 1

Relative Response Factor (RRF):

$$\text{RRF} = \frac{A_x C_{is}}{A_{is} C_x}$$

where:

A_x is the area response of the analyte quantitation ion.
A_{is} is the area response of the corresponding internal standard quantitation ion.
C_{is} Internal standard concentration, ng.
C_x Analyte concentration, ng.

Note: The equation above is valid under the condition that the volume and concentration of internal standard spiking mixture added in all field and QC samples is the same from run to run.

13.7.2 Equation Number 2

Average (or Mean) RRF:

$$\overline{RRF} = \frac{\sum_{i=1}^{N} RRF_i}{N}$$

where:

RRF_i are the individual RRFs from each concentration level in the initial calibration curve.
N is the number of calibration concentration levels.

13.7.3 Equation Number 3

Standard Deviation, SD:

$$SD = \sqrt{\sum_{i=1}^{N} \frac{\left(RRF_i - \overline{RRF}\right)^2}{N-1}}$$

where:

RRF_i are the individual RRFs from each concentration level in the initial calibration curve.

$\overline{RRF}$ Average (or Mean) RRF of all concentration levels in the initial calibration curve.

N total number of calibration concentration levels

13.7.4 Equation Number 4

Percent Relative Standard Deviation, %RSD:

$$\%RSD = \frac{SD}{\overline{RRF}}(100)$$

where:

SD Standard Deviation calculated in equation number 3

$\overline{RRF}$ Average or Mean RRF

13.7.5 Equation Number 5

Percent Difference, %D (CCV)

The %D is used for evaluating CCV RRFs vs. the initial calibration $\overline{RRF}$:

$$\%D = \frac{RRF_{ccv} - \overline{RRF}}{\overline{RRF}}(100)$$

where, for any given analyte:

RRF_{ccv} is the RRF from the CCV being evaluated.

$\overline{RRF}$ is the mean RRF from the current calibration curve.

13.7.6 Equation Number 6 For calculating analyte concentrations in a sample, the starting point is the nanogram amount generated by the HP Enviroquant software, which appears on the quantitation report. This will be the mass collected on the sampling tube (ng/tube). The equation used is:

$$ng_x = \frac{A_x ng_{is}}{A_{is}\,\overline{RRF}}$$

where:

ng_x is the nanogram amount of analyte x.
A_x is the area response of the analyte's quantitation ion.
A_{is} is the area response of the corresponding internal standard's quantitation ion.
ng_{is} is the internal standard amount, in nanograms.
$\overline{RRF}$ is the average or mean RRFs

13.7.7 Equation Number 7 The final analyte concentration, C_x, in units of micrograms per cubic meter (µg/m^3), is then calculated from ng_x using the following:

$$C_x = \left(\frac{ng_x}{V}\right)\left(\frac{1\mu g}{1000ng}\right)\left(\frac{1000l}{1m^3}\right)$$

where:

V is the sample volume, in liters.

13.7.8 Equation Number 8 To convert to units of parts per billion volume (ppbv), the equation is:

$$C_{ppbv} = C_x\left(\frac{24.46}{FW}\right)$$

where:

FW is the formula weight of the analyte, in g/mole.
24.46 is the molar volume of an ideal gas at 298 K (25 °C) and 760 mmHg (1 atm), in liters per mole (l/mol).
C_x the final analyte concentration in micrograms per cubic meter.

Refer to Table 2 for the appropriate molecular weights.

13.7.9 Equation Number 9

Relative Retention Time (RRT)

$$RRT = \frac{RT_C}{RT_{IS}}$$

where:

RT_C Retention time of the target compound, seconds.
RT_{IS} Retention time of the internal standard, seconds.

13.7.10 Equation Number 10

Mean Relative Retention Time ($\overline{RRT}$)

$$\overline{RRT} = \sum_{i=1}^{n} \frac{RRT_i}{n}$$

where:

$\overline{RRT}$ Mean relative retention time for the target compound for all initial calibration levels.
RRT_i Relative retention time for the target compound in level i.
n Number of calibration levels

13.7.11 Equation Number 11

Mean Area Response ($\overline{Y}$) for Internal Standard

$$\overline{Y} = \sum_{i=1}^{n} \frac{Y_i}{n}$$

where:

Y_i Area response for the primary quantitation ion for the internal standard for each initial calibration standard.
n number of calibration concentration levels

13.7.12 Equation Number 12

Mean Retention Times ($\overline{RT}$)

$$\overline{RT} = \sum_{i=1}^{n} \frac{RT_i}{n}$$

Where:

$\overline{RT}$ Mean retention time, seconds
RT_i Retention time for the internal standard for each initial calibration standard, seconds.
n number of initial calibration levels

13.7.13 Equation Number 13

Percent Recovery (%R):

%R = X/TV x 100

where

X = Concentration of the analyte recovered
TV = True value of amount spiked

13.7.14 Equation Number 14

Relative Percent Difference (RPD)

$$RPD = \frac{|x_1 - x_2|}{\bar{x}}(100)$$

where:
x_1 First measurement value
x_2 Second measurement value
$\bar{x}$ Average of the two values

13.8 Data Review

The analyst must review data on a real time basis for all calibration and QC data. The QC data must be evaluated by analytical sequence following the data review checklist in Attachment C. The data shall be reviewed and the sample results calculated and assessed by one analyst and reviewed by a second qualified analyst (Refer to Section 10.0). The data review checklist is used to document the reviews and once it has been completed, initialed and dated it must be filed with each job file.

Initial calibrations must be reviewed in the same manner as QC data with all ICAL documentation retained in a separate file organized by instrument and date. Refer to the

initial calibration checklist in Attachment B for the review guideline. The ICAL file must contain all the pertinent information stated in Section 11.6.6.

13.9 Reporting

The results of each test shall be reported clearly, unambiguously and objectively, and shall include all the information necessary for the interpretation of the test results and all information required by CAS policy, National Environmental Laboratory Accreditation Conference (NELAC) standards and the TO-17 method including modifications, observances, data qualifiers, and certification information.

13.9.1 Analysis Observations / Case Narrative Summary Form

This form, which is included in the *SOP for Laboratory Analysis, Storage and Tracking*, must be generated when there are specific sample composition information or analysis issues and/or observations. In addition, during the analysis, specific identification information or problems, interferences, calibration issues, flags, and additional/expanded explanation of flags should be added to the form. This form may be modified as long as the sections and basic concepts are reserved.

This form is necessary as a means of documentation. This form, among other information, will be reviewed when compiling the final report and case narrative. All information regarding the job shall remain in the file, in order that sufficient documentation is available to recreate the job from sample receipt through analysis, data reduction, and reporting.

13.9.2 Surrogate Only report surrogate results at the request of the client. If the surrogate is out of control, all samples results (with surrogates requested) associated with the surrogate must be reported with the appropriate data qualifier.

14.0 METHOD PERFORMANCE

An on-going assessment of method performance is conducted in order to ensure that the laboratory is capable of reporting results which are acceptable for its intended use. Validation of the method is confirmed by the examination and provision of objective evidence that these requirements are met.

14.1 Method Detection Limit (MDL)

The procedure used to determine the method detection limits are as stated in the *Code of Federal Regulations* (40 CFR 136 Appendix B) as defined in the *SOP for Performing Method Detection Limit Studies and Establishing Limits of Detection and Quantitation.*

The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. The MDL actually achieved in a given analysis will vary depending on instrument sensitivity and matrix effects. All MDLs, regardless of the mode of operation, meet the method performance criteria of <0.5ppbV if needed..

14.2 Accuracy and Precision

Refer to the referenced method for information on replicate precision criteria for method performance. Single laboratory accuracy is presented as the second source initial calibration verification standard, which meets the method performance criteria of 30%.

Note: Wider limits of 50%-150% may be used in special circumstances for compounds that have been determined to be problematic. The use of limits other than 70%-130% must be reported as a modification to the method.

14.3 Selectivity

Mass spectrometry is considered a more definitive identification technique than single specific detectors such as flame ionization detector (FID), electron capture detector (ECD), photoionization detector (PID), or a multidetector arrangement of these The use of both gas chromatographic retention time and the generally unique mass fragmentation patterns reduce the chances for misidentification.

It is necessary to establish that a given GC/MS meets tuning and standard mass spectral abundance criteria prior to initiating any data collection. Upon sample injection onto the column, the GC/MS system is operated so that the MS scans the atomic mass range from 35 to 300 amu. At least ten scans per eluting chromatographic peak must be acquired. Scanning also allows identification of unknown compounds in the sample by searching through library spectra.

The sample analysis using the GC/MS is based in part on a combination of retention times and relative abundances of selected ions. The retention time of each chromatographic peak should be ±0.10 minutes of the library/reference retention time of the compound. The acceptance level for relative abundance should be set at ±20% of the expected abundance. The data should be manually examined by the analyst to determine the reason for the # flag [(#) = qualifier out of range], if present and whether the compound should be reported as found or if there is matrix interference. A background subtraction may aid in this determination. Manual inspection of the qualitative results should also be performed to verify concentrations outside the expected range.

Specific selectivity information is provided in this section and document (such as relative retention time) as well as in the referenced method. Refer to the method for additional information on selectivity.

- Use NIST Library 98 or newer version
- The *reference spectra updates* must be performed with every new ICAL utilizing the mid-level standard (minimum). If needed, the reference spectra may be updated sooner with the continuing calibration standard.
- *Retention time updates* must be performed using EasyID and not by updating to the method (InitCal \ Update Calibration). Refer to the Help selection of the software.

14.4 Demonstration of Capability

An initial demonstration of capability shall be performed prior to analysis of samples and shall include the analysis of four (4) LCS spike standards at approximately four (4) times the MRL for each analyte with acceptable recoveries (as specified in this SOP). A continuing demonstration of proficiency must be performed annually per analyst and shall be conducted in the same manner as the initial demonstration.

14.5 Proficiency Testing (PT) Program

The laboratory may participate in an air and emissions PT study for TO-17. The testing shall be performed in accordance with this document.

15.0 POLLUTION PREVENTION AND WASTE MANAGEMENT

Samples from tubes are consumed by the analytical procedure, and then the tubes are cleaned and reused. However, any waste disposals shall be carried out in accordance with the requirements detailed in the *SOP for Waste Disposal.*

16.0 CORRECTIVE ACTIONS FOR OUT-OF-CONTROL DATA

Any maintenance which may alter instrument sensitivity or linearity must result in the re-analysis of the entire sequence including the tune compound, ICAL or CCV.

16.1 Tune Does Not Meet Criteria

Perform auto tune or manual tune and then re-analyze BFB. If the BFB acceptance criteria are still not met, the MS must be retuned according to the procedure outlined in the instrument users manual. Perform necessary maintenance and make notations in the instrument maintenance logbook. It may be necessary to clean the ion source, or quadrupole, or take other necessary actions to achieve the acceptance criteria.

16.2 Initial Calibration Does Not Meet Calibration Criteria

Follow the initial calibration guidelines detailed in Section 12.2 for information on re-analyzing or dropping points and the restriction of maintenance performed during the analysis of the initial calibration standards. If the criteria are not met it may be necessary to perform maintenance, if this is the case then all calibration points must be re-analyzed.

16.3 Initial Calibration Verification Does Not Meet Criteria

If the initial calibration verification technical acceptance criteria are not met, reanalyze and if it still fails prepare a new canister and analyze. If the criteria are still not met inspect the system for possible sources and perform any necessary maintenance and make a notation in the maintenance logbook of any steps taken. It may be necessary to clean the ion source or change the column. Perform a new initial calibration if any performed maintenance has altered instrument linearity and/or sensitivity. A demonstration of an acceptable ICV is required.

16.4 Continuing Calibration Verification Results Do Not Meet Calibration Criteria

If the continuing calibration verification technical acceptance criteria are not met, reanalyze once and if it still fails prepare a new spiking standard (if applicable) and analyze. If the criteria are still not met inspect the system for possible sources of the problem and perform any necessary maintenance and make a notation in the maintenance logbook of any steps taken. It may be necessary to clean the ion source or change the column.

If any corrective action and/or reanalysis fails to produce continuing calibration verification within acceptance criteria (analyzed immediately following the initial failure), then either two consecutive successful verifications must be performed following corrective action or a new initial calibration must be performed. However, sample data associated with an unacceptable calibration verification may be reported as qualified data under the following special conditions:

> *When the acceptance criteria for the continuing calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. If however, the acceptance criteria for the continuing calibration verification are exceeded low, i.e., low bias, and there are associated samples that are non-detects, then those non-detects may be reported with the reporting limit adjusted to the next level in the calibration curve (typically 5 times higher) to prove the nonexistence of a false negative.*

16.5 Internal Standards Do Not Meet Criteria

16.5.1 Internal Standard Responses If the problem is with the instrument, perform maintenance. If the problem is with a sample, check for matrix interferences. If the response is high, it is likely that interference is present. If the response is low, it may be due to excessive co-collected water from the sample tube that was not sufficiently removed during the dry purge step. Report results with the appropriate qualifier. Reanalysis of the sample is usually not possible since the entire sample is consumed by the analysis.

16.5.2 Internal Standard Retention Times If the retention time for any internal standard within the sample changes by more than 20 sec from the latest daily calibration or initial calibration mid-point standard, the GC/MS system must be inspected for malfunctions, and maintenance performed as required. Report results with the appropriate qualifier.

16.6 Method Blank (MB) Results Do Not Meet Criteria

If the analyte concentration results in the blank do not meet the acceptance criteria repeat analysis with another pre-cleaned tube until results are acceptable or recondition the tube for about twenty minutes and reanalyze. If the analyte results in the blank still do not meet the acceptance criteria the source of the problem must be investigated and measures taken to eliminate the source. Determine whether the contamination is from the instrument or due to contamination in the blank tube (if results from the new or reconditioned tube are not acceptable then the system is probably contaminated). Regardless, appropriate corrective measures must be taken and documented before sample analysis proceeds. However, if this is not a possibility and the results must be reported follow the reporting requirements stated in Section 17.2.

If the requirements for the internal standard are not met then follow the corrective action detailed in Section 16.5.

16.7 Laboratory Control Sample (LCS) Results Do Not Meet Criteria

If the LCS criteria are not met, determine whether the cause is instrumentation, the result of a poor injection, or a bad spiking stock standard. If the problem is instrumentation, perform maintenance and if the problem is with the injection re-analyze the LCS. It may be necessary to prepare a new spiking stock. Also, the reporting requirements in Section 17.3 must be followed.

16.8 Sample Results Do Not Meet Criteria

- If the retention time for any internal standard within the sample changes by more than 20 sec from the latest daily calibration or initial calibration mid-point standard, the GC/MS system must be inspected for malfunctions, and maintenance performed as required.

- If the area for any internal standard changes by more than ±40 percent between the sample and the most recent calibration, check for possible matrix interferences and note in the case narrative. If the requirement is still not met and matrix interference is not detected the GC/MS system must be inspected for malfunction and maintenance made where necessary.
- When corrective actions are made, samples analyzed while the instrument was not functioning properly must have the appropriate data qualifiers attached to the results.

If a quality control measure is found to be out of control, and the data must be reported, all samples associated with the out of control quality control measure shall be reported with the appropriate data qualifier(s).

16.9 Sample's Holding Time Expired

The customer is to be notified that the sample's holding time was missed and the customer is to decide if the sample analysis is to continue. The documentation of missed holding time and the client's decision to proceed must be included in the corresponding job file. A statement dictating all holding time occurrences must accompany the sample results in the final report.

16.10 Surrogate Results Do Not Meet Criteria

Poor surrogate recovery should be noted in the case narrative. Refer to Section 12.6.1 (Note 2) for specific information on the use of surrogates.

17.0 CONTINGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

The following is specific information on how to report unacceptable data. If the data requires a data qualifier flag, as specified in this SOP, refer to Appendix D of the most recent version of the Quality Assurance Manual.

Note: *No analyte results may be reported with an unacceptable initial calibration or initial calibration verification standard. However, any analyte not meeting such requirements (and the initial calibration is to be used) must be eliminated from the reporting list and any action taken fully documented.*

17.1 Continuing Calibration Verification

- When the acceptance criteria for the continuing calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported without a qualifier.

- If however, the acceptance criteria for the continuing calibration verification are exceeded low, i.e., low bias, and there are associated samples that are non-detects, then those non-detects may be reported with the reporting limit adjusted to the next level in the calibration curve (typically 5 times higher) to prove the nonexistence of a false negative. If this is the case then a full explanation must be noted in the case narrative of the final report. Refer to Section 13.9 for additional reporting requirements.

17.2 Method Blank

- If an analyte in the blank is found to be out of control and the analyte is also found in associated samples, those sample results shall be "flagged" in the report and the method blank results reported.
- If the analyte is found in the blank but not in the sample then the results for the sample may be reported without a qualifier.

17.3 Laboratory Control Sample

All results associated with an out of control laboratory control sample must be reported with the appropriate data qualifier. An indication of whether the LCS was out high or low should also be included.

17.4 Surrogate

Refer to Section 12.6.1 (Note 2) for specific information on the use of these compounds. Report surrogate recoveries only at the request of the client and report sample results with the appropriate data qualifier.

17.5 Internal Standard

All target analytes associated with an out of control internal standard must be flagged with the appropriate data qualifier.

17.6 Estimated Sample Results

17.6.1 Sample Hold Time

All occurrences of missed holding times must be included on the final report including those samples received and/or analyzed outside of the specified hold times detailed in this standard operating procedure.

17.6.2 Matrix Interference

Sample data associated with matrix interference must be flagged with the appropriate data qualifier.

17.6.3 Results Outside Initial Calibration Range

All sample results not bracketed by initial calibration standards (within calibration range) must be reported has having less certainty by reporting with the appropriate data qualifier.

18.0 REFERENCES

18.1 EPA Method TO-17, Compendium of Methods for the Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling Onto Sorbent Tubes, EPA/625/R-96/010b, U.S. Environmental Protection Agency, Research Triangle Park, NC, January 1997.

18.2 EPA Method TO-15, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA/625/R-96/010b, U.S. Environmental Protection Agency, Research Triangle Park, NC, January 1997.

18.3 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, January 1999.

18.4 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, Addendum, January 17, 2002.

18.5 *SOP for Batches and Sequences*, SOP Code ADM-BATCH_SEQ

18.6 *SOP for Making Entries into Logbooks and onto Benchsheets*, SOP Code ADM-DATANTRY

18.7 *SOP for Performing Method Detection Limit Studies and Establishing Limits of Detection and Quantitation*, SOP Code ADM-MDL

18.8 *SOP for Manual Integration of Chromatographic Peaks*, SOP Code ADM-INT

18.9 *SOP for Corrective Action*, SOP Code ADM-CA

18.10 *Preparation of Gas Phase Standards for Ambient Air Analysis*, Tekmar-DOHRMANN Application Note, Spring 96, Vol. 6.5.

18.11 National Environmental Laboratory Accreditation Conference, *2003 NELAC Standard*, June 5, 2003, EPA 600/R-04/003.

19.0 TRAINING PLAN

All analysts must be trained in accordance with the guidelines detailed in the *SOP for Documentation of Training*. The training plan (Attachment A) shall be used to document the training certification of new analysts.

20.0 METHOD MODIFICATIONS

The use of limits wider than 70%-130% for second source verifications (ICV or LCS) must be reported as a modification to the method.

21.0 INSTRUMENT-SPECIFIC ADDENDUM

Not Applicable

22.0 CHANGES FROM PREVIOUS REVISION

Section 1.0	Revised fourth sentence of second paragraph Added Note 1
Section 2.0	Last sentence of last paragraph changed "establish the compound concentration" to "establish the concentration"
Section 3.11	Changed "then" to "than"
Section 3.22	Revised
Section 3.23	First sentence changed "on front" to "in front"
Section 4.3	Changed "conditions to be used for sample tubes" to "conditions as sample tubes"
Section 4.5	First sentence changed "hardware results" to "hardware which results"
Section 5.2	Revised second sentence
Section 7.1	Revised instrument information
Section 7.3	Revised instrument information
Section 7.9	Added
Section 7.10	Added
Section 8.1.4	Added
Section 8.2.2.3	Revised sentence to add procedural information
Section 8.3	First bullet – changed "@" to "at"
Sections 8.0 & 9.0	Renumbered to comply with ADM-SOP
Section 11.4.1	Revised/updated various conditions
Section 11.6.4	Second paragraph, last sentence changed "conc." to "concentration"
Section 11.10	Revised last sentence
Section 12.2.2	Removed Reference to Figure 1
Section 12.3.1	Added Note
Section 12.3.2	Removed Reference to Figure 1

Section 12.6.2	Removed Reference to Figure 4
Section 12.7.1	Added Note
Section 12.7.2	Removed Reference to Figure 3
Section 12.8	Revised first sentence
Section 14.0	Added
Section 15.0	Revised
Section 16.5.1	Revised
Section 16.5.2	Revised
Section 18.7	Updated SOP Title
Section 18.11	Added NELAC reference
Section 20.0	Added
Section 21.0	Added
Section 23.1	Added Table 3 to list
Table 2	Added Various Compounds
Table 3	Added Various Compounds
Attachment A	Updated SOP Titles; replaced "bag handling" with "tube handling"
Attachment B	Added criteria to #14, added MS18
Attachment C	Added criteria to #9, added MS18

23.0 ATTACHMENTS AND TABLES

23.1 Tables

Table 1: Instrument Tune Check Ion Abundance Criteria (TO-15)
Table 2: Volatile Organic Compounds, EPA Compendium Method TO-15
- Target Analytes
- CAS Numbers
- Primary Ions
- Secondary Ions
- Associated Internal Standards
- Molecular Weights

Table 3: Standard Concentrations (Primary Source)

23.2 Attachments

Attachment A: Training Plan for Analysis of TO-17 by GC/MS
Attachment B: TO-17 by GC/MS Initial Calibration Checklist
Attachment C: TO-17 by GC/MS Analyses Data Review Checklist

TABLE 1

Required BFB Key Ions and Ion Abundance Criteria for Method TO-15

Mass	Ion Abundance Criteria[2]
50	8.0 to 40.0 percent of m/e 95
75	30.0 to 66.0 percent of m/e 95
95	Base Peak, 100 Percent Relative Abundance
96	5.0 to 9.0 Percent of m/e 95
173	Less than 2.0 Percent of m/e 174
174	50.0 to 120.0 Percent of m/e 95
175	4.0 to 9.0 Percent of m/e 174
176	93.0 to 101.0 Percent of m/e 174
177	5.0 to 9.0 Percent of m/e 176

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TABLE 2

VOLATILE ORGANIC COMPOUNDS EPA COMPENDIUM METHOD TO-17					
Compound	**CAS Number**	**Primary Ion**	**Secondary Ion(s)**	**MRL (ng/sample)**	**Internal Standards/Molecular Weight**
Bromochloromethane (IS1)	74-97-5	130	128, 132	NA	-
Dichlorodifluoromethane (CFC 12)	75-71-8	85	87, 101, 103	0.5	IS1/120.9
Chloromethane	74-87-3	50	52	0.5	IS1 / 50.49
Freon 114	76-14-2	135	137	0.5	IS1 / 170.92
Vinyl Chloride	75-01-4	62	64	0.5	IS1 / 62.50
1,3-Butadiene	106-99-0	54	39, 53	0.5	IS1 / 54.09
Bromomethane	74-83-9	94	96, 93	2.0	IS1 / 94.94
Chloroethane	75-00-3	64	66	2.0	IS1 / 64.52
Ethanol	64-17-5	45.	46	5	IS1 / 46.07
Acetonitrile	75-05-8	41	40	1.0	IS1 / 41.05
Acrolein	107-02-8	56	55	2	IS1 / 56.06
Acetone	67-64-1	58	43	5.0	IS1 / 58.08
Trichlorofluoromethane	75-69-4	101	103	0.5	IS1 / 137.37
Isopropanol	67-63-0	45	43	0.5	IS1 / 60.10
Acrylonitrile	107-13-1	53	52	0.5	IS1 / 53.06
1,1-Dichloroethene	75-35-4	96	61	0.5	IS1 / 96.94
Methylene Chloride	75-09-2	84	49	0.5	IS1 / 84.93
Allyl Chloride	107-05-1	41	76	0.5	IS1 / 76.53
Trichlorotrifluoroethane	76-13-1	151	101	0.5	IS1 / 187.38
Carbon Disulfide	75-15-0	76	78	2.0	IS1 / 76.14
trans-1,2-Dichloroethene	156-60-5	61	96	0.5	IS1 / 96.94
1,1-Dichloroethane	75-34-3	63	65	0.5	IS1 / 98.96
Methyl tert-Butyl Ether	1634-04-4	73	57	0.5	IS1 / 88.15
Vinyl Acetate	108-05-4	86	43	0.5	IS1 / 86.09
2-Butanone	78-93-3	72	43	0.5	IS1 / 72.11
cis-1,2-Dichloroethene	156-59-2	61	96	0.5	IS1 / 96.94
n-Hexane	110-54-3	57	86	0.5	IS1 / 86.18
Chloroform	67-66-3	83	85	0.5	IS1 / 119.38
1,2-Dichloroethane-d4(S)	10706-07-0	65	67	NA	IS1 / 102.98
Tetrahydrofuran	109-99-9	72	71,42	0.5	IS1/72.11
1,2-Dichloroethane	107-06-2	62	64	1.0	IS1 / 98.96

TABLE 2 (Continued)

VOLATILE ORGANIC COMPOUNDS EPA COMPENDIUM METHOD TO-17					
Compound	**CAS Number**	**Primary Ion[1]**	**Secondary Ion(s)[1]**	**MRL (ng/sample)[2]**	**Internal Standards/Molecular Weight**
1,4-Difluorobenzene(IS2)	540-36-3	114	88	NA	-
1,1,1-Trichloroethane	71-55-6	97	99, 61	0.5	IS2 / 133.41
Benzene	71-43-2	78	77	1.0	IS2 / 78.11
Carbon Tetrachloride	56-23-5	117	119	0.5	IS2 / 153.82
Cyclohexane	110-87-7	84	69,56	0.5	IS2/84.16
1,2-Dichloropropane	78-87-5	63	62	0.5	IS2 / 112.99
Bromodichloromethane	75-27-4	83	85	0.5	IS2 / 163.83
Trichloroethene	79-01-6	130	132	0.5	IS2 / 131.39
1,4-Dioxane	123-91-1	88	58	1.0	IS2 / 88.11
2,2,4-Trimethylpentane (Isooctane)	540-84-1	57	41	0.5	IS2/114.23
n-Heptane	142-82-5	71	57,100	0.5	IS2/100.2
cis-1,3-Dichloropropene	10061-01-5	75	77	0.5	IS2 / 110.97
4-Methyl-2-Pentanone	108-10-1	58	43, 85, 100	0.5	IS2 / 100.16
trans-1,3-Dichloropropene	10061-02-6	75	77	0.5	IS2 / 110.97
1,1,2-Trichloroethane	79-00-5	97	83	0.5	IS2 / 133.41
Chlorobenzene-d5(IS3)	3114-55-4	82	117, 54	NA	-
Toluene-d8(S)	2037-26-5	98	100	NA	IS3/100.189
Toluene	108-88-3	91	92	0.5	IS3 / 92.14
2-Hexanone	591-78-6	43	58	0.5	IS3 / 100.16
Dibromochloromethane	124-48-1	129	127	0.5	IS3 / 208.29
1,2-Dibromoethane	106-93-4	107	109	0.5	IS3 / 187.87
Butyl Acetate	123-86-4	43	56, 73, 61	1.0	IS3 / 116.16
n-Octane	111-65-9	57	114	0.5	IS3/114.23
Tetrachloroethene	127-18-4	166	164	0.5	IS3 / 165.83
Chlorobenzene	108-90-7	112	114	0.5	IS3 / 112.56
Ethylbenzene	100-41-4	91	106	0.5	IS3 / 106.17
m-& p-Xylene	136777-61-2	91	106	1.0	IS3 / 106.17
Bromoform	75-25-2	173	175	0.5	IS3 / 252.75
Styrene	100-42-5	104	78, 103	0.5	IS3 / 104.15
1,1,2,2-Tetrachloroethane	79-34-5	83	85	0.5	IS3 / 167.85
o-Xylene	95-47-6	91	106	0.5	IS3 / 106.17
n-Nonane	111-84-2	43	57, 85, 128	0.5	IS3 / 128.26
4-Bromofluorobenzene(S)	460-00-4	174	176	NA	IS3/175
Cumene	98-82-8	105	120	0.5	IS3 / 120.20

TABLE 2 (Continued)

VOLATILE ORGANIC COMPOUNDS EPA COMPENDIUM METHOD TO-17					
Compound	**CAS Number**	**Primary Ion[1]**	**Secondary Ion(s)[1]**	**MRL (ng/sample)[2]**	**Internal Standards/Molecular Weight**
Alpha-Pinene	80-56-8	93	77	1.0	IS3 / 136.24
4-Ethyltoluene	622-96-8	105	120	0.5	IS3 / 120.20
1,3,5-Trimethylbenzene	108-67-8	105	120	0.5	IS3 / 120.20
1,2,4-Trimethylbenzene	95-63-6	105	120	0.5	IS3 / 120.20
Benzyl Chloride	100-44-7	91	126	1.0	IS3 / 126.59
1,3-Dichlorobenzene	541-73-1	146	148	0.5	IS3 / 147
1,4-Dichlorobenzene	106-46-7	146	148	0.5	IS3 / 147
1,2-Dichlorobenzene	95-50-1	146	148	0.5	IS3 / 147
d-Limonene	5989-27-5	68	93	1.0	IS3 / 136.24
1,2,Dibromo-3-Chloropropane	96-12-8	157	75, 39	0.5	IS3 / 236.33
1,2,4-Trichlorobenzene	120-82-1	184	145, 180, 182	0.5	IS3 / 181.45
Naphthalene	91-20-3	128	129	0.5	IS3 / 128.17
Hexachloro-1,3-butadiene	87-68-3	225	227	0.5	IS3 / 260.76

Note 1: These are suggested primary and secondary ions. However, any ions in the analyte spectra that are sufficient enough in response to reach the desired reporting limit and having a limited amount of interference, is acceptable for both the primary and secondary ion selection. Analyst experience should be utilized in determining appropriate ions.

Note 2: The method reporting limit listed is the standard limit (lowest concentration in the initial calibration curve), but may change with each new initial calibration performed. Therefore, current reporting limits should be reviewed.

Table 3
Standard Concentrations (Primary Sources)

Compound Name	Density	0.1ng	0.2ng	0.5ng	1.0ng	5.0ng	25ng	50ng	100ng
	(g/mL)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)
Dichlorodifluoromethane	1.329	0.105	0.210	0.525	1.05	5.25	26.3	52.5	105
Chloromethane	0.911	0.100	0.200	0.500	1.00	5.00	25.0	50.0	100
Freon 114		0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
Vinyl Chloride	0.9106	0.101	0.202	0.505	1.01	5.05	25.3	50.5	101
1,3-Butadiene	0.6149	0.120	0.240	0.600	1.20	6.00	30.0	60.0	120
Bromomethane	1.6755	0.102	0.204	0.510	1.02	5.10	25.5	51.0	102
Chloroethane	0.8902	0.101	0.202	0.505	1.01	5.05	25.3	50.5	101
Ethanol	0.7893	0.520	1.040	2.60	5.20	26.0	130	260	520
Acetonitrile	0.7857	0.105	0.210	0.525	1.05	5.25	26.3	52.5	105
Acrolein	0.840	0.108	0.216	0.540	1.08	5.40	27.0	54.0	108
Acetone	0.7845	0.550	1.100	2.75	5.50	27.5	138	275	550
Trichlorofluoromethane		0.105	0.210	0.525	1.05	5.25	26.3	52.5	105
Isopropanol	0.7809	0.189	0.378	0.945	1.89	9.45	47.3	94.5	189
Acrylonitrile	0.8060	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
1,1-Dichloroethene	1.213	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110
Methylene Chloride	1.3266	0.107	0.214	0.535	1.07	5.35	26.8	53.5	107
Allyl Chloride	0.9376	0.108	0.216	0.540	1.08	5.40	27.0	54.0	108
Trichlorotrifluoroethane	1.5635	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110
Carbon Disulfide	1.2632	0.107	0.214	0.535	1.07	5.35	26.8	53.5	107
trans-1,2-Dichloroethene	1.2565	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
1,1-Dichloroethane	1.1757	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
Methyl tert-Butyl Ether	0.7405	0.109	0.218	0.545	1.09	5.45	27.3	54.5	109
Vinyl Acetate	0.9317	0.502	1.004	2.51	5.02	25.1	126	251	502
2-Butanone	0.7999	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110
cis-1,2-Dichloroethene	1.2837	0.109	0.218	0.545	1.09	5.45	27.3	54.5	109
n-Hexane	0.6548	0.109	0.218	0.545	1.09	5.45	27.3	54.5	109
Chloroform	1.4832	0.107	0.214	0.535	1.07	5.35	26.8	53.5	107
Tetrahydrofuran	0.8892	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110
1,2-Dichloroethane	1.2351	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
1,1,1-Trichloroethane	1.3390	0.105	0.210	0.525	1.05	5.25	26.3	52.5	105
Benzene	0.8765	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
Carbon Tetrachloride	1.5940	0.108	0.216	0.540	1.08	5.40	27.0	54.0	108
Cyclohexane	0.7739	0.215	0.430	1.08	2.15	10.8	53.8	108	215
1,2-Dichloropropane	1.1560	0.105	0.210	0.525	1.05	5.25	26.3	52.5	105
Bromodichloromethane	1.980	0.108	0.216	0.540	1.08	5.40	27.0	54.0	108
Trichloroethene	1.4642	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
1,4-Dioxane	1.0337	0.107	0.214	0.535	1.07	5.35	26.8	53.5	107
2,2,4-Trimethylpentane (Isooctane)	0.6877	0.105	0.210	0.525	1.05	5.25	26.3	52.5	105
n-Heptane	0.6837	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
cis-1,3-Dichloropropene	1.224	0.099	0.198	0.495	0.990	4.95	24.8	49.5	99.0
4-Methyl-2-Pentanone	0.7965	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110
trans-1,3-Dichloropropene	1.217	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110

Compound Name	Density	0.1ng	0.2ng	0.5ng	1.0ng	5.0ng	25ng	50ng	100ng
	(g/mL)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)	Conc(ng)
1,1,2-Trichloroethane	1.4397	0.105	0.210	0.525	1.05	5.25	26.3	52.5	105
Toluene	0.8669	0.108	0.216	0.540	1.08	5.40	27.0	54.0	108
2-Hexanone	0.8113	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110
Dibromochloromethane	2.451	0.115	0.230	0.575	1.15	5.75	28.8	57.5	115
1,2-Dibromoethane	2.1791	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
Butyl Acetate	0.8825	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110
n-Octane	0.6986	0.107	0.214	0.535	1.07	5.35	26.8	53.5	107
Tetrachloroethene	1.6227	0.102	0.204	0.510	1.02	5.10	25.5	51.0	102
Chlorobenzene	1.1058	0.108	0.216	0.540	1.08	5.40	27.0	54.0	108
Ethylbenzene	0.8670	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
m- & p-Xylene	0.8642, 0.8611	0.208	0.416	1.04	2.08	10.4	52.0	104	208
Bromoform	2.899	0.103	0.206	0.515	1.03	5.15	25.8	51.5	103
Styrene	0.9060	0.107	0.214	0.535	1.07	5.35	26.8	53.5	107
o-Xylene	0.8802	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
n-Nonane	0.7176	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
1,1,2,2-Tetrachloroethane	1.5953	0.107	0.214	0.535	1.07	5.35	26.8	53.5	107
Cumene	0.8618	0.103	0.206	0.515	1.03	5.15	25.8	51.5	103
alpha-Pinene	0.859	0.101	0.202	0.505	1.01	5.05	25.3	50.5	101
4-Ethyltoluene	0.8614	0.109	0.218	0.545	1.09	5.45	27.3	54.5	109
1,3,5-Trimethylbenzene	0.8652	0.109	0.218	0.545	1.09	5.45	27.3	54.5	109
1,2,4-Trimethylbenzene	0.8758	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
Benzyl Chloride	1.1004	0.108	0.216	0.540	1.08	5.40	27.0	54.0	108
1,3-Dichlorobenzene	1.2884	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110
1,4-Dichlorobenzene	1.2475	0.109	0.218	0.545	1.09	5.45	27.3	54.5	109
1,2-Dichlorobenzene	1.3059	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
d-Limonene	0.8402	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106
1,2-Dibromo-3-Chloropropane	2.093	0.109	0.218	0.545	1.09	5.45	27.3	54.5	109
1,2,4-Trichlorobenzene	1.459	0.110	0.220	0.550	1.10	5.50	27.5	55.0	110
Naphthalene	1.0253	0.112	0.224	0.560	1.12	5.60	28.0	56.0	112
Hexachloro-1,3-butadiene	1.556	0.106	0.212	0.530	1.06	5.30	26.5	53.0	106

Note: The concentrations (for analytes in gas form) detailed in this table may change with each standard purchased. Refer to the TO-17 method manual, where necessary, for a current list.

ATTACHMENT A

Training Plan for Analysis of VOCs by GC/MS

Training Plan for Analysis of VOCs by GC/MS

SOP Title: Determination of VOCs in Ambient Air using Sampling Onto Sorbent Tubes Revision: _____ Date: _____

Trainee: _____ Trainer: _____ Instrument: _____

1. Read SOP *Training Duration:* _____ Trainer: ____ Trainee: ____ Date: _____
2. Read Methods TO-15 and TO-17 *Training Duration:* _____ Trainer: ____ Trainee: ____ Date: _____
3. Demonstrated understanding of the scientific basis of the analysis Trainer: ____ Trainee: ____ Date: _____
   - Whole air sample preconcentration techniques *Training Duration:* _____
   - Gas chromatography *Training Duration:* _____
   - Mass spectrometry *Training Duration:* _____
4. Demonstrated familiarity with related SOPs *Training Duration:* _____ Trainer: ____ Trainee: ____ Date: _____
   - SOP for Batches and Sequences; Rev. ____
   - SOP for Making Entries into Logbooks and onto Benchsheets; Rev. ____
   - SOP for Manual Integration of Chromatographic Peaks; Rev. ____
   - SOP for Significant Figures; Rev. ____
   - SOP for Corrective Action; Rev. ____
   - SOP for Performing Method Detection Limit Studies and Establishing Limits of Detection and Quantitation; Rev. ____
5. Observe performance of SOP *Training Duration:* _____ Trainer: ____ Trainee: ____ Date: _____
   - ___Sample preparation and sample loading and analysis
   - ___Analytical sequence setup
   - ___standard preparation
   - ___BFB tuning evaluation/initial calibration/initial calibration verification
   - ___Continuing calibration verification
   - ___EnviroQuant introduction
   - ___Data reduction and reporting
   - ___ Canister and tube handling
6. Perform SOP with supervision *Training Duration:* _____ Trainer: ____ Trainee: ____ Date: _____
   - ___Sample preparation/dilution and sample loading
   - ___Analytical sequence setup
   - ___standard preparation
   - ___BFB tuning evaluation/initial calibration/initial calibration verification
   - ___Continuing calibration verification
   - ___Sample analysis
   - ___EnviroQuant use
   - ___Data reduction and reporting
   - ___ Canister and tube handling
7. Independent performance of the SOP *Training Duration:* _____ Trainer: ____ Trainee: ____ Date: _____
   - ___Sample loading and sample dilutions
   - ___Analytical sequence setup
   - ___Standard preparation
   - ___BFB tuning evaluation/initial calibration/initial calibration verification
   - ___Continuing calibration verification
   - ___Sample analysis
   - ___EnviroQuant proficiency
   - ___Data reduction and reporting
   - ___Canister and tube handling
   - ___Initial demonstration of competency (4 Laboratory Control Samples)
8. Instrument operation and maintenance Trainer: ____ Trainee: ____ Date: _____
   - ___Autosampler *Training Duration:* _____
   - ___Gas chromatograph and capillary column installation *Training Duration:* _____
   - ___Mass spectrometer *Training Duration:* _____
   - ___Data system *Training Duration:* _____

ATTACHMENT B

Initial Calibration Review Checklist

EPA Compendium Method TO-17
ICAL Date: _____
Instrument: ☐ MS5 ☐ MS17 ☐ MS18
Mode: ☐ SIM ☐ SCAN

Initial Calibration Review Checklist

Analyst **Reviewer**

☐ 1. Is the required documentation in the ICAL file? ☐
- ☐ BFB Tune analysis Report ☐
- ☐ Calibration Status Report (aka Calibration History) ☐
- ☐ Response Factor Report/Percent RSD ☐
- ☐ Print of the calibration curve for any compound that uses a curve (instead of an average RF) ☐
- ☐ Quantitation Report for each calibration standard (including manual integration documentation) ☐
- ☐ ICV Quantitation Report ☐

☐ 2. Was the ICAL performed continuously (i.e., not interrupted for maintenance or for sample analysis)? ☐

☐ 3. Have all the calibration standards been analyzed within 24 hours of each other? ☐

☐ 4. Does the BFB tune check standard analysis at the start meet the tune criteria? ☐

☐ 5. Are all the analytes in the blank analysis <MRL? ☐

☐ 6. Does each analyte's ICAL include a minimum of 5 concentrations at 5 consecutive levels? ☐

☐ 7. Were the standards analyzed from low concentration to high concentration? ☐

☐ 8. For each analyte, are there no levels skipped? ☐

☐ 9. For each analyte, is there only one value used for each calibration level? ☐

☐ 10. For each analyte, is the lowest standard's concentration at or below the analyte's MRL? ☐

☐ 11. If a point is dropped, are all the responses for each target analyte dropped and is the information noted in the ICAL explaining the reason? ☐

☐ 12. Is the average RSD <30% for all analytes, with no more than two exceptions <40%? ☐

☐ 13. Is the response Y at each calibration level within 40% of the mean area response over the initial calibration range for each internal standard? ☐

☐ 14. For the ICV analysis, is the percent recovery for each analyte 70-130%? ☐
- ☐ Or percent recovery 50-150% (List compounds below – Report as Method Modification) ☐

☐ 15. Was the RRT for each target compound at each calibration level within 0.06RRT units of the mean RRT for the compound? ☐

☐ 16. Is the retention time shift for each of the internal standards at each calibration level within 20s of the mean retention time over the initial calibration range for each standard? ☐

☐ 17. If there are any manual integrations, are they performed correctly according to the corresponding SOP. If so, initial and date the appropriate pages. ☐

COMMENTS:

Analyst: _____ Date: _____

Secondary Reviewer: _____ Date: _____

ATTACHMENT C

Data Review Checklist

EPA Compendium Method TO-17 Data Review Checklist

(Note exceptions in Comments Section and attach Nonconformity and Corrective Action Reports as appropriate)

Analysis Date: _____ Analyst: _____ CAS Project #: _____

Instrument: ☐ MS5 ☐ MS17 ☐ MS18 Analysis Mode: ☐ SIM ☐ SCAN

☐ 1. Is the required documentation present? ..... ☐
- ☐ BFB Tune analysis Report
- ☐ CCV analysis Quantitation Report and Evaluate Continuing Calibration Report. (aka Percent Diff. report)
- ☐ LCS/LCSD analysis Quantitation Report
- ☐ MB analysis Quantitation Report
- ☐ Quantitation Report for each sample including
  - ☐ manual integration documentation
  - ☐ spectral match details for each hit, where necessary

☐ 2. Does the BFB **tune** check standard analysis meet the tune criteria? ..... ☐

☐ 3. Are all analyses within the tune's **24-hr. window**? ..... ☐

☐ 4. Does the **CCV** have a difference ≤30% for all analytes? ..... ☐
[Note outliers biased high and/or low]

☐ 5. Are all the **IS** retention times within 20 seconds of the CCV RT or the RT from the midpoint (ICAL)? .. ☐

☐ 6. Are all the **IS** responses within ±40% of CCV or the midpoint in the ICAL? ..... ☐

☐ 7. Are all the **surrogate** recoveries (in CCVs, MBs, LCSs, etc.) within acceptance limits (70%-140%)? .... ☐

☐ 8. Are all the analytes in the **MB** <MRL? ..... ☐

☐ 9. Are all the analytes in the **LCS and LCSD** within 70-130% recovery acceptance limits? ..... ☐
- ☐ Or percent recovery 50-150% (List Compounds Below – Report as Method Modification ..... ☐

☐ 10. Is the RPD between the **LCS** and **LCSD** < or = to 25%? ..... ☐

☐ 11 Are all the analyte hits in the samples within the **calibration range** and/or noted? ..... ☐

☐ 12. Are all peak **integrations** acceptable? ..... ☐

☐ 13. Are all manual **integrations** flagged and documented? ..... ☐

☐ 14. Are all **calculations** correct? ..... ☐

☐ 15. Has the analyst initialed and dated each **quantitation report**? ..... ☐

☐ 16. For TICs are the relative intensity and other requirements met? ..... ☐

COMMENTS:

Initial Reviewer: _____ Secondary Reviewer: _____
Date: _____ Date: _____

Appendix D

Standard Operating Procedures

AECOM

Standard Operating Procedure

Investigation of Vapor Intrusion Pathway

Revision: 0.0

Revision Date: June 2010

Contents

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1.0 Scope and applicability

1.1 This Standard Operating Procedure (SOP) has been developed, reviewed, and approved for use by AECOM's Environmental Operations. This SOP defines the steps and measures that will be taken prior to performing work associated with an air sparging pilot test which is known or suspected to contain hazardous materials and/or wastes.

1.2 In the event the Project Manager or Project Team determines that the protocols and procedures listed in this SOP are not applicable to the project, there is the option to either modify this SOP or to develop a site-specific SOP to more closely match the requirements of the project. Refer to SOP 1011, Preparation and Control of Standard Operating Procedures, for SOP modification and Project Operating Procedure (POP) development procedures.

The standard operating procedure (SOP) presented here is based on methods used and recommended by AECOM. This SOP provides methods to be used for the monitoring and collection of indoor air, ambient air, soil gas, and sub-slab vapor samples for the purpose of evaluating the vapor intrusion to indoor air pathway as well as the general approach for the evaluation of these data. The standard operating procedures detailed below are general guidelines that should be followed during sampling events and evaluation of data. However, the applicable state and country environmental regulations, site conditions, the level of data quality, and budget restrictions should be considered to determine appropriate procedures.

2.0 Health and safety considerations

This section presents the generic hazards associated with soil gas measurement techniques and is intended to provide general guidance in preparing site-specific health and safety documents. The site-specific HASP and Job Safety Analyses (JSAs) will address additional requirements and will take precedence over this document. Note that soil gas sampling typically requires Level D personal protective equipment (PPE) unless there is a potential for airborne exposures to site contaminants.

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

- Hazardous materials (exposure and/or release)
- Underground utilities
- High noise levels
- Eye hazards
- Air quality (i.e., chemical, dust, explosive conditions)
- Uneven walking/working surfaces
- Electric equipment operation (e.g., jackhammer)
- Pinch points
- Loose clothing
- Heavy lifting

- Overhead hazards
- Hand hazards

3.0 Interferences

3.1 Depending on the specific site operating and access conditions, interferences to AECOM implementing this SOP can include, but are not limited to the following:

3.1.1 Lack of cooperation from the employees, land owners or tenants at the site or surrounding areas and/or limited access to the site working locations due to physical obstructions (i.e. parked vehicles or equipment, facility operations, etc.).

3.1.2 Inability to clearly identify underground hazards: This would include an inability to accurately delineate utilities, USTs or restrictions to inspect portions of the site where AECOM work will be conducted, or limitations of underground hazard locating equipment (e.g. cable locators) due to interferences caused by surface or near-surface structures (e.g. rebar, concrete).

4.0 Equipment and materials

The materials and equipment needed by the sample collection personnel may include the following (details regarding the site layout and scope of work should be reviewed to determine exact material needs):

- General Materials
  - Field notebook and field log forms
  - Pens (ball point and indelible ink/Sharpe)
  - Flagging tape (if necessary to mark locations)
  - Camera for photo-documenting sampling locations, building construction, utilities, etc.
  - Chain of custody forms
  - Sample labels
  - Custody seals
  - Clear Packing Tape
  - Tool box with common hand tools (wrenches of various sizes, screw drivers, tubing cutters, etc.)
  - Electric jackhammer/ drill
  - Coring drill, for sampling soil gas below a slab
  - Generator with extension cords and ground fault protection (if functional electric outlets are unavailable)
  - Soil gas probe assembly (Geoprobe SP-15 or equivalent) when sampling soil gas
  - Quick connect fittings to connect sampling probe tubing, monitoring instruments, and sample canisters to appropriate fittings on the soil gas probe assembly when sampling soil gas

- Granular bentonite and potable water for sealing around the soil gas probe when sampling soil gas
- Mixing basin, tremie pipe, pump and hose for bentonite slurry mixing and installation
- Lift jack for removing the soil gas probe from borehole when sampling soil gas
- Photoionization Detector (PID) and calibration gas
- Surface box with lockable cover (such as a groundwater monitoring well completion box) to protect and secure the soil gas nested sampling probes
- Sample shipping containers and materials
- A copy of the site-specific HASP
- Any available utility/building plans

- Air Sampling Apparatus and Materials
  - Summa® canister – electropolished, 100% certified clean, evacuated and wrapped for shipping
  - Flow controller – 100% certified clean, set (by laboratory) at desired sampling rate and wrapped for shipping
  - Sampling probe – Stainless steel, Teflon® or Nylaflow® (rigid wall nylon tubing) with 1/8-inch or ¼-inch OD, fitted with compression fittings (Swagelok®) , pre-cleaned (by laboratory) and wrapped for shipping
  - Connecting tubing - Stainless steel tubing (straight and splitter) and valves
  - Shipping Container – suitable for protection of canister during shipping
  - Wrenches and screw drivers of various sizes (clean and free of contaminants) - for making adjustments to flow controller
  - Bubble flow meter or equivalent (clean and free of contaminants) - used in the adjustment of the flow controller
  - Negative pressure gauge (clean and free of contaminants)– either installed on the canister or used externally to check canister pressure
  - Zero air ultra high purity (UHP) purge gas and regulator – for purging and cleaning flow controller between uses

5.0 Procedures

5.1 Subsurface Utility Clearance

Prior to commencing subsurface fieldwork when sampling soil gas, field personnel should work with the facility manager or property owner to locate and mark any subsurface utilities or structures and discuss any pertinent health and safety issues. Note that AECOM and client specific utility clearance protocols must be understood prior to mobilization to the field. These protocols may involve state required utility notification and mark-out procedures, geophysical surveys, and/or pre-excavation of subsurface locations by soft/low energy digging methods.

5.2 Background Data Collection

Background information on buildings where vapor intrusion is of concern should include the following:

- Interviewing the occupants of each of the buildings
- Surveying the building and the basement, crawl space, or concrete slab on grade
- Documenting environmental conditions, all of which may affect air sampling results.

5.2.1 Occupant Interviews (Indoor Air Sampling Only)

If appropriate to the investigation and practical for the site, prior to conducting indoor air sampling, at least one occupant from each building being evaluated, as applicable, should be interviewed to determine the specific types of products containing volatile organic compounds (VOCs) that are used or stored within the building and the occupant use patterns of the building. The interview should include determination of the following items:

- Length of time the occupant spends in the building during a typical day
- Time each occupant spends in the basement, if present
- If any occupants smoke tobacco products in/near the building and the frequency
- Products containing VOCs that are used in the building for cleaning, maintenance, or other activities – obtaining copies of material safety data sheets (MSDS) for these products is recommended as part of the products' inventory.
- Storage location of each product containing VOCs
- Frequency of use of each product containing VOCs
- Methods of handling and disposing of products containing VOCs
- Identification of commercially cleaned products within the building (e.g. drycleaned clothing)
- Type of heating system used in the building and general time of day/seasons of use
- Recent remodeling or redecorating activities
- Wells or cistern and associated piping present in or near the building

The information obtained, along with other pertinent information, should be documented. To simulate worse-case conditions windows should remain closed 24 hours prior to the sampling event. If it is determined that windows have been opened within the 24 hour period prior to sampling, the sampling team should postpone sampling and return at a later time to obtain the sample.

5.2.2 Indoor Survey

To account for VOC sources other than from the subsurface, a survey of the building and basement (if present) should be conducted prior to conducting indoor air sampling. In an effort to identify and document these possible sources, the following items should be noted during the indoor survey.

- Age of the building
- Physical dimensions, layout, and type of material construction of the building/basement

- Furnace location and type of fuel used
- Other appliances and type (e.g., hot water heaters, dryers, stoves, etc.)
- Stored volatile materials (e.g., paints, thinner, gasoline, etc.)
- Gasoline-powered engines (e.g., lawnmowers, generators, etc.)
- Condition and type of walls and floor
- Floor drain(s) location and discharge
- Basement wall/floor joints and sumps
- Other utility conduits entering the basement or lowest occupied space
- Air intake locations for combustion appliances (heating, etc)
- Garage location (attached or not) and contents (autos, stored volatiles, etc.)
- Evidence of recent remodeling or redecorating activities (e.g., carpet, tile, painting, drywall, drapery, furniture, etc.)
- Type of active ventilation (open windows, fans, heating, etc.)
- Visual inspection for a well or cistern present near or in the house

The information gathered should be documented.

5.3 Environmental Factors

Written documentation of field conditions is recommended. Information regarding several environmental factors should be obtained prior to, during, and after sample collection and documented since they may affect the results of the soil gas sampling. These factors include:

- Weather conditions
  - Indoor and outdoor air temperatures (measured with a thermometer)
  - Wind speed and direction, and humidity (from local meteorological station)
  - Degree of cloud cover (observed)
  - Barometric pressure (from local meteorological station) and trend (rising or falling)
- Soil Conditions
  - Information regarding any recent rainfall or snowfall events or irrigation activities
  - The presence of frozen or wet surface soils (observed)
  - Groundwater elevations

Atmospheric conditions should be taken into account when scheduling the soil gas sampling activities. If possible, these activities should be done during falling barometric pressure conditions so as to take advantage of an upward soil gas pressure gradient, which would lead to measurements under conservative, worst-case conditions. In northern climates, a good time for collecting sample is when the heating system is in use in the

building. Soil gas sampling should not be conducted during or immediately after significant rainfall events (≥0.5 inches) or equivalent irrigation.

5.4 Air Monitoring/Sampling for Subsurface Vapor Intrusion

Air monitoring and/or sampling may be conducted in order to evaluate the vapor intrusion to indoor air pathway. A method of air monitoring that may be used to determine the presence or absence of VOCs/explosive atmospheres are:

- Air monitoring for the presence of VOCs and/or explosive atmospheres may be conducted using a Photo-Ionization Detector (PID) (see Section 5.4.1).

Three types of air sampling are detailed below:

- Indoor air sampling may be conducted in the basement, crawl space, or lowest occupied space of a building to quantify air concentrations of VOCs (see Section 5.4.2).
- Ambient air sampling may be conducted outdoors in the immediate vicinity of the building of concern (see Section 5.4.3).
- Soil gas sampling may be conducted at various depths below grade to quantify air concentrations within the soil column and to determine the attenuation factor of VOCs as they migrate towards the surface (see Section 5.4.4).

Air monitoring methods are detailed in Section 5.4.1. Standard operating procedures detailed below are general guidelines that should be followed during air monitoring/sampling events. However, the applicable regulations, site conditions, the level of data quality, and budget restrictions should be considered to determine appropriate procedures.

5.4.1 Preliminary Air Monitoring/PID Screening

Screening using a photoionization detector (PID) should be used to monitor for the presence of VOCs and/or explosive atmospheres prior to air sampling within an occupied space. Using this procedure, an occupied or otherwise enclosed space can be evaluated for sources of combustible gasses (e.g., natural gas from a furnace), sources of VOCs, (e.g., paint thinner), and/or areas that may contain higher concentrations of VOCs where air sampling may be warranted. The use of a PID and Combustible Gas Indicator (CGI) should be used in tandem in order to evaluate if air monitoring/sampling results may be influenced by sources other than vapor intrusion to indoor air.

Sampling equipment for PID screening include a CGI (Bacharach TLV Sniffer) or equivalent for combustible gasses, and a PID (HNu Model 101, 10.2-electronvolt [eV] lamp) or equivalent for VOC monitoring. The CGI should detect natural gas (methane) and other combustible organic compounds; however, methane should not be distinguishable from other combustible organic compounds. The detection limit for the CGI is 2 parts per million (ppm), with a range of 2 to 10,000 ppm. The PID should detect all organic compounds with an ionization potential below 10.2 eV; however, it can not distinguish between one VOC and another (e.g., benzene and toluene). Methane, on the other hand, has an ionization potential greater than 10.2 eV and is therefore not detectable with a PID. The detection limit for the HNu Model 101 is 0.2 ppm, with a range of 0.2 to 2,000 ppm. CGIs and PIDs should be checked and calibrated according to the manufacturer's directions prior to use.

Standard procedures supplied from the manufacturer should be followed for CGI testing and PID screening. Prior to PID screening, an inspection of natural gas lines and appliances and a check for natural gas leaks using a CGI should be conducted. Should any natural gas leaks be detected, sampling should not be performed until the identified leaks are repaired. The PID should be used to screen the building and the basement, crawl space, or concrete slab for VOCs. Initial monitoring should occur approximately halfway between the floor and ceiling near the center of the room and away from obstructions. A minimum of four other locations should also be monitored within the building and the basement, crawl space, or concrete slab in order to evaluate potential sources of VOCs or areas where VOCs are concentrated. Monitoring should also be conducted near possible sources of VOCs including furnaces, drains, basement wall/floor joints, floor sumps, and stored VOC products.

Data collected during monitoring events should be documented and evaluated in conjunction with information obtained during the Occupant Interview and Indoor Survey to determine if VOCs are present within the structure and/or if further sampling should occur.

5.4.2 Indoor Air Sampling (Basement, Crawl Space, or Lowest Occupied Space)

Indoor air sampling may be conducted in the basement, crawl space, or lowest occupied space of a building to quantify air concentrations of VOCs present within a structure. Data and observations from the PID screening (Section 5.4.1) or other site-specific information should be used to determine the best location for indoor air samples. Indoor air samples should be collected approximately at breathing height (2 to 5 ft), near the center of the room and away from obstructions. Evacuated, polished, and 100% certified clean Summa® canisters (Section 5.4.6), with 100% certified clean inlet flow control valves, should be used to collect air samples over an eight or 24-hour period and analyzed using USEPA Method TO-15.

Data collected during sampling events should be documented and evaluated in conjunction with information obtained during the Occupant Interview and Indoor Survey to determine if VOCs are present within the structure and/or if further sampling should occur.

5.4.3 Ambient Air Sampling

The methodology for collecting ambient air is consistent with that presented above for collecting samples using Summa® canisters (Section 5.4.6). However, there are some considerations specific to ambient air sampling.

Ambient (outdoor) samples are collected to characterize site-specific outdoor air contaminants and provide an outdoor air quality baseline, to which subsurface sources are additive. Ambient air samples should be, at a minimum, collected from one representative upwind location, one location between the structure and the release, and one location in proximity to any nearby ambient air VOC sources, including oil wells, storage tanks, and roadways. The samples should be collected from 3 to 5 feet off the ground to approximate the breathing zone, and should be collected from a distance 5 to 15 feet away from the structure (ITRC, 2007).

5.4.4 Soil Gas Sampling

Soil gas sampling may be conducted at various depths below grade to quantify air concentrations within the soil column and to determine the attenuation factor of VOCs as they migrate towards the surface. The procedure for soil gas sampling using direct push technology is presented below as well as from permanent soil gas points for periodic monitoring.

All soil gas samples should be collected from the vadose zone, above the capillary and saturated zones. At some sites, a very narrow vadose zone may be present. If groundwater is extremely shallow, it may not be possible to collect a soil gas sample. In surficial soils, near the soil surface or building foundation (less than 5 feet below ground surface (bgs)), soil gas samples may be influenced by atmospheric processes such as wind, precipitation and changes in atmospheric pressure, and building effects (advective flow from the overlying building) (ITRC, 2007b). As such, representative soil gas samples are generally difficult to obtain in the soil horizon to 5 feet bgs. However, important processes such as oxygen replenishment, bioattenuation, and substructure flushing occur at near surface depths (<3 feet bgs) and sampling within this horizon should not necessarily be precluded, especially if site conditions dictate the need for shallower samples (ITRC, 2007b). Should shallower samples be collected, additional sample events will be required to ensure the representativeness of the samples obtained.

Soil gas sampling procedures using direct push technology

This section provides general guidance regarding the field methods to be used for soil gas sampling using direct push technology. Note that soil gas samples obtained using (temporary) direct push technologies are not recommended if data are to be used to support human health risk assessment.

As part of the soil gas sampling probe installation, soil samples collected using direct push drilling methods (e.g., hydraulic press) should exercise care in advancing probes in areas with known underground utilities or pipelines. Prior to collecting soil samples, each boring location should be surrounded by hand auger boreholes to clear the location of underground utilities or pipelines. When drilling at the soil gas sampling locations, soil cores should be collected in from multiple soil depth intervals to provide a vertical profile of the soil column.

Soil gas samples should be collected with a Geoprobe SP-15 sampler or equivalent. The probe assembly consists of an outer, 4-foot long, 1 ¼-inch outer diameter (OD) steel tube and an inner, stainless-steel, slotted screen (0.010 slot) that is 3 ½ feet long and has a ¾-inch OD. The end of the probe assembly is equipped with an expendable (single use) drive point. Each boring should be completed to the water table. The approximate depth of each boring should be determined prior to drilling by gauging the groundwater level in a nearby monitoring well (if available) as a guide. An electric jackhammer or direct-push drilling rig should be used to advance the probe assembly into the vadose zone to the depth specified. Extension rods should be attached to the probe assembly. The rods are steel, are 4-feet in length, and have a 1-inch OD. All connections between the sampling probe assembly and rods should be wrapped with Teflon® tape to ensure an airtight seal at all connection points.

After the probe is advanced to the final depth in the borehole, the slotted screened portion of the probe assembly should be exposed to the soil when the expendable drive point head is detached from the bottom of the assembly. This is accomplished when the outer portion of the assembly is retracted. Approximately 1 foot of the screen should be exposed to collect the soil gas sample. The annulus around the outer portion of the probe assembly (or extension rod) at the ground surface should then be sealed with granular bentonite, which should be hydrated to form an airtight seal. The seal is necessary to prevent ambient air from migrating down the outside of the probe and diluting the soil gas sample. Teflon or Nylon tubing should then be fitted to the top of the sampling assembly or extension rod. The tube should be clamped to ensure an airtight seal. The tubing length should be kept as short as possible.

Soil gas samples should be collected from the boreholes at a minimum approximately 30 minutes after installation to allow for an airtight seal to form and to allow equilibration of vapor concentrations between the

sampling probe and the vadose zone. Collecting soil gas samples using Summa® canisters should follow the procedures outlined for collecting integrated Summa® canister samples (collected over a 30 minute period) in Section 5.4.6.

Permanent Soil Gas Points

The target depth for the soil gas point should be determined based on building construction (basement depth below ground surface), depth to groundwater, and soil types. Where groundwater is deeper than a couple 6 to 8 feet, nested soil gas points may be considered. In general, the vertical distribution of nested screens will consist of one point just above the water table, and then a point every 3 to 5 feet everywhere else. Fine tuning of the intervals will depend on the distribution of permeable stratigraphic units.

Soil borings for the installation of SG points may be advanced by hand tooling, hand auger, or hollow stem auger depending on the target depth and soil type, but should not exceed 4-inches in diameter. During boring advancement, soils should be screened with a PID and described on a boring log. Soil samples may be collected from intervals where screens will be placed, and submitted for laboratory analysis for bulk density, specific gravity, moisture content, grain size, and total organic carbon to be used in the vapor intrusion modeling.

Soil gas points should be constructed of three inch by 1/4 inch screened stainless steel points attached to 1/8" ID by 3/16" OD Teflon or Nylon tubing extending to the ground surface. A filter sand pack should be placed to 3 inches below and 3 inches above the SG point. Approximately 1.5 feet of bentonite should be placed above the filter pack (and in between intervals at nested locations) and hydrated to seal the interval. Care must be taken to clearly label the Teflon or Nylon tubing at the surface as to the interval screened. The surface should be completed with a 6 to 8 inch road box to secure and protect the points when the points are not being monitored or sampled.

Soil gas sampling will be performed no less than 24 hours after SG point installation to allow for soil gas to re-equilibrate. Each soil gas point will be purged using a multiREA 4-gas plus PID meter. During purging PID readings will be recorded, as well as oxygen concentrations to screen for ambient air indicating failed borehole seals. A Tedlar bag may be attached to the PID to measure the purge volume. Following purging, soil gas samples will be collected with a laboratory certified Summa Canister (Section 5.4.6). For additional information on permanent soil gas point installation, monitoring and sampling, see the 2004 Westhollow Soil Gas Sampling Protocol and the API 2005 guidance document titled Collecting and Interpreting Soil Gas Samples from the Vadose Zone.

5.4.5 Sub-Slab Vapor Sampling

Sub-slab soil vapor points are typically installed through the floors of building or home interiors. The goal is to collect a sample from immediately below the foundation. This is achieved by coring through the floor with a 1 to 4 inch concrete coring machine. The utmost care must be taken to identify where utilities are present in the foundation to avoid damage and injury. Once the floor has been cored through to the subsurface, the boring should be advance no more than 2 to 12 inches below the base of the foundation. For temporary points, a small stainless steel screen less than three inches long should be placed in the boring and packed in sand to fill in the annular space. Teflon or Nylon tubing should be attached and extended to the ground surface. Bentonite for permanent points or modeling clay for temporary points should be placed above the screen and into the core through the foundation to for a strong/air-tight seal. If the point is permanent, a protective sleeve

and cover can be installed in the core-hole and secured with hydraulic cement. After allowing the bentonite to expand (0.5 to 1 hour) the point should be and then sampled using a Summa Canister (Section 5.4.6)

5.4.6 Collecting samples using Summa® canisters

Clean sampling protocols must be followed all times when handing and collecting samples. This requires care in the shipping, storage and use of all sampling equipment. Personnel that perform the sampling must maintain appropriate cleanliness: no smoking, eating or drinking, perfumes, or deodorants, and clean over garments are required (not dry cleaned).

Air samples should be collected using Summa® canisters that meet all the requirements specified for USEPA Method TO-15/TO-15 Selective Ion Monitoring (SIM). A 6-liter Summa® canister is recommended. Time-integrated samples, which will last from approximately 30 minutes to 24 hours, should be obtained by opening the valve to the evacuated canister and slowly bringing it to equilibrium with the source at a flow rate that should not exceed 200 milliliters/minute [mL/min]. Care must be taken not to allow the vacuum in the canister to reach 0 PSI, and in general, sampling is considered complete once the vacuum drops below 5 PSI. Inlet control valves may be used to ensure that the flow rate is approximately equal to the volume of the Summa® canister divided by the recommended sample collection time period. Duplicate samples, collected simultaneously, may be recommended for laboratory quality assurance/quality control (QA/QC).

The following general procedures should be used for obtaining samples using a Summa® canister:

- **Sampling System Preparation:**
  - Inspect the Summa® canister for damage. Do not use a visibly damaged container.
  - When sampling soil gas, the sampling equipment and tubing will be purged by connecting the tubing to a PID and allowing the PID to draw soil gas. The volume of air in the probe assembly and rods must be calculated. The PID will then be used to remove one volume of air in the sampling equipment or purge the equipment for a period of at least 5 minutes, whichever is longer.
  - The PID readings recorded during the purging will be recorded in the field book. Soil gas concentrations indicative of source or impacted areas should be expected to be in the ppm range, typically between 1 ppm and several hundred ppm. Most PIDs are designed to operate within this range.
  - All samples will be collected as time-integrated (not grab) samples by drawing air through the slotted screen and the tubing into a laboratory-supplied canister, which operates as a negative pressure vessel (Summa® canister).
  - Prior to sampling, verify that the vacuum pressure of the canister is equal to that indicated on the laboratory's evacuation tag: canister pressure should be greater than -28 inches of mercury (Hg). Do not use a canister that has leaked. If the pressure is less than -28 inches of Hg (e.g., -27 in Hg), contact the laboratory. The optimal pressure is -29.9 inches of Hg.
  - In the field log record the canister ID, flow controller ID, initial vacuum, desired flow rate, sample location information and all other pertinent information related to the sampling effort.
  - A flow controller may be used to collect the time-integrated sample. The flow controller may be a fixed rate flow controller and the length of sample time will be set by the laboratory. The flow controller fitting denoted ("LP" or "OUT") is connected to the canister. Tighten the fitting to be leak free but do not over tighten. The flow controller should not be used for more than one sample.

- **Sampling System Leak Check[1] and Purge:**
  - Connect the sampling interface (i.e., the probe assembly, purge system, and Summa® canister) and assure that all components are assembled and fittings snug (do not over-tighten).
  - Assuring that the sampling valves are closed, open the purge valve and flush vapor lines using a battery-powered pump or dedicated purge gas Summa® canister (be sure to label/flag this container as such). Purge vapor lines using the same flow rate used for subsequent sampling (<200 ml/min). The purge test data (i.e., purge volume, purging rate and duration of purging) should be recorded for each vapor sampling point. Note – to avoid subsequent "dead space" in the sampling probe commence sampling within 10-minutes of purging the probe.
  - If sampling crawl spaces remotely through a crawl space vent, adjust the length of the sampling probe to achieve the desired sampling location and place an inert "spacer" near the end of the probe to keep the probe tip opening about 3 inches above ground level. With the sampling probe in place, purge 3 volumes of crawl space air and then connect the sampling probe to the inlet of the flow controller.
  - A leak-free system in confirmed by closing the purge valve and observing no loss in vacuum pressure within the sampling interface system. Repair any leaks prior to sampling.
  - Record the date, time and outcome (including measures taken to correct an apparent leak) of the leak check in the field sampling log.
- **Sampling**
  - Remove all work articles from the sampling area.
  - Special attention should be given to all valves to assure that they are closed and no inadvertent loss to the canister vacuum has occurred. ***Never open the sample valve on the Summa® canister for any reason other than to collect a sample***.
  - Sampling commences when the (1) purge valve is confirmed closed, (2) the probe valve is opened, and (3) the sample valve is opened.
  - Slowly rotate the Summa® canister valve counter clockwise on full turn. The flow controller (set by the laboratory, as specified) will maintain the appropriate flow rate:
    - 30-minute sample period – The flow controller should be set for 167 ml/min for a 6-liter Summa® canister and the sample taken for 30 minutes, or when the pressure within the Summa canister has decreased to 5 inches of Hg
    - 24-hour sample period – The flow controller should be set for 3.5 ml/min for a 6-liter Summa® canister and the sample taken over a 24 hour period, or when the pressure within the Summa canister has decreased to 5 inches of Hg.
  - For canisters with built in pressure gauges, monitor the vacuum pressure change several times during the course of the sampling period to ensure the canister is filling at the desired rate. Maintain a steady flow rate into the canister.

[1] It is necessary to assess the potential leakage of atmospheric air into the sampling equipment during sampling, as leaks can compromise the integrity of the vapor samples being collected. Leaks are most likely to occur in the connections and fittings in the above ground sampling equipment, but can also occur below ground. To assess the presence of both above ground and blow ground leaks, a semi-quantitative method for assessing leaks using a tracer gas may be applied.

- After sampling is completed, close (1) the sample valve and (2) the canister valve (finger tight) but DO NOT over tighten, which can result in sample loss. Remove the flow controller/sampling apparatus from the canister and replace the protective cap on the canister valve fitting. Record the final pressure – which should be approximately 5 inches of Hg, document field parameters, and document general weather conditions (see Section 2.3). If using an external vacuum gauge, re-attach the canister valve and record the pressure. If the flow controller and/or sampling probe will be used for more than one sample collection at a given location, be sure to purge between uses. This is done by attaching the flow controller and/or sampling probe to a vacuum source and drawing clean air or gas (UHP) through it before attaching the canister.
- Record all sample information on the label supplied with the canister or affix label on the canister label tag. ***Do not affix any labels to the canister body***.
- Collect field parameters following sampling, including: air pressure, VOCs, oxygen, carbon dioxide, and methane.

- **Shipment Preparation:**
  - When preparing the canisters for shipment, verify that the valve (turned just past finger tight) and valve caps are snug (ca 1/4-turn past finger tight), and use adequately clean packing to prevent the valves from contacting any hard surfaces.
  - Place chain of custody seal over the openings of the shipping container
  - Ship immediately to the laboratory for analysis.

Each sample should be stored in a cool location that is not subject to change in pressure or temperature, and should not be affected by errant VOCs in the atmosphere.

5.4.7 Data Collection and Quality Control

Proper data collection and quality control will ensure that data are representative, defensible, and readily accepted by all stakeholders. The analytical method chosen for the analysis, the use of replicate and other quality control samples, and proper documentation of the air monitoring/sampling activities will ensure that data meet the expectations of all parties involved.

<u>Analytical method</u>

Analytical methods and analytes will be site-specific. Prior to initiating sampling activities, a thorough evaluation of the sampling objectives, state or federal criteria for each media sampled, analytical method/laboratory limitations, and risk calculations should be performed. The minimum detection limit for the analyses should be determined prior to analysis based on the appropriate screening levels/evaluation methods. All samples collected should be analyzed using a certified laboratory.

6.0 Quality assurance/quality control

Unless otherwise specified in the project Work Plan, quality assurance/quality control (QA/QC) samples should be collected to ensure that data is representative, defensible, and readily accepted by all parties. In the absence of a site Quality Assurance Project Plan (QAPP), QA/QC samples should include: duplicate samples (one for every 10 samples); method blanks (one for every 10 samples); and trip blanks (one per shipment). Field blanks should be collected at the site during sampling activities. These are collected from a certified air source supplied by the contracted laboratory and should be obtained each sampling day or event. It is recommended that at least one field blank sample be collected each sampling day, or from a minimum 10% of the samples obtained.

Trip blank samples should be obtained from the contracted laboratory and included with samples for each sampling day or event, and included with the shipment of containers.

Field duplicate samples should be collected at the site during sampling activities. Duplicate samples should be obtained each sampling day or event, or from a minimum of 10% of the samples obtained. A duplicate sample is obtained by use of a splitter affixed upgradient of the flow controller, with separate sampling tubes connected to two individual Summa® canisters. The flow controller must be set to a flow rate <200 ml/min. Due to use of the splitter and simultaneous filling of the canisters, the sampling time required to obtain a duplicate sample is doubled.

All Summa® canisters used for indoor air analysis shall be certified 100% clean by GC/MS analysis by the laboratory before being used in the field. Certification of cleaning and evacuation should be noted by field personnel prior to collection of the samples. Site name, sample location, number, and date should be recorded on a chain of custody form and on a blank tag attached to the canister.

Once samples are collected they should be stored according to the method protocol (at ambient temperature) and delivered to the analytical laboratory as soon as possible. Samples should not exceed recommended holding times prior to being processed by the laboratory. Sample holding times for canisters is variable and may range from 72 hours (California EPA, 2003) to 14 days (USEPA, 1999). Laboratory procedures for sample accession and chain of custody should be followed.

7.0 Data and records management

Calibration and inspection equipment (e.g., PID and CGI) should be performed daily, prior to the start of the monitoring/sampling events. All instrumentation should be operated in accordance with operating instructions as supplied by the manufacturer and laboratory, unless otherwise specified in the Work Plan. Equipment checkout and calibration activities must occur prior to site sampling and must be documented.

Field logbooks and/or log sheets and any other measurement documentation shall be placed in the project files and retained following completion of the project.

8.0 Vapor Intrusion Evaluation

The evaluation of environmental data including indoor air, outdoor air, soil gas, and/or sub-slab vapor should be conducted in accordance with the appropriate federal, regional/state, and local regulations/guidance where available. In general, the evaluation of the vapor intrusion pathway consists of a tiered approach including comparison of available site environmental data to generic/conservative risk-based screening levels to select constituents for further evaluation, followed by a more site-specific assessment of the constituents identified during the screening process. These tiers are discussed further below:

- Tier 1 – Screening – The screening step typically involves a comparison of maximum detected concentrations of constituents in environmental media to risk-based screening levels (RBSLs). In some cases, default RBSLs are available/recommended by a regulatory agency/guidance. In other cases, semi-site-specific or site-specific RBSLs may be derived based on available site-specific information.

- Tier 2 – Site-specific Assessment - Constituents identified during the screening step may be further evaluated using site-specific information to either estimate the total potential carcinogenic risk and noncarcinogenic hazard associated with detected constituents at the site or to calculate site-specific RBSLs for comparison with constituent concentrations detected on site.

During the vapor intrusion assessment process, the use of vapor intrusion modeling may be used as appropriate. Models considered for evaluation include the BioVapor Indoor Vapor Intrusion model (API, 2010) which accounts for the biodegradation of petroleum constituents in the subsurface and the USEPA Johnson and Ettinger model (USEPA, 2004) and RBCA ToolKit for evaluation of non-biodegradable constituents where applicable.

Where appropriate, the use of a multiple lines of evidence approach will be used to assess the potential vapor intrusion pathway. This approach may consist of various methods including:

- The evaluation of paired sub-slab vapor/indoor air and outdoor air data,

- The use of indoor air modeling,

- The assessment of site data in comparison to typical (background) concentrations and the evaluation of potential indoor air/background sources, and

- The use of site-specific and default attenuation factors.

Evaluation methods used to assess the vapor intrusion pathway and the results of the assessment should be fully documented and referenced in the project report.

9.0 References

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USEPA, 2004. United States Environmental Protection Agency (USEPA) Spreadsheets for Implementation of the Johnson and Ettinger Model. February 2004.

10.0 Revision history

Revision	Date	Author(s)
0.0	[month year]	J. Kabel, J. Millard
0.1	June 2010	G. Vierkant

HAPSITE STANDARD OPERATING PROCEDURE

1.0 QA/QC Procedures

Quality assurance and quality control (QA/QC) measures will be conducted prior to and during the collection of real-time air monitoring and analytical sampling to ensure that air monitoring and sampling results are usable. The following sections describe QA/QC actions taken to ensure completeness and correctness of data.

1.1 Analytical Sampling

Steps are performed to ensure analytical samples are identified and handled properly in the field. The following sections describe these steps.

1.1.1 Sample Bag Inspection

Analytical tedlar sampling bags will be shipped by a vendor and will be prepared by the manufacturer. Upon receipt by CTEH®, tedlar bags will be inspected prior to use in the field and during time of utilization by field personnel. If sampling bags appear to be damaged, broken, or incorrectly labeled, the bag will be discarded. Furthermore, field personnel will inspect tedlar bags to ensure that sample integrity are not compromised prior to the sampling event. When samples are collected after a sampling event, they will be re-inspected prior to analysis.

1.1.2 Sample Identification and Labels

Each analytical sample prepared and collected will be allocated a unique identifier (sample ID). For the purpose of this project, GSI or CTEH® personnel will label the tedlar bag with the agreed upon sample ID and document the sample ID appropriately. The corresponding HAPSITE® file name of each sample ID will be recorded on a CTEH® Field Form or notebook.

1.1.3 HAPSITE® Calibration and Daily Checks

Foremost, it is necessary to establish that a given GC/MS meets tuning and standard mass spectral abundance criteria prior to initiating any data collection. Prior to the analyses of any samples, blanks, or calibration standards, the instrument performance check will be performed to establish that the GC/MS system meets the mass spectral ion abundance criteria. The instrument performance check solution will be analyzed initially and once per 24-hour time period of operation. In the event the instrument performance check standard does not meet criteria, the GC/MS instrument will not been used until corrections are made, however the MS only mode or survey mode may be used to look for the selected masses of the chemicals of interest.

The HAPSITE® will be calibrated using a minimum of five chemical concentrations that span the monitoring range of interest in an initial calibration sequence to determine instrument sensitivity and the linearity of GC/MS response for the target compounds. CTEH® calibrated the GC/MS system for compounds on TO-15 analyte list following modified EPA Method TO-15. The selective ion monitoring (SIM) quantitation method was developed by using the primary and secondary quantitation ions used by MS library searches for compound identification, in addition to identifying the target compound based upon elution time. The instrument was calibrated with standards prepared using a 1 ppm TO-15 calibration gas mixture. Calibration standards were prepared and analyzed in January of 2010.

Prior to the analysis of samples and blanks but after tuning criteria have been met, the initial calibration of the GC/MS system must be routinely checked by analyzing a continuing calibration verification (CCV) standard to ensure that the instrument continues to remain within control limits. The CCV standard will be performed once every 24 hours and contain all compounds on the target analyte list or will be flagged appropriately. CCVs are evaluated to determine whether the instrument is within acceptable calibration criteria throughout a period in which samples will be analyzed. In short, the CCV is performed to verify that the initial calibration was applicable during the sample analyses. Strict CCV compliance criteria will not be used since the HAPSITE® GC/MS will be used as a screening instrument to characterize the area and identify locations to collect representative air samples for laboratory analysis. One of the calibration points from the initial calibration curve will be at the same concentration as the daily calibration standard or CCV standard. The CCV standard will be prepared and analyzed daily prior to collecting samples. All CCVs will be prepared by cleaning a tedlar bag three times with 99.99% nitrogen and cleaning all gas-tight syringes with nitrogen. If the CCV shows recovery of the individual analyte, then analysis can proceed. However, if there is no recovery for a specific analyte on the target compound list and sample detection is observed, the data will be flagged as “R” or rejected, since recovery cannot be verified. If a CCV shows no recovery for a compound and no detection is observed within the search criteria for an investigative sample, the CCV will not be flagged.

Since all QA/QC procedures, sampling, and analysis will be conducted in the field, field blanks or method blanks (MB) will be collected as field QC checks for the samples. Field blanks are designed to determine whether samples have been contaminated prior to or during the sampling event. The field blank/method blank is carried through each step of the analytical method to examine the potential for cross-contamination. MBs will be prepared in the same fashion as samples using all standards, equipment, and apparatus that are used for a sample analysis. MB tedlar bags will be cleaned with nitrogen. A MB will be prepared at the frequency of at least once in every 24-hour analytical sequence.

AECOM

SOP NUMBER: 7515

Recording of Field Data

Date:	April 2005
Revision Number:	0
Author:	Debra McGrath
Discipline:	Quality Assurance

1.0 INTRODUCTION

1.1 Purpose and Applicability

This Standard Operating Procedure (SOP) provides instructions for recording data when documenting a sample collection event, field measurements, or a site visit. Field data may be recorded in field logbooks, on standardized forms, as annotated maps, as photo documentation, or electronically. Chain-of-custody records are also considered field data; however, these records are specifically addressed in SOPs 1007 (Chain-of-Custody Procedures) and 7510 (Packaging and Shipping of Environmental Samples).

1.2 Quality Assurance Planning Considerations

Field records provide evidence and support for technical decisions, interpretations, and judgments. It is therefore critical that procedures and systems be in place to ensure that they are legible, identifiable, and retrievable, and protected from loss or damage. In addition, client or regulatory requirements, or the end use of the data (e.g., to support litigation) may determine the format in which the data must be recorded. For example, some projects may require that all field information be recorded in the field logbook and may not allow the use of standardized forms. The requirements necessary to meet the data quality objectives for a particular project will be defined in the site-specific workplan and/or Quality Assurance Project Plan (QAPP) hereafter referred to as the project plan.

1.3 Health and Safety Considerations

Not applicable.

2.0 RESPONSIBILITIES

2.1 The Project Manager is responsible for ensuring that project-specific requirements are communicated to the project team and for providing the materials, resources, and guidance necessary to perform the measurements in accordance with this SOP and the project plan. In the absence of a Field Team Leader, the Project Manager is

responsible for ensuring that field records are reviewed and approved as described below.

2.2 The Field Team Leader is responsible for reviewing and approving the field records for accuracy, completeness, and conformance to the procedures in this SOP.

2.3 Field personnel are responsible for recording data according to the procedures outlined in this SOP.

3.0 REQUIRED MATERIALS

The following materials are necessary for this procedure:

- Bound field logbook (preferably waterproof, such as Rite-in-Rain™)
- Standardized field data sheets (refer to individual SOPs for test pit logs, boring logs, groundwater sample collection logs, etc.)
- Pen or Sharpie™
- Watch or other time-keeping device

The following materials may also be needed:

- Site maps
- Clipboard
- Three-ring binder or equivalent
- Camera
- Hand-held electronic recording device (e.g., PDA, laptop, or tablet PC)

4.0 METHOD

4.1 General

4.1.1 Field activities vary widely and no general rules can specify the exact information that must be recorded for each event. However, the field records must contain sufficient detail so that persons going to the site could reconstruct a particular situation without reliance on the collector's memory.

4.1.2 Field logbooks may be supplemented by standardized forms (e.g., well construction and development, sample collection forms, drum logs). In that case, the logbook provides a chronology of events, summary of personnel on site, and a narration of events not covered by the standardized forms. It is recommended that the details recorded on the standardized forms not be replicated in the logbook due to the potential for transcription errors and inconsistencies. References to standardized forms must be included in the logbook.

4.1.3 Entries will be recorded legibly in permanent ink (a black ballpoint pen is preferable) and will be signed and dated. No erasures or obliterations will be

made. If an incorrect entry is made, the information will be crossed out with a single strike mark which is initialed and dated by the sampler, and the correct information added.

4.1.4 Pencil should not be used. If a ballpoint pen cannot be used because of adverse weather conditions (rain or freezing temperatures), a fine-point Sharpie™ is an acceptable substitute. If conditions are such that only pencil can be used, an explanation must be included in the logbook and the affected data should be photocopied, signed as verified copy, and maintained in the project files as documentation that the data has not been changed.

4.1.5 Information to be recorded should address the questions of who, where, what, when, how, and why. A specific list of information that should be recorded is included in Table 1.

4.1.6 Entries will be objective, factual, and free of personal feelings or inappropriate language. Cryptic notes and undefined abbreviations or acronyms should be avoided.

4.1.7 Information will be made in as close to real time as possible. Information recorded significantly after the fact must be dated as such.

4.2 Field Logbooks

4.2.1 Field logbooks will be bound water-proof field survey books or notebooks with consecutively numbered pages.

4.2.2 Logbooks will be assigned to field personnel, and will be identified by a unique document number. The logbook should be kept in the field person's possession or in a secure location during field activities and archived in the project files upon completion of the field program.

4.2.3 Logbooks should be specific to a project. Multiple projects should not be included in one logbook because of document retention and evidentiary reasons.

4.2.4 The title page of each logbook will contain the following:

- Person to whom the logbook is assigned, ENSR office location, and phone number,
- The logbook number,
- Project name and number, and
- Start and end dates of work covered by the logbook.

4.2.5 Logbook entries documenting sample collection or field measurements must clearly identify the task being completed (for example, water level measurements, headspace readings). Units must be included for all measurements.

4.2.6 For ease of reference, it is recommended that a new page be started for each sampling day and that the time be recorded in the far left column. Each day's entries will be signed and dated by the person making the entries. A diagonal line across the bottom of the page will indicate the end of an entry.

4.3 Standardized Forms

4.3.1 At a minimum, each form must include a title identifying the activity being documented and the project identification (name and number).

4.3.2 Each form must be signed and dated by the person completing the form.

4.3.3 There should be no blank spaces on the form. Each space must be filled in with the information requested or "NA" (not applicable).

4.3.4 Forms should not be loose, but should be maintained in an organized manner (e.g., clipboards, binders).

4.4 Maps and Drawings

4.4.1 Maps and drawings that document final sampling locations and which are separate from the field logbook must be referenced in the logbook. These maps or drawings must include the project name and number, site identification and location, and must be signed and dated by the person recording the locations.

4.4.2 Maps and drawings must include compass orientation and scale.

4.5 Photographs and Other Photo Documentation

4.5.1 Photo documentation, if permitted at the site, can provide invaluable information on site conditions, sample locations, and the sample itself.

4.5.2 Photographs, videos, or slides must be cross-referenced to entries in the field logbook or on a photo documentation log. Information to be recorded includes name of photographer, date, time, direction faced, description of subject, and sequential number of the photograph and roll number. An indication of scale is also helpful. Image-enhancing techniques (lenses, film) should also be noted.

4.6 Electronic Files

4.6.1 Electronically captured data may include data logging systems and hand-held electronic recording devices such as PDAs, laptops, or tablet PCs.

4.6.2 Field data that is captured electronically must be cross-referenced in the field logbook. Information to be recorded includes the identity of the person

recording the data, instrument make and model number, measurement time and date, and file identification.

4.6.3 Sufficient backup systems must be in place to protect against the loss of data. Electronic files must be saved to a disk or backed up immediately upon completion. The backup disk or other media (CD, flash drive) should then be stored in a secure location separate from the laptop, tablet, or PDA.

4.6.4 Files must be uniquely identified and should be stored in the project files on the network. An unedited version of the file must be maintained and all subsequent manipulations tracked.

5.0 QUALITY CONTROL

5.1 The field records will be reviewed by the Field Team Leader, or by the Project Manager or his/her designate, for accuracy, completeness, and adherence to the requirements of this SOP. At a minimum, this must occur at the end of the field event. For field activities of extended duration, it is recommended that this review occur more frequently (e.g., daily or weekly).

5.2 If information recorded in the field is transcribed to another format, the original record must be retained for comparison purposes.

5.3 Periodic copying of the field records should be considered to insure against the loss or destruction of the original documents.

6.0 RECORDS MANAGEMENT

At the end of the field program, original field records must be placed in the project files and maintained for a certain retention time. The duration of record retention will be determined by project-specific requirements, or, in the absence of project requirements, by ENSR Corporate policy.

7.0 TRAINING/QUALIFICATIONS

The individual recording field data must have read, and be familiar with, the requirements of this SOP.

8.0 REFERENCES

USACE. 2001. Requirements for the Preparation of Sampling and Analysis Plans. EM 200-1-3. United States Army Corps of Engineers. 1 February 2001.

USEPA. 2004. Contract Laboratory Program Guidance for Field Samplers. OSWER 9240.0-35. EPA540-R-00-003. United States Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. August 2004.

USEPA. 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. United States Environmental Protection Agency, Region 4, Athens, GA. November 2001.

USEPA. 1998. Test Methods for Evaluating Solid Wastes. Physical/Chemical Methods (SW-846). Third edition, including all final updates.

USEPA. 1992. RCRA Ground-water Monitoring: Draft Technical Guidance. United States Environmental Protection Agency, Office of Solid Waste, Washington, DC. November 1992.

Table 1 Specific Information to be Recorded

- Site name and location
- Personnel on site (ENSR, clients, site contacts, regulators, oversight personnel, subcontractors, general public)
- Results of phone calls, conversations
- Chronology of activities, including mobilization, investigatory activities, and demobilization
- Weather conditions (initial and any changes; temperature, barometric pressure, wind conditions, precipitation)
- Tidal stage (if applicable)
- Inspections of equipment, materials, supplies (problems, corrective action)
- Subcontractor name, description of services to be provided, and any issues (problems, stand by time)
- Description of major equipment (drill rigs, backhoe, survey vessels, sampling platforms)
- Field measurements
  - Description of procedure
  - Instruments (make, model, serial number, lamp)
  - Instrument calibration (date, time, personnel, standard, lot number, standard expiration date, true/measured results, units, corrective action, calibration checks and results)
  - Results (including units of measure, any correction factors applied, documentation of calculations (if applicable)
  - Date and time of measurement
  - Identity of person performing the measurements
  - Atmospheric conditions (if applicable)
- Equipment decontamination procedures and materials
- Well information (depth to water, static water depth, condition of well)
- Well purging information (procedure, equipment, volumes, pumping rate, criteria for acceptance, time and date)
- Presence and detection of immiscible layers, detection method, sampling method
- Sampling information
  - Procedures and equipment (type and material)
  - Sample (soil) selection criteria/rationale (PID, staining, water table)
  - Sample location identification (e.g., boring, well identification)
  - Sample location description (sketch, GPS coordinates, compass and distance measurements from fixed points).
  - Sample depth
  - Sample flow rate/drawdown
  - Sample description (recovery, moisture, color, odor, texture, turbidity, artifacts)
  - Sample manipulations (filtration, homogenization, compositing, preservation)
  - Sample date and time
  - Unique sample ID
  - Identity of sampler
  - Sample parameters, containers (size/type), preservation
  - QC samples (field duplicates, trip blanks, field/equipment blanks, MS/MSDs, split samples) – include ID, associated field sample, method of collection
- Any pertinent field observations that could affect data quality (instrument problems, contamination sources)
- Deviations from approved plan (schedule modifications, relocation or elimination of sample locations, change orders), including rationale
- Investigation-derived waste (IDW) types, volumes, storage, and disposal
- Health and safety (H&S) meetings, personal protective equipment (PPE) worn, H&S monitoring

Appendix E

Building Survey and Sample Collection Record Form

Indoor Air Building Survey And Sampling Form

Date:_____ Survey performed by:_____

1. PROPERTY OWNER / OCCUPANT INFORMATION

Property Owner

Last name:_____ First name:_____

Address: _____

City and State: _____

County: _____

Home/business phone:_____Mobile phone: _____

Occupant (if not the property owner)

Last name:_____ First name:_____

Address: _____

City and State: _____

County: _____

Home/business phone:_____Mobile phone: _____

2. SENSITIVE POPULATION: (circle all that apply)

daycare / nursing home / hospital / school / other (specify): _____

3. BUILDING CHARACTERISTICS: (circle all that apply)

residential / multi-family residential / office / strip mall / commercial / industrial / school

Describe building: _____

Year constructed: _____

Number of floors at or above grade: _____

Number of floors below grade: _____

Type of construction: full basement / crawl space / slab on grade

Indoor Air Building Survey And Sampling Form

Depth of structure below grade: _____ ft Basement size: _____ ft^2

If the property is residential, what type? (circle all that apply)

ranch	2-family	3-family	raised ranch
split level	colonial	cape cod	contemporary
mobile home	duplex	apartment house	townhome / condo
modular	log home	other: _____	

If multiple units, how many? _____

If the property is commercial:

Business type(s) _____

Does it include residences (i.e., multi-use)? Y / N If yes, how many? _____

4. OCCUPANCY

How frequently is the basement or lowest level occupied? (circle one)

full-time occasionally seldom almost never

General use of each building level (e.g., family room, bedroom, laundry, workshop, storage)

Basement _____

1st Floor _____

2nd Floor _____

3rd Floor _____

4th Floor _____

(Use additional page(s) as necessary)

5. CONSTRUCTION CHARACTERISTICS (circle all that apply)

a. Above grade construction: wood frame concrete stone brick other _____

b. Basement type: full crawlspace slab other _____

Indoor Air Building Survey And Sampling Form

c. Basement floor: concrete dirt stone other _____

d. Finished basement floor: uncovered / covered

If covered, what with? _____

e. Foundation walls: poured block stone other_____

f. Foundation walls: unsealed sealed sealed with _____

g. The basement is: wet damp dry

h. The basement is: finished unfinished partially finished

i. Sump present (Y / N) If yes, how many? _____

Where discharged? _____

Water in sump? (Y / N / not applicable)

Identify all potential soil vapor entry points and estimated size (e.g., cracks, utility ports, drains)

_____

_____

_____

_____

_____

Are the basement walls or floor sealed with waterproof paint or epoxy coatings? Y / N

Type of ground cover outside of building: grass / concrete / asphalt / other _____

Sub-slab vapor/moisture barrier in place? Y / N

Type of barrier: _____

6. HEATING, VENTING, and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply - note the primary)

hot air circulation	heat pump	hot water baseboard
space heaters	steam radiation	radiant floor

electric baseboard wood stove outdoor wood boiler
other _____

The primary type of fuel used is:

natural gas fuel oil kerosene
electric propane solar
wood coal

Domestic hot water tank fueled by:
_____

Boiler/furnace located in: basement outdoors main floor other
_____

Air conditioning: central air window units open windows none

Are there air distribution ducts present? Y / N

Is there a whole house fan? Y / N

Describe the air intake system (outside air supply, cold air return, ductwork, etc.), and its condition where visible. Indicate the locations on the floor plan diagram.

_____

_____

_____

_____

_____

7. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

If feasible, household VOC sources should be removed from the building and its immediate vicinity 24 hours before sampling begins. If the sources cannot be removed, the use of these sources should be reduced to the extent practicable during the sampling event.

a. Is there an attached garage? Y / N

If yes, does it have a separate heating unit? Y / N

b. Are any petroleum-powered machines or vehicles stored in an attached garage (e.g., lawnmower, ATV, car) Y / N

c. Has the building ever had a fire? Y / N

Indoor Air Building Survey And Sampling Form

d. Is there a fuel-burning or unvented gas space heater? Y / N

e. Is there a workshop or hobby/craft area? Y / N

If yes, where and what type:

_____

f. Does anyone smoke in the building? Y / N

If yes, how frequently? _____

g. Are cleaning products stored in or around the building? Y / N

If yes, where are they stored and what type?

_____

h. Are cosmetic products stored in the building? Y / N

If yes, where are they stored and what type?

_____

i. Are paints or stains stored in or around the building? Y / N

If yes, where are they stored and what type?

_____

j. Has the building been updated or remodeled recently? Y / N

If yes, when and where?

_____

What type of remodeling was completed? (circle all that apply)
new flooring (e.g., carpet, tile, wood) new wall treatments (e.g., paint, wallpaper)
new window treatments reconstruction (e.g., new drywall)

k. Have air fresheners been used recently? Y / N

If yes, when and what type?

_____

l. Is there a kitchen exhaust fan? Y / N

If yes, is it vented outside? Y / N
If yes, where is it vented? _____

m. Is there a clothes dryer? Y / N

If yes, is it vented outside? Y / N

n. Are pesticides stored in or around the building? Y / N

If yes, where and what type? _____

o. Are there odors in the building? Y / N

If yes, please describe: _____

p. Do any of the building occupants use solvents at work? Y / N
(e.g., chemical or petroleum industry, dry cleaning industry, construction industry, painter, nail manicurist, other)

If yes, what types of solvents are used? _____

If yes, are their clothes washed at work? Y / N

q. Do any of the building occupants use a dry cleaning service? Y / N

____Yes, use dry-cleaning regularly (weekly)
____Yes, use dry-cleaning infrequently (monthly or less)
____Yes, work at a dry-cleaning service

r. Is there a subsurface depressurization system (often used for radon mitigation) for the building/structure? Y / N
What type of system is it - active or passive? Active / Passive
Date of installation:_____

Conduct an Inventory of all products that may contain chemicals of concern found in the home. Open cabinets and inventory all products. Take photographs of products and product labels:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Indoor Air Building Survey And Sampling Form

Sample Collection

On a separate sheet(s), provide a sketch of the building (including each floor as applicable), all (unremovable) potential indoor sources found in the building (including attached garages), the location of the source (floor & room), and each sample location (see item # 9 below). Any ventilation implemented after removal of potential sources shall be completed at least 24 hours prior to the commencement of the indoor air sampling event.

Photographs should be taken at each sample location, and of any unremovable source, to supplement the documentation recorded below. The photographs must be of good quality with legible labels.

Location	Sample ID	Sample Container Size	Sample Duration	Flow Rate Verification (Y / N)	Comments

Sampling Information:

Sample Technician: _____
Phone #: _____

Analytical Method: TO-15 / TO-15 sim / TO-17 / other:
_____

Laboratory:
_____

Indoor Air Building Survey And Sampling Form

Was field screening performed? Y / N

If yes, describe make and model of field instrument used:

_____

Meteorological Conditions

Was there significant precipitation within 12 hours prior to (or during) the sampling event? Y / N

Describe the general weather conditions:

_____

_____

General Observations

Provide any information that may be pertinent to the sampling event and may assist in the data interpretation process.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Indoor Air Building Survey And Sampling Form

Sketch of Building (include additional sheets as needed)

Sample Collection Record Form

AECOM

Client: | Date:

Project # :

Site Location:

Field Personnel:

Field Screening Equipment:

Sample ID	Canister Number	Flow Controller Number	Sample Depth / Screen Interval (ft.)	Purge Data				Field Screening		Sample Collection						
				Time (start/finish)	PID/FID Reading (ppmv): purge vol=	PID/FID Reading (ppmv): purge vol=	PID/FID Reading (ppmv): purge vol=	PID/FID Reading (ppmv) - Start	PID/FID Reading (ppmv) - Finish	Start Time	Canister Vacuum Start (in. Hg)	Canister Vacuum _____hours Time_____ _ (in. Hg)	Canister Vacuum _____hours Time_____ _ (in. Hg)	Canister Vacuum _____hours Time_____ _ (in. Hg)	Final Canister Vacuum	Finish Time (Sample Time)
Comments/Sample Location:																
Comments/Sample Location:																
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Notes:

Appendix F

Probe and Sampling Assembly Leak Testing

Appendix F
Probe and Sampling Assembly Leak Testing

It is necessary to assess the potential leakage of atmospheric air into the sampling equipment during sampling, as leaks can compromise the integrity of the soil vapor samples being collected. Leaks are most likely to occur in the connections and fittings in the above ground sampling equipment, but can also occur below ground (when sampling soil gas). Below ground leaks are unlikely if the probe has been installed properly. Shallow probes (<5 feet bgs) are most susceptible to leakage due to proximity to the atmosphere and potential leakage around probes. Sampling equipment must be inspected thoroughly to ensure that fittings between all components of the sampling system are tight. Note that leakage locations may not be apparent.

A non-reactive tracer gas can be used to assess potential ambient air leakage into the sampling system. When collecting soil vapor samples as part of a vapor intrusion evaluation, a tracer gas serves as a quality assurance/quality control device to verify the integrity of the soil vapor probe seal. Without the use of a tracer, there is no way to verify that a soil vapor sample has not been diluted by ambient air. Helium is the preferred tracer gas to be used, where practical, as it is an inert gas, is delectable at low concentration with field instruments, and allows real-time checking for system leakage. Although industrial grade helium can be obtained from party stores, this is not recommended for use as a tracer gas due to the presence of organic impurities, which can confound sampling results. Therefore, only laboratory grade helium is recommended.

Tracer Gas Protocol

The use of helium as a tracer gas allows for assessment of potential probe leakage prior to commencing sample collection. Other methods (e.g., use of Freon) allows for the assessment of potential probe leaks after sample collection and analysis by the laboratory.

The protocol for using helium as a tracer gas involves enriching the atmosphere with helium in the immediate vicinity of the probe area with the tracer gas and measuring the presence of vapor from the sampling probe (tubing) for the presence of high concentrations of the tracer (i.e., greater than 20% of the tracer gas concentration at the ground surface). Tracer gas measurements are conducted prior to sample collection for laboratory analysis using field measurement equipment and are conducted as part of the purge sampling procedure described below. A cardboard box, a plastic pail, or plastic sheeting (tracer gas sampling leak check enclosure) can serve to keep the tracer gas in contact with the probe during the testing (**Appendix B, Figures 1** through **3**).

The tracer gas sampling manifold includes the following components:

- An enclosure for placement of over the sampling probe;
- Helium inlet - for helium introduction;
- Helium outlet – for escape of helium. An outlet is necessary to ensure that the pressure within the enclosure is similar to that of the ambient atmospheric pressure; and
- Sampling outlet – for obtaining a sample from the probe.

Helium Leak Checking Technique and Purging

- Remove the probe seal insert and wrap the sampling union fitting threads (1/4-inch male Swagelok or equivalent) with Teflon® tape and tighten into the exposed soil gas probe fitting. Attach the Teflon®-taped tubing to the sampling union
- Move enclosure into place and attach the sampling assembly.
- Attach tubing to the flow meter of the helium tank regulator to the helium intake of the enclosure. Attach the exhaust tube to the enclosure and place the other end as far from the helium detector as possible.
- Attach the helium detector to the exhaust line of the sample pump. If using a helium detector equipped with a pump, the detector may be attached directly to the purge line.
- Making sure that the sample valve (closest to the probe) is closed, open the purge valve and the sample valve upgradient of the flow controller. Turn on the sample pump and helium detector.
- Open the helium tank and set the flow meter to approximately 200 ml/min. Assure that the detector is not reading any helium before starting the purge.
- Approximately 2 liters need to be purged before sampling. Purge time is about 10 minutes at a rate of 200 mg/min.
  - Close the sample value upgradient of the flow controller and open the sample valve simultaneously and start timing for the stated purge volume of 2 liters.
  - Monitor the helium detector for indication of leakage. If the reading >5 percent, then the probe leak check has failed - CHECK THE FITTINGS AND RE-TRY.
- At the end of the purge time, close all vales and turn the pump off. If during the purge period a detector reading of <5 percent was observed, the system is considered leak free and ready for sampling. If <5 percent reading cannot be achieved after checking/adjusting fittings, the probe location should be abandoned and a new location drilled.
- Close helium tank value.
- Record all helium leak check values on the field log sheet provided.

Appendix G

Health and Safety Plan and Task Hazard Analyses

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:

Dan 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:

Mobilization/Demobilization: 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.

Equipment Decontamination: AECOM and subcontractor personnel will perform decontamination of equipment used to perform work within controlled work areas.

Investigative-Derived Waste (IDW) Management: 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).

[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 (°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

Type of Cold Stress

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° 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.

Symptoms of Cold Stress

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° 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.

Methods to Prevent Cold Stress

When the ambient temperature, or a wind chill equivalent, falls to below 40° 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.

Sunny Sky Air Temperature		**No Noticeable Wind**		**Wind 8 km/h (5 mph)**		**Wind 16 km/h (10 mph)**		**Wind 24 km/h (15 mph)**		**Wind 32 km/h (20 mph)**	
^{o}C below zero*	^{o}F below zero*	Max. work period	Number of breaks /4 hours	Max. work period	Number of breaks /4 hours	Max. work period	Number of breaks /4 hours	Max. work period	Number of breaks /4 hours	Max. work period	Number of breaks /4 hours s
26 to 28	15 to 19	normal breaks	1	normal breaks	1	75 minutes	2	55 minutes	3	40 minutes	4
29 to 31	20 to 24	normal breaks	1	75 minutes	2	55 minutes	3	40 minutes	4	30 minutes	5
32 to 34	25 to 29	75 minutes	2	55 minutes	3	40 minutes	4	30 minutes	5	Non-emergency work should stop	
35 to 37	30 to 34	55 minutes	3	40 minutes	4	30 minutes	5	Non-emergency work should stop			
38 to 39	35 to 39	40 minutes	4	30 minutes	5	Non-emergency work should stop					
40 to 42	40 to 44	30 minutes	5	Non-emergency work should stop							
43 and below	45 and below	Non-emergency work should stop									

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. Do not crawl under or between rail cars. 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).

NOTE: 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 does not 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

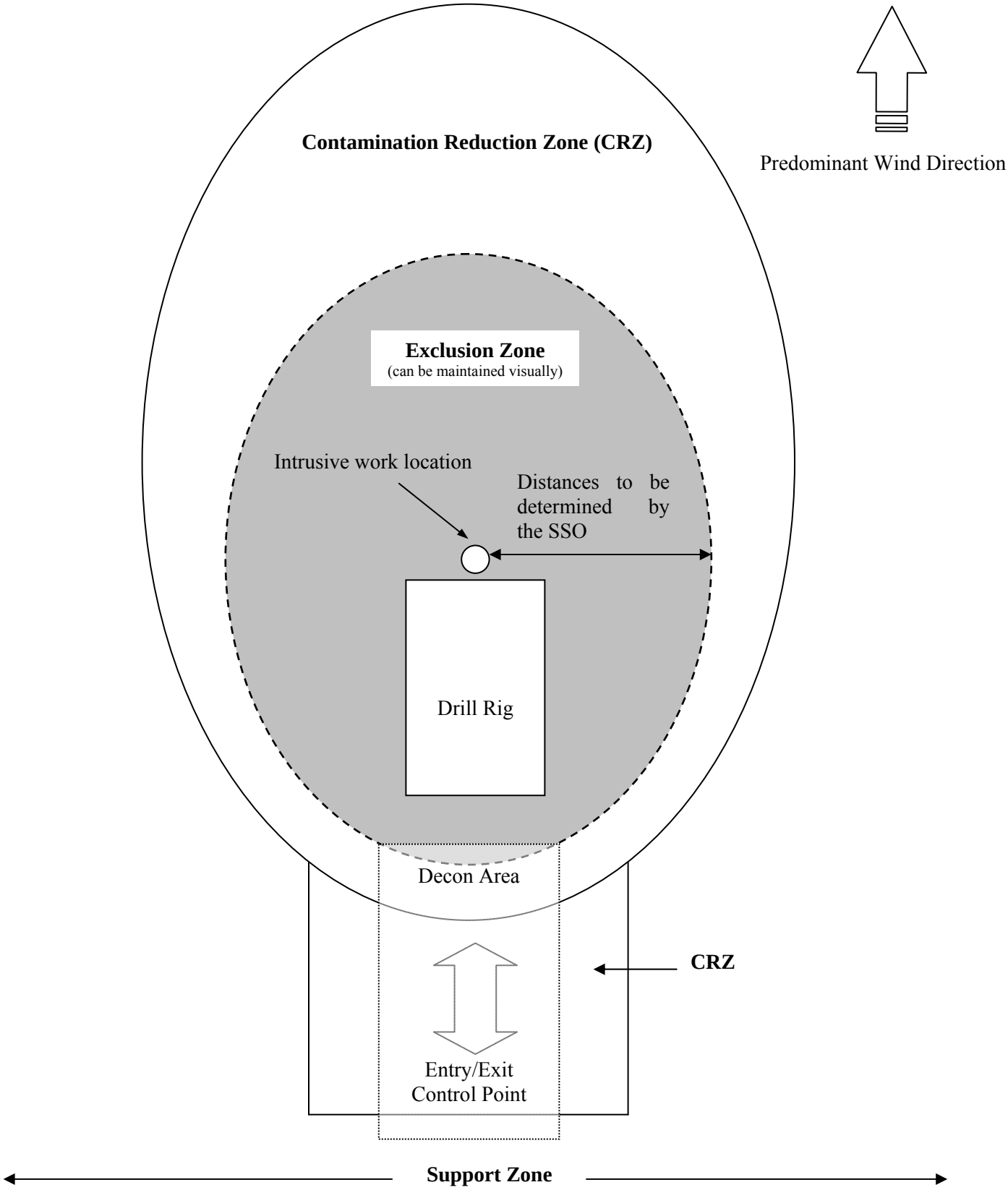
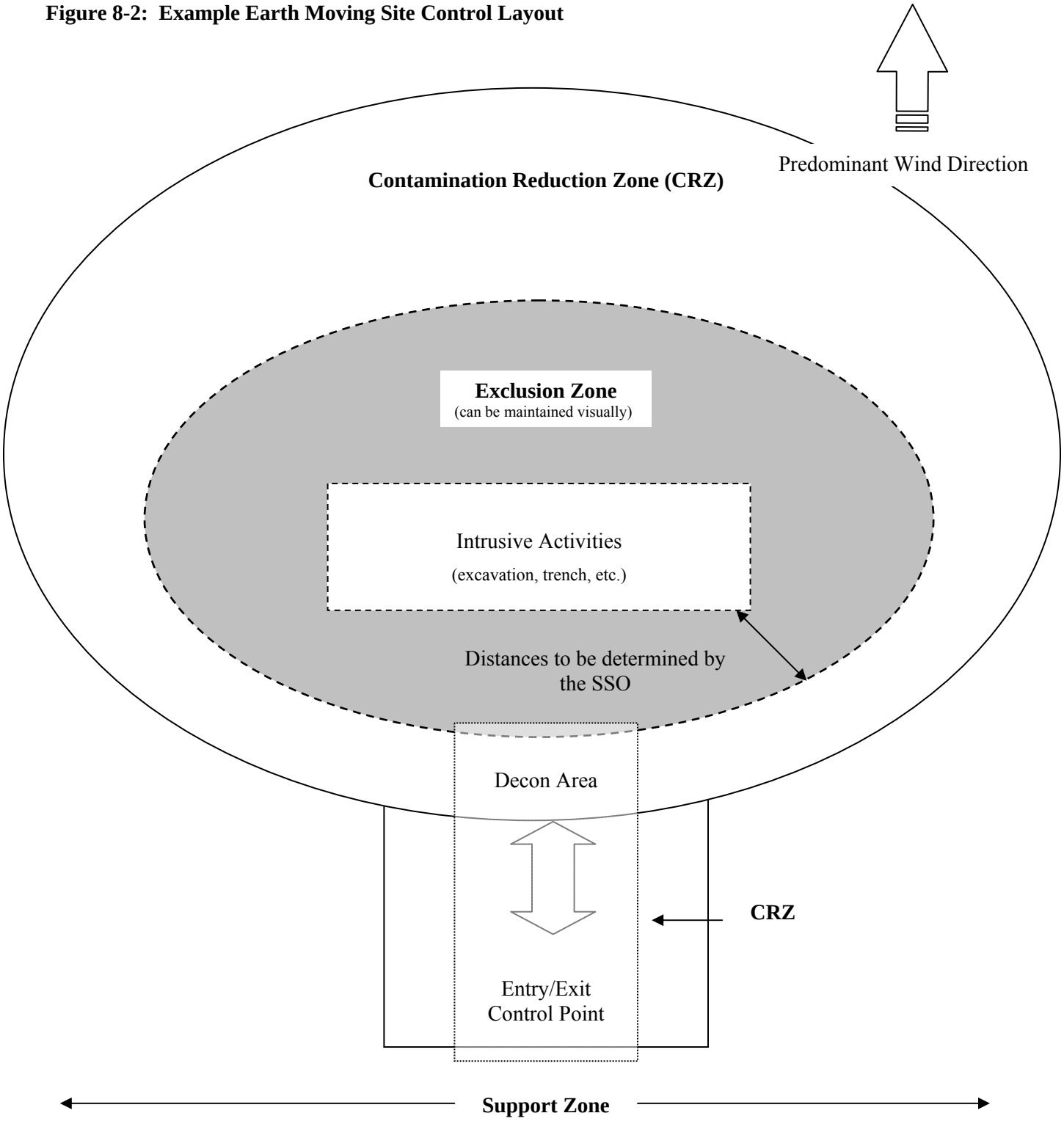


Figure 8-2: Example Earth Moving Site Control Layout



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. Low-Level Hazard: Report the spill/release to the BNSF Resource Operations Center at (800) 832-5452 and clean-up as directed by the products MSDS.
2. High Hazard: 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

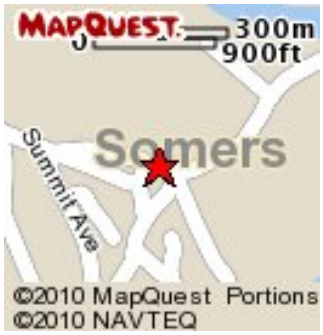
Emergency Coordinators / Key Personnel			
Name	**Title/Workstation**	**Telephone Number**	**Mobile Phone**
Dave Smith	BNSF Representative	(406) 256-4046	(303) 809-8050
Steve Haverl, PE	Account Manager	(303) 804-2359	
Leslie Alexander	Client Service Manager	(970) 493-8878	
Shelly Young	Project Manager	(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

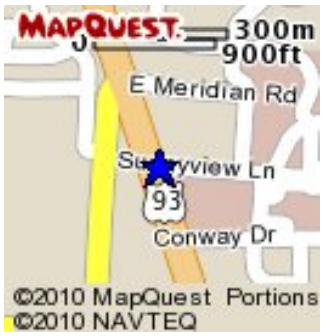
Organization / Agency	
Name	**Telephone Number**
Police Department (local)	911
Fire Department (local)	911
Ambulance Service ***(EMT will determine appropriate hospital for treatment)***	911
Non-Emergency Clinic ***(Use by site personnel is only for non-emergency cases)***	
Tracy Hand and Occupational 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

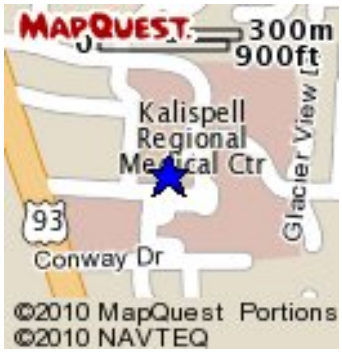




Driving Directions	
From: **401 Somers Road** **Somers, MT 59932**	To: **111 Sunnyview Ln Ste C** **Kalispell, MT 59901**
Start out going WEST on SOMERS RD toward BATTLE HOLLOW AVE.	0.36 mi
Turn RIGHT onto US-93 N.	10.66 mi
Turn RIGHT onto SUNNYVIEW LN.	53 ft
Estimated driving time: 16 minutes	**11.03 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

AECOM

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
- ☐ 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)
- ☒ Non-ionizing radiation (RF/UV/IR)
- ☒ 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*): 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*)
- ☒ 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
Clearing Equipment	Equipment-Specific

APPLICABLE SOPS (SEE HASP/SSHP/APP)

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

TRAINING REQUIREMENTS

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

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM (CONT'D)

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. **PAGE 2 OF 2**

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

AECOM

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: 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: 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

AECOM

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

- ☐ 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)
- ☒ Non-ionizing Radiation (RF/UV/IR)
- ☒ 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*): 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)

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

TRAINING REQUIREMENTS

40-hr HAZWOPER, 8-hr Supervisor, FA/CPR, PPE-specific, tool-Specific, 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: 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

AECOM

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

- ☐ 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
- ☒ 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)

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 for samples _____(*type*)
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*): Reflective 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*): _____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
PPE	PPE-specific
Hand tools prior to use	Tool specific
Hollow stem rig prior to use	Hollow stem 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, 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: 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

AECOM

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

- ☐ 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)
- ☒ Non-ionizing radiation (RF/UV/IR)
- ☒ 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*): Animals/insects/poisonous plants, lifting / back strain, cuts / contusions / abrasions, protruding sharp objects

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
- See below _____(*type*)
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*) Reflective traffic safety vest where required

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

- ☒ Fire ext. 1A:10B:C:D (*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

APPLICABLE SOPS (SEE HASP/SSHP/APP)

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

TRAINING REQUIREMENTS

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: 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. **PAGE 2 OF 2**

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

AECOM

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

☐ 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, 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)

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

TRAINING REQUIREMENTS

40-hr HAZWOPER, FA/CPR, HAZCOM, lead awareness, PPE-specific, DOT Level I shipper, BNSF Contractor, On-Track

ACCEPTED SIGNATURES

Site/Field Supervisor: Nancy Gilliland	**SSO/SH&E:** Angelia Winn, DHSM for

AECOM
BNSF TIE TREATMENT PLANT, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM (CONT'D)

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

AECOM

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

- ☐ 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)
- ☒ Non-ionizing radiation (RF/UV/IR)
- ☒ 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*): Animals/insects/poisonous plants, lifting/back strain

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 _____(*type*)
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*): 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 15, Heat Stress

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
Paper work signatures prior to work.	None

APPLICABLE SOPS (SEE HASP/SSHP/APP)

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

TRAINING REQUIREMENTS

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:	SSO/SH&E:
Nancy Gilliland	Angelia Winn, DHSM 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)	[X] C.A.S. No. [ ]
Creosote	8001-58-9

CHEMICAL NAME AND/OR SYNONYM

2, 3 and 4 ringed polynuclear aromatic hydrocarbons including some substituted compounds.

FORMULA	MOLECULAR WEIGHT
Mixture of organic compounds.	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	FLAMMABLE LIMITS IN AIR (% BY VOL.)	
70°C ☐ OPEN CUP ☒ CLOSED CUP	N.D. °C	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 EXTINGUISHING 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, Krlopol, 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):	APPEARANCE AND ODOR	
☒ LIQUID ☐ SOLID ☐ GAS ☐	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) ☒ (PSIG) ☐ 100°C — 80 MM 125°C — 225 MM 150°C — 370 MM
EVAPORATION RATE (Butyl Acetate = 1) ☒ (Ether = 1) ☐ < 1	% VOLATILES BY VOLUME (At 20°C) N.D.	

G. REACTIVITY DATA

STABILITY	CONDITIONS TO AVOID
☐ UNSTABLE ☒ STABLE	None known.

INCOMPATIBILITY (MATERIALS TO AVOID)

None known.

HAZARDOUS DECOMPOSITION PRODUCTS

Material does not decompose.

HAZARDOUS POLYMERIZATION	CONDITIONS TO AVOID
☐ MAY OCCUR ☒ WILL NOT OCCUR	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):

COMPONENT	WT %	RQ (LBS)
Anthracene	6.0	5000
Benzene	.002	10
O-Cresol	<0.1	1000
M&P-Cresol	<0.1	1000
Naphthalene	4.8	1[illegible]
Phenol	<0.1	1[illegible]
Quinoline	1.8	[illegible]
Toluene	0.01	[illegible]
Xylene	0.01	[illegible]
Acenaphthalene	8.0	[illegible]
Phenanthrene	16.0	5000
Fluorene	5.0	5000

NOTE: THE INFORMATION PROVIDED IN SECTIONS 1 AND 2 IS REQUIRED FOR EMERGENCY RESPONSE REPORTING.

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	[illegible]

Date: 12-04-90

* = PROPRIETARY — TRADE SE

I. ENVIRONMENTAL

DEGRADABILITY/AQUATIC TOXICITY	OCTANOL/WATER PARTITION COEFFICIENT
	N.D.

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 NUMBER: (IF APPLICABLE)	40 CFR 261
Hazardous Waste. (See Section K for other pertinent waste designations).	U 051	

J. REFERENCES

PERMISSIBLE CONCENTRATION REFERENCED

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.

PSDS FILE NO. 049

THIS MATERIAL SAFETY DATA SHEET IS OFFERED SOLELY FOR YOUR INFORMATION, CONSIDERATION AND INVESTIGATION.

MATERIAL SAFETY DATA SHEET

K O P P E R S

MEDICAL EMERGENCIES: 800-553-5631

(IN PENNSYLVANIA CALL: 800-323-6571

PERS COMPANY, INC.
4) SEVENTH AVENUE
PITTSBURGH, PA. 15219

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 PRODUCTS MAY BE RELEASED FORMING FLAMMABLE/EXPLOSIVE MIXTURES IN AIR. CLOSED CONTAINERS 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 MSNA/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 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 DURIN 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.

NOTICE: WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVE TO BE ACCURATE AS OF THE DATE HEREOF, KOPPERS COMPANY MAKES NO WARRANT WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON

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

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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-

THE INFORMATION BELOW IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES.

MSDS for ZINC Page 1

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)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
ZINC	90-100	7440-66-6

3 - PHYSICAL DATA

BOILING POINT: 908 C (1666 F)
MELTING POINT: 420 C (788 F)
SPECIFIC GRAVITY: 7.14 (H2O=1)
VAPOR PRESSURE(MM HG): 1
VAPOR DENSITY(AIR=1): N/A
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.

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: ZnCl2
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.

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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.

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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.

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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.

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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/l00 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

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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	NDSL	Phil.
Zinc Chloride (7646-85-7)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	-------SARA 313------ List	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

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)

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:
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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.

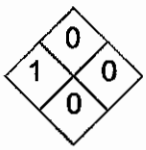
All components of Simple Green® are listed on the TSCA Chemical Substance Inventory.

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	Telephone:	
Address:	1061 Cudahy Place (92110) P.O. Box 80607 San Diego, California 92138-0607	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_2O = 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

We believe the statements, technical information and recommendations contained herein are reliable. However, the data is provided without warranty, expressed or implied. It is the user's responsibility both to determine safe conditions for use of this product and assume loss, damage or expense, direct or consequential, arising from its use. Before using product, read label.

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^{0}F) 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 Packing Group: II
DOT Hazard Class: 3 DOT Label: Flammable Liquid
UN ID#: UN 1219

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.

OFF! INSECT REPELLENT II

Date Issued: 27Jan2005 **Supersedes: 03Dec2002**

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.

OFF! INSECT REPELLENT II

Date Issued: 27Jan2005 **Supersedes: 03Dec2002**

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.

This document has been prepared using data from sources considered technically reliable. It does not constitute a warranty, express or implied, as to the accuracy of the information contained herein. Actual conditions of use and handling are beyond seller's control. User is responsible to evaluate all available information when using product for any particular use and to comply with all Federal, State, Provincial and Local laws and regulations.
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 NOW
NO OTHER WAY

AECOM

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: _____

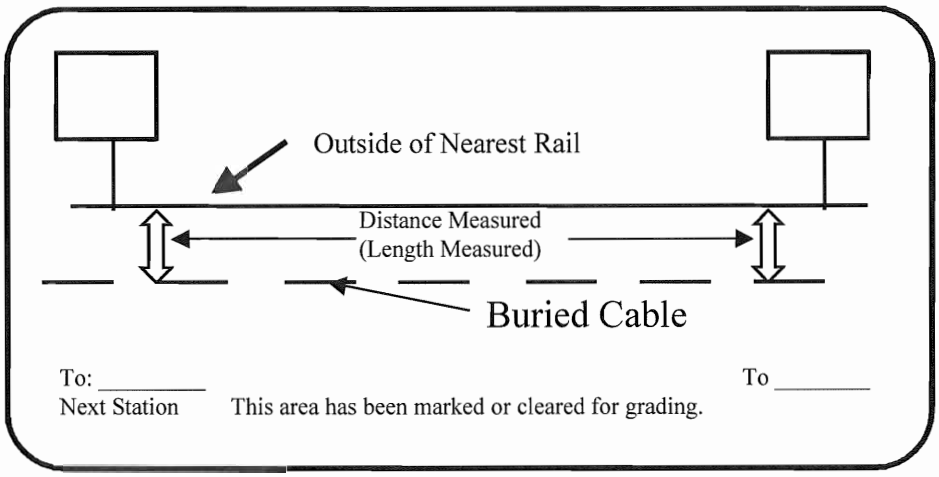
Meeting Location: _____ Time: _____

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.



Notes:

All signal cables must be marked with paint and flags (as ground conditions permit) prior to any grading.

_____

_____

_____

_____

_____

_____

_____

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CTEH | Center for Toxicology and Environmental Health, L.L.C.

Task Hazard Analysis Worksheet

Number: 8942	**Job:** Residential indoor air monitoring on the interior and crawl space of homes using the Hapsite GC/MS		**Date:** To Be Determined at a later date
Page of: 1 of 1	**Supervisor:** Lourdes Mahoney	**Location:** Residences between 512 and 544 Somers Road	**Analysis: VOC**
Skills Required: HAPSITE Operator		**Reviewed By:** Christine Millner	**Approved By:** Dr. Glenn Millner

Required Personal Protective Equipment: Steel toe boots, safety glasses, Hard hat (all under home only). Ear plugs are not anticipated, but will be available for hearing protection

Tools and Equipment Required: HAPSITE GC/MS, TO-15 calibration gas, HAPSITE PROBE, Consumables (tedlar bags, HAPSITE gases, 3 way- valve), crescent wrench

Job Preparation: Calibration check, pack equipment, order and pack consumables

Hazardous Materials: TO-15 Calibration gas in 104L bottle	**Special Requirements:** Keep pin in bottle and store closed in pelican

Number	Sequence of Basic Job Steps	Potential Accidents or Hazards	Recommended Safe Job Procedures
1.	Residential Sampling	1. Slips / Trips & Falls 2. Heavy equipment 3. Cuts & abrasions 4. Animal	1. Maintain awareness of footing and travel path. 2. Use proper lifting techniques to avoid back and shoulder injury while handling heavy equipment. 3. Be mindful of sharp objects and low head clearance during crawl space entry. 4. Maintain awareness of animals, both domestic and wild.

NA = not applicable

AECOM
BNSF, VAPOR INTRUSION INVESTIGATION, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM

AECOM

ADMINISTRATIVE INFORMATION

Job/Task Name: Vapor Sampling – Indoor Living Spaces and Outdoor Ambient Air

Project Name: BNSF Vapor Intrusion Investigation	Project Location: 512, 520, 528, 523, and 544 Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: Jan 2011 thru Jan 2012	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Shelly Young

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. Initiate gas monitoring
2. Don applicable PPE	7. Obtain all required samples, package and label
3. Verify equipment is in working order	8. Complete all paper work and COC's
4. Correct any identified deficiencies from inspection	9. Verify all samples are collected prior to departing area
5. Position equipment at sampling location	10. Clean area and depart

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
- ☒ Volatiles
- ☐ 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)
- ☒ Non-ionizing Radiation (RF/UV/IR)
- ☒ 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, flammable gases Animals/insects/poisonous plants, lifting / back strain, cuts / contusions / abrasions, biological hazards, Methane, BTEX, PAHs. Will be collecting air samples for Methods TO-15 and TO-17.

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 rubber for samples (*type*)
- ☐ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*): **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*): _____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
PPE	PPE-specific
Hand tools prior to use	Tool specific

APPLICABLE SOPS (SEE HASP/SSHP/APP)

SH&E 103, SH&E 201, SH&E 307, SH&E 509, SH&E 607, SH&E 610, SH&E 615, SH&E 617, SH&E 713

TRAINING REQUIREMENTS

40-hr HAZWOPER, 8-hr Supervisor, First Aid, CPR, PPE-specific, BNSF required trainings

ACCEPTED SIGNATURES

Site/Field Supervisor: Shelly Young	**SSO/SH&E:** Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF, VAPOR INTRUSION INVESTIGATION, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM (CONT'D)

ADMINISTRATIVE INFORMATION	
Job/Task Name: Vapor Sampling – Indoor Living Spaces and Outdoor Ambient Air	
Project Name: BNSF Vapor Intrusion Investigation	Project Location: 512, 520, 528, 523, and 544 Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: Jan 2011 thru Jan 2012	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Shelly Young

JOB EVENT SEQUENCE (CONT'D)

LIST ONE STEP OF THE JOB FOR EACH LINE. **PAGE 2 OF 2**

11. Decontaminate equipment where required
12. Collect any IDW and dispose of properly
13. Move to next location and repeat steps 2 through 12 as required
14. Daily housekeeping around the site
15. **Consult Confined Space Entry THA where required.**
16.
17.

MONITORING PROCEDURES

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 and continue monitoring.
		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.
Explosivity (multi-gas detector or CGI)	Obtain in the worker's breathing zone or in the immediate work area.	< 10% LEL	Continue work activities. If significant changes exist in this acceptable range, contact the SSO to investigate the potential for contributing factors.
		> 10% LEL	Cease work, exit the excavation, and contact the SSO.

ACCEPTED SIGNATURES

Site/Field Supervisor:	SSO/SH&E:
Shelly Young	Angelia Winn, DHSM for Daniel Schillings

AECOM
BNSF, VAPOR INTRUSION INVESTIGATION, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Vapor Sampling – Indoor Living Spaces and Outdoor Ambient Air	
Project Name: BNSF Vapor Intrusion Investigation	Project Location: 512, 520, 528, 523, and 544 Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: Jan 2011 thru Jan 2012	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Shelly Young

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, VAPOR INTRUSION INVESTIGATION, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM

AECOM

ADMINISTRATIVE INFORMATION

Job/Task Name: Mobilization and Demobilization	
Project Name: BNSF Vapor Intrusion Investigation	Project Location: 512, 520, 528, 523, and 544 Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: Jan 2011 thru Jan 2012	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Shelly Young

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 too 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. Do not enter tank, vats, sumps, holes, or other potential confined spaces without a Confined Space Entry Procedure, Hazard Evaluation, and Permit completed.	10. Correct any deficiency

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)
- ☒ Non-ionizing radiation (RF/UV/IR)
- ☒ 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*): Animals/insects/poisonous plants, lifting / back strain, cuts / contusions / abrasions, protruding sharp objects

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
- See below _____(*type*)
- ☒ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*) Reflective traffic safety vest where required

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

- ☒ Fire ext. 1A:10B:C:D (*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

APPLICABLE SOPS (SEE HASP/SSHP/APP)

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

TRAINING REQUIREMENTS

BNSF Training

ACCEPTED SIGNATURES

Site/Field Supervisor: Shelly Young	**SSO/SH&E:** Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF, VAPOR INTRUSION INVESTIGATION, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM (CONT'D)

ADMINISTRATIVE INFORMATION	
Job/Task Name: Mobilization and Demobilization	
Project Name: BNSF Vapor Intrusion Investigation	Project Location: 512, 520, 528, 523, and 544 Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: Jan 2011 thru Jan 2012	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Shelly Young

JOB EVENT SEQUENCE (CONT'D)

LIST ONE STEP OF THE JOB FOR EACH LINE. **PAGE 2 OF 2**

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: Shelly Young	**SSO/SH&E:** Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF, VAPOR INTRUSION INVESTIGATION, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Mobilization and Demobilization	
Project Name: BNSF Vapor Intrusion Investigation	Project Location: 512, 520, 528, 523, and 544 Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: Jan 2011 thru Jan 2012	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Shelly Young

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, VAPOR INTRUSION INVESTIGATION, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM

AECOM

ADMINISTRATIVE INFORMATION

Job/Task Name: Vapor Sampling – Indoor Living Spaces and Outdoor Ambient Air

Project Name: BNSF Vapor Intrusion Investigation	Project Location: 512, 520, 528, 523, and 544 Somers, Montana
Project Manager: Shelly Young	Analysis Performed By: Dan Schillings
Date Job/Task to be performed: Jan 2011 thru Jan 2012	Type of Job/Task: ☐ One time ☒ Routine job/task
Responsible Organization: AECOM	Job Supervisor: Shelly Young

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. Initiate gas monitoring
2. Don applicable PPE	7. Obtain all required samples, package and label
3. Verify equipment is in working order	8. Complete all paper work and COC's
4. Correct any identified deficiencies from inspection	9. Verify all samples are collected prior to departing area
5. Position equipment at sampling location	10. Clean area and depart

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
- ☒ Volatiles
- ☐ 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)
- ☒ Non-ionizing Radiation (RF/UV/IR)
- ☒ 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, flammable gases Animals/insects/poisonous plants, lifting / back strain, cuts / contusions / abrasions, biological hazards, Methane, BTEX, PAHs. Will be collecting air samples for Methods TO-15 and TO-17.

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 rubber for samples (*type*)
- ☐ Leather/cloth
- ☐ Welder's
- ☐ Electrical safety _____(*volts*)

Other (*List*): **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*): _____

INSPECT/PERMIT REQUIREMENTS	EQUIPMENT TO BE USED
PPE	PPE-specific
Hand tools prior to use	Tool specific

APPLICABLE SOPS (SEE HASP/SSHP/APP)

SH&E 103, SH&E 201, SH&E 307, SH&E 509, SH&E 607, SH&E 610, SH&E 615, SH&E 617, SH&E 713

TRAINING REQUIREMENTS

40-hr HAZWOPER, 8-hr Supervisor, First Aid, CPR, PPE-specific, BNSF required trainings

ACCEPTED SIGNATURES

Site/Field Supervisor: Shelly Young	**SSO/SH&E:** Angelia Winn, DHSM Daniel Schillings for

AECOM
BNSF, VAPOR INTRUSION INVESTIGATION, SOMERS, MONTANA
TASK HAZARD ANALYSIS FORM (CONT'D)

ADMINISTRATIVE INFORMATION	
Job/Task Name: Vapor Sampling – Indoor Living Spaces and Outdoor Ambient Air	
Project Name: BNSF Vapor Intrusion Investigation	Project Location: 512, 520, 528, 523, and 544 Somers, Montana
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JOB EVENT SEQUENCE (CONT'D)

LIST ONE STEP OF THE JOB FOR EACH LINE. **PAGE 2 OF 2**

11. Decontaminate equipment where required
12. Collect any IDW and dispose of properly
13. Move to next location and repeat steps 2 through 12 as required
14. Daily housekeeping around the site
15. **Consult Confined Space Entry THA where required.**
16.
17.

MONITORING PROCEDURES

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 and continue monitoring.
		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.
Explosivity (multi-gas detector or CGI)	Obtain in the worker's breathing zone or in the immediate work area.	< 10% LEL	Continue work activities. If significant changes exist in this acceptable range, contact the SSO to investigate the potential for contributing factors.
		> 10% LEL	Cease work, exit the excavation, and contact the SSO.

ACCEPTED SIGNATURES

Site/Field Supervisor:	SSO/SH&E:
Shelly Young	Angelia Winn, DHSM for Daniel Schillings

AECOM
BNSF, VAPOR INTRUSION INVESTIGATION, SOMERS, MONTANA
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION	
Job/Task Name: Vapor Sampling – Indoor Living Spaces and Outdoor Ambient Air	
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