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SITE-SPECIFIC HEALTH AND SAFETY PLAN

Columbia Falls Aluminum Company
Columbia Falls, Flathead County, Montana

Prepared for

COLUMBIA FALLS ALUMINUM COMPANY, LLC
2000 Aluminum Drive, Columbia Falls
Flathead County, Montana

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1.0 INTRODUCTION

Roux Associates, on behalf of Columbia Falls Aluminum Company, LLC (CFAC), has prepared this Health and Safety Plan (HASP) to identify the procedures, responsibilities, and training necessary to protect the health and safety of on-site personnel during the Remedial Investigation/ Feasibility Study (RI/FS) being conducted at the Columbia Falls Aluminum Company (CFAC) in Columbia Falls, Flathead County, Montana (hereinafter, "the Site"). The RI/FS is being performed pursuant to the Administrative Settlement Agreement and Order On Consent for Remedial Investigation/Feasibility Study (AOC) between the USEPA and CFAC (CERCLA Docket No. 08-2016-0002). The HASP was prepared in accordance with the Occupational Safety and Health Administration's (OSHA's) Hazardous Waste Operations and Emergency Response standard (29 CFR 1910.120), the National Institute for Occupational Safety and Health's (NIOSH's) Occupation Safety and Health Guidance Manual for Hazardous Waste Site Activities, and Roux Associates' corporate standard operating procedures for health and safety. Compliance with this HASP is required for all Roux Associates employees and subcontractors, as well as any authorized third-party personnel who enter work zones associated with the RI/FS.

1.1 Applicability

This HASP is applicable to the activities described in the RI/FS Work Plan and the Phase I Site Characterization Sampling and Analysis Plan (Phase 1 SAP), which are summarized in Section 3.0 of this HASP. This HASP may undergo revision as Site conditions change, as additional phases of work are conducted, and/or based upon additional information made available. Any proposed changes must be reviewed and approved by the Project Health and Safety Manager and/or his designee.

1.2 Roles and Responsibilities

The Project Health and Safety Officer will serve to ensure that the policies and procedures of this HASP are implemented by the individuals on-site and will provide guidance regarding the appropriate monitoring and safety equipment, rules and regulations, and other resources necessary in implementing the HASP. The Health and Safety Manager will also ensure that all Roux Associates personnel designated to work at the Site are qualified according to applicable OSHA and state requirements. Mr. Joseph Gentile currently serves as the Health and Safety Officer for the project.

Roux Associates' RI/FS Manager is ultimately responsible for the performance of all RI/FS-related tasks at the Site, including health and safety. Mr. Andrew Baris currently serves as the RI/FS Manager for the project. For the Remedial Investigation (RI) portion of the project, the Roux Associates' RI Manager is responsible for directing the safety program. The RI Manager is responsible for ensuring that an adequate number of field copies of this HASP are produced for field use, and that a duplicate office copy of this HASP is placed in the central project files. The RI Manager is also responsible for ensuring that all field team members have reviewed and signed off on the HASP, and that current trainings and medical clearances are on file for all field team members. Mr. Michael Ritorto has been designated Roux Associates' RI Manager for implementation of the remedial investigation.

The on-site, day-to-day management of health and safety issues for the for the RI/FS activities is the responsibility of the Site Health and Safety Officer (SHSO). Roux Associates field personnel will be present for the duration of the field work and one of the Roux personnel will be designated as the SHSO. The SHSO's responsibilities include ensuring compliance with this HASP, determination of the appropriate level(s) of personnel protection and coordination of emergency response if required. The SHSO also has stop-work authorization, which he or she will execute upon determination that an imminent safety hazard, emergency situation, or other potentially dangerous situation (such as detrimental weather conditions) exists.

1.3 Stop-Work Authority

All field team members are responsible for understanding and complying with this HASP and for reporting unsafe or hazardous conditions to the SHSO. If an unsafe or hazardous condition is perceived by any field team member, he/she has the authority to temporarily stop work and discuss the condition with the SHSO. The SHSO shall consult with the Site Coordinator, the RI/FS Project Manager, and/or the Project Health and Safety Officer as needed to develop an appropriate solution to the unsafe or hazardous condition. Authorization to proceed with work following a stop-work order will be issued by the SHSO in consultation with the project team. The SHSO shall follow-up to ensure that any potential solutions and high value learnings are effectively communicated to the rest of the personnel involved in the RI/FS.

2.0 DESCRIPTION AND HISTORY OF CFAC SITE

The facility is located at 2000 Aluminum Drive near Columbia Falls, Flathead County, Montana (Figure 1). The Site is accessed by Aluminum Drive via North Fork Road (County Road 486). The Site is approximately 2.0 miles northeast from the center of Columbia Falls and the Site is accessed by Aluminum Drive via North Fork Road (County Road 486). According to the 2013 Census (www.census.gov), the total population of Columbia Falls is 4,796. The nearest residences are located approximately 0.80 miles west of the Site and the nearest groundwater wells used for drinking water are located within 1 mile from the Site. Existing onsite wells are not used for potable water.

The CFAC RI/FS Site consists of approximately 1,340 acres bounded by Cedar Creek Reservoir to the north, Teakettle Mountain to the east, Flathead River to the south, and Cedar Creek to the west (Figure 1). The non-industrial areas of the Site have been previously used for recreational purposes such as hunting and fishing, etc.

Buildings and industrial facilities located at the Site include offices, warehouses, laboratories, mechanical shops, paste plant, coal tar pitch tanks, pump houses, casting garage, and the potline facility. The Site also includes seven closed landfills, one active landfill, material loading and unloading areas, two closed leachate ponds, and several wastewater percolation ponds. A rectifier yard and switchyard owned by Bonneville Power Administration and a right-of-way for the Burlington Northern Railroad are also within the Site boundaries.

Aluminum was produced at the Site from 1955 to 2009. The facility began with two potlines in 1955 and an annual capacity of 67,500 tons per year (using 120 pots per potline). A third potline was added in 1965, and a fourth and fifth potlines were added in 1968, increasing total aluminum production capacity at the Site to 180,000 tons per year.

During aluminum production, the Hall-Heroult process and the Vertical Stud Soderburg technology were used to reduce alumina into aluminum. In the Hall-Heroult process, aluminum oxide is dissolved into sodium hexafluoroaluminate (Na_3AlF_6; cryolite) bath in a carbon-lined pot heated to 960 degrees Celsius. Electric current runs through a carbon anode made of petroleum coke and pitch, to a carbon cathode (the steel pot, firebrick liner, and a layer of carbon paste),

reducing the aluminum ion to aluminum metal. The anode is consumed during the reaction, and molten aluminum forms at the bottom of the pot. The molten aluminum was tapped from the pot and transferred to the casting garage, to be alloyed (if desired by customer) and cast into ingots as the finished product for offsite shipment.

A Rod Mill, in the southwest corner of the Main Plant Area, was also operated until the late 1960s. The Rod Mill was used to produce aluminum wire and cable. After its use as a Rod Mill, the building was used as a warehouse. The aluminum production process generated several waste products, most notably spent potliner (SPL). The sodium in the cryolite bath gradually penetrates the carbon paste lining of the pot, causing the carbon to swell and eventually fail. The typical lifespan of the carbon cathode is 5-7 years. To re-use the pot, the carbon lining of the pot is removed and replaced with a new carbon lining. The SPL consists of the thick layer of carbon bonded to an insulating brick layer, containing fluoride, sodium, aluminum, and small amounts of cyanide. The fluoride and sodium in the SPL is from the sodium hexafluoroaluminate (cryolite) bath, and the cyanide forms in the cathode as a side chemical reaction during aluminum production.

The aluminum production process generated air emissions, including particulate fluoride, hydrogen fluoride, and polyaromatic hydrocarbon compounds (PAHs). The main sources of air emissions were the Paste Plant and the aluminum reduction (i.e., the potlines) facility. Air emissions from the smelting process were controlled using wet scrubbers until 1976, and air emissions from the Paste Plant also used a wet scrubber from 1955 to 1999. Waste water from the Paste Plant wet scrubber was discharged to the North Percolation Ponds until 1999, when the wet scrubber was replaced with a coke dry scrubber. Waste water from the aluminum reduction facility wet scrubbers was discharged into the Wet Scrubber Sludge Pond. The aluminum reduction facility wet scrubbers were replaced with dry scrubbers in 1976, and an analysis of the sludge by the Columbia Falls Reduction Plant laboratory staff indicated that the sludge is about 80% calcium fluoride on a dry weight basis, and also contained calcium oxide, magnesium oxide, sodium oxide and iron oxide. The sludge generated from the scrubbers was landfilled on Site in the Wet Scrubber Sludge Pond

Raw materials were delivered to the Site predominantly by rail, and included aluminum oxide, petroleum coke, coal tar pitch and fluoride/cryolite. Alumina was delivered to the off-loading buildings, where the alumina was transferred to silos located between the potlines. Petroleum coke and coal tar pitch were delivered to the northeast side of the plant and mixed in the Paste Plant to form briquettes to be used as anodes.

Solid waste generated by the aluminum production process was primarily disposed in on-site landfills until early 1990, after which SPL was shipped offsite for disposal as hazardous waste due to reclassification of the waste by the USEPA. In addition to SPL and wet scrubber sludge, the on-Site landfills were potentially used to dispose of other wastes such as: dross, potliner refractory wastes (non-hazardous – likely the scrap calcined petroleum coke, ore, cryolite, aluminum fluoride, bath, brick, concrete), scrap metal, wood, used oil and municipal solid waste (MSW). Liquid waste (primarily contact cooling water) generated as a result of the aluminum reduction process was discharged to several percolation ponds.

Additional details regarding the physical setting of the Site, including a review of the Site topography, climate, geology, hydrogeology, and groundwater flow and a description of the Site history and past operations are provided in Section 2.0 of the RI/FS Work Plan.

3.0 SCOPE OF WORK

The Scope of Work for the RI/FS is described in the RI/FS Work Plan dated November 23, 2015 and included as part of the AOC. This Section provided a summary of the RI/FS Phase I Site Characterization activities planned at this time and covered by this HASP. A detailed description of the field procedures associated with each activity is provided in the Phase I SAP. This HASP will be revised as needed to facilitate future work beyond the Phase I Site Characterization.

3.1 Site Reconnaissance

This activity will include a ground-level Site reconnaissance by Roux Associates field personnel. Roux Associates personnel will visit the Site and observe Site features. During the reconnaissance, field personnel will:

- Inspect existing Site monitoring wells;
- Field verify existing base maps and aerial photographs;
- Develop a further understanding of drainage / overland flow and document any erosional features at the Site that may be contaminant migration pathways;
- Identify habitat areas for further evaluation in the Screening Level Ecological Risk Assessment (SLERA);
- Confirm accessibility and determine equipment requirements for access to proposed sampling locations.
- Refine soil boring locations that are proposed to be biased towards areas of known or suspected areas of contamination; and
- Identify any additional areas / site features where Contaminants of Potential Concern (COPCs) potentially were released, and where samples will be collected, based upon visual indications of waste materials, soil piles, staining, stressed vegetation, etc.

Subcontractors may be present during the Site Reconnaissance in order to plan the implementation of the various field tasks.

3.2 Pre Intrusive Activities

A geophysical survey will be completed utilizing electrical resistivity and ground penetrating radar (GPR) technology with the goal of providing a preliminary understanding of approximate depth to bedrock, approximate depth to groundwater, approximate depth of Site features,

potential changes in subsurface hydrogeological conditions and potentially other subsurface anomalies that may contribute to the delineation of source areas.

A passive soil gas sampling and landfill gas investigation will be completed to evaluate the soil vapor conditions in various parts of the Site. For passive soil gas sampling, an Amplified Geochemical Imaging, LLC (AGI) passive sampling device will be used to collect samples at a depth of five feet. Field screening of soil gas will be conducted at landfills to evaluate the potential for methane and VOCs. This activity involves advancing a soil gas probe into the subsurface to a depth of approximately five feet.

3.3 Soil Boring and Soil Sampling

Soil borings and soil sampling will be conducted in the vicinity of the RI Areas which have been identified as potential source areas, within operational areas, and within background areas. Soil borings will be completed utilizing either sonic-rotary drilling or direct-push (e.g., Geoprobe) techniques. At each proposed location, continuous core samples will typically be collected from land surface to the bottom of the borehole in an effort to obtain lithologic and soil screening data. Samples will be collected at varying depths, screened with a PID, and then sent to the designated laboratory for further analysis. The locations of the soil borings and proposed soil sampling are described in the Phase I SAP.

3.4 Monitoring Well Installation and Gauging

Selected soil borings are proposed to be completed as monitoring wells. These new monitoring wells will be used to supplement the existing monitoring well network at the Site. The majority of the proposed Phase I monitoring wells will be installed immediately below the groundwater table. In addition to the water table wells, a number of deep monitoring wells are proposed to evaluate groundwater flow within deeper hydrogeologic units and to evaluate vertical extent of contaminants of potential concern (COPCs). Groundwater levels will be measured across the monitoring well network on a quarterly basis for a period of one year following installation of all Phase 1 wells to evaluate Site-wide groundwater elevations and groundwater flow. Additionally, groundwater levels will be monitored long-term through the use of data logging pressure transducers in six monitoring wells.

3.5 Groundwater and Surface Water Sampling

Groundwater samples will be collected from the monitoring well network. Samples may be collected from existing wells with dedicated sampling pumps. Groundwater samples in wells without dedicated samplings pumps will be collected using low stress (Low Flow) purging and sampling techniques.

Surface water samples will be collected on a quarterly basis for one year from surface water bodies present at the Site including Flathead River, Cedar Creek, and Cedar Creek Drainage Overflow (if wet). Samples will be collected by taking a grab sample directly from the water body using the sample collection container for each analysis. During each surface water sampling event, the discharge of Cedar Creek and Cedar Creek Drainage Overflow will be measured utilizing a mechanical current-meter method in accordance with Roux SOPs. In addition, a staff gauge will be installed within the Flathead River adjacent to the Site and the discharge will be estimated from by correlating readings from the gauge to a nearby USGS monitoring station downstream of the Site.

3.6 Sediment Sampling

Sediment samples from the bottom of surface water bodies will be collected from the same locations as surface water samples. Sediment will be collected by grab sampling sediment immediately beneath the subsurface and placing in sampling jars for laboratory analysis.

A sediment sample will also be collected from Site drywells where feasible. Sediment may be collected utilizing hand tools and or via drilling through the dry bottom of the drywell.

3.7 Test Pitting

Test pitting will be completed within and around the asbestos landfills to define the extent and contents of the landfills. Test pitting will be completed by a subcontractor with the use of heavy equipment (e.g., backhoe, excavator, etc.). The test pitting activities will be overseen by Roux Associates personnel and a certified asbestos inspector.

3.8 Coordination with Other Site Activities

Personnel performing work associated with the RI/FS must be cognizant of other activities potentially being conducted at the Site concurrently. For example, it is expected that demolition

of the Main Plant buildings and equipment will be ongoing simultaneously with the RI/FS activities. Additional chemical or physical hazards may be associated with the demolition activities that are not covered by this HASP. At a minimum, personnel performing RI/FS field activities must communicate with those performing other activities, including the applicable SHSO. If necessary, RI/FS personnel may be required to read and comply with the requirements of the HASP associated with the concurrent activities.

3.9 Additional Activities

Over time, Roux Associates may be tasked to perform additional activities at the Site. Health and safety hazards associated with such additional activities must be evaluated to determine if this HASP would cover those activities. If it is determined that the additional activities are not covered, the HASP would require revision by the Project Health and Safety Officer and review by field personnel.

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4.0 HAZARD ASSESSMENT

This section identifies the chemical, physical, and biological hazards that are associated with the Scope of Work described in Section 3.0. Personal protective equipment (PPE) required to limit exposure to chemical hazards is described in Section 5.0 of this HASP. Site-specific controls to mitigate potential for exposure to these hazards are described in Section 6.0 of this HASP.

4.1 Chemical Hazards

Previous investigation results and historic land use at the Site associated with RI/FS activities indicate the potential for exposure to contaminated groundwater, surface water and sediments, soil vapor, surface and subsurface soil.

According to the EPA Site Reassessment Report dated April 2014, there have been releases or threatened releases of hazardous substances at, or from, the Site from historical industrial activities at the plant, and that the disposal of hazardous substances at the Site have affected soil, sediment, ground water and/ or surface water. The known and potential contaminants of concern are metals, including arsenic, cadmium, chromium, lead, manganese, nickel, selenium and zinc as well as cyanide, fluoride, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl compounds (PCBs), and pesticides.

Cyanide and fluoride are the principal contaminants of potential concern (COPCs) that may be encountered in environmental media at the Site as a result of historical waste disposal. Additionally, PAH's and Metals may be expected in environmental media as a result of historical operations. Hydrocarbons may also be encountered, as the Site has multiple Underground Storage Tanks (USTs) and Above-ground Storage Tanks (ASTs) and there have been documented releases. PCBs are also known to have been released in the area of the Rectifier Yards. These contaminants may pose a potential exposure hazard through ingestion, skin absorption, inhalation, or a combination of these routes. Pertinent physical, chemical, and toxicological information regarding the COPCs is provided in Appendix A. Toxicological information for Contaminants detected during the USEPA 2013 Site Reassessment activities is included in Table 1.

Material Safety Data Sheets (MSDSs) / Safety Data Sheets (SDS) shall be provided for chemicals that are brought onsite during the Work, if any. Those chemicals likely to be brought on site are laboratory reagents and preservatives, such as hydrochloric acid, in small quantities. The primary hazard due to these chemicals is corrosivity. Exposure will be controlled by avoiding contact and the use of the non-permeable gloves. Any new MSDSs or SDSs brought onsite will be stored with the existing Site MSDSs / SDSs and available for review by project personnel during field operations.

4.2 Physical Hazards

There are a variety of potential environmental, physical, and biological hazards associated with the activities to be conducted during implementation of the RI/FS. The remainder of this section describes these potential hazards.

4.2.1 Hazards Associated With the Working Environment

This section discusses the potential hazards that could be encountered as a result of the working environment.

4.2.1.1 Heat Stress

The National Weather Service records average maximum temperatures of 80 degrees Fahrenheit during the hottest months in Columbia Falls, Montana. Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment in hot weather environments.

Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat stress are as follows:

- Severe muscle cramps, usually in the legs and abdomen;
- Exhaustion, often to the point of collapse; and
- Dizziness or periods of faintness.

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the

skin in an effort to rid the body of excess heat through transference. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin with heavy perspiration;
- Skin appears pale;
- Fatigue and weakness;
- Dizziness; and
- Elevated body temperature.

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a medical emergency requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- Dry, hot red skin;
- Body temperature approaching or above 105 degrees F;
- Large (dilated) pupils; and
- Loss of consciousness – the individual may go into a coma.

4.2.1.2 Cold Stress

The National Weather Service records average minimum temperatures of 13 degrees Fahrenheit during the coldest months in Columbia Falls, Montana. Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole body protection. Adequate insulating clothing must be used when the air temperature is below 60°F. A work/rest regimen will be initiated when ambient temperatures and protective clothing cause a stressful situation. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. The signs and symptoms of cold stress include the following:

- Severe shivering;
- Abnormal behavior;

- Slowing;
- Weakness;
- Stumbling or repeated falling;
- Inability to walk;
- Collapse; and/or
- Unconsciousness.

4.2.1.3 Noise

Noise is associated with the operation of heavy equipment, power tools, pumps, and generators. Noise is also a potential hazard when working near operating equipment such as drill rigs. High noise operations will be evaluated by the SHSO to avoid individual noise exposures exceeding 85 dBA as an 8-hour time-weighted average.

4.2.1.4 Working Near Open Water

The potential for drowning due to the amount of work requiring entry into, or working near, surface water bodies is a notable hazard. There are three surface water bodies present within the Site including the Flathead River, Cedar Creek, and Cedar Creek Drainage Overflow. Although samples will be collected from surface water features at shallow depths (i.e., less than two feet on most occasions), greater depths are possible during the spring months and following storms and prolonged periods of precipitation. Additionally, the Flathead River is a fast-flowing, powerful river that flows heavily during the Spring months. Moreover, drowning can occur even in shallow water, for example if a person falls and becomes unconscious or otherwise incapacitated.

4.2.2 Contact hazards

This section discusses the potential contact hazards that could be encountered during the Work.

4.2.2.1 Heavy Equipment and/or Vehicular Traffic and Railroad Traffic

Some RI/FS activities will be conducted within or adjacent to Site roadways, with the potential to encounter moving vehicles. Additionally, Roux Associates personnel will utilize field

vehicles to traverse the Site, and therefore personnel would be exposed to typical hazards while driving. Contact and/or operation of vehicles present the potential for serious injury.

Some RI/FS activities will be completed concurrently with ongoing demolition activities with the potential for work to be completed near operating heavy equipment and/or moving vehicles. Additionally, some RI/FS activities will require the use of a drill rig, backhoe, or other heavy equipment. Contact with heavy equipment presents the potential for serious injury.

Some RI/FS activities will be conducted adjacent to and require crossing an active rail line. The crossing area is not equipped with any type of signal system. There is potential risk of serious injury to field personnel from contact with moving trains.

4.2.2.2 Hand Tools / Puncture Hazards

Hand tools will be utilized during the RI/FS activities to collect environmental samples. Field personnel can be cut, or struck by, hand tools while using them, resulting in puncture hazards. Sharp and/or rusty objects, such as broken glass, concrete and rebar, debris, and nails can be encountered at the Site.

4.2.2.3 Electrical Hazards

Portable pumps, generators, and other power tools will be utilized during drilling and sampling. This equipment requires proper grounding and/or a ground fault circuit interrupter (GFCI) before operation. Personnel shall never attempt to move an operating pump or generator.

Overhead and underground utilities are also present across the Site. The presence of utilities in the work zone presents the potential for contact with live electric, resulting in serious injury.

4.2.3 Other Physical Hazards

Field personnel performing work at the Site will be aware of typical exertion hazards that may be present when implementing a remedial investigation. These may include:

- Lifting of field equipment and other heavy objects;
- Repetitive motions;
- Bending and ergonomics during sampling; and

- Walking while working.

Field personnel will be required to traverse large portions of the Site. Due to the nature and condition of the Site, uneven and slippery terrain may be present, which represents significant slip, trip, and fall hazards. Wet weather and icy conditions increase the risk of slips, trips, and falls, particularly when working on uneven terrain.

4.3 Biological Hazards

The Site is located within the backcountry of Montana, and various types of wildlife may be present within the Site boundaries. Biological hazards include the possibility of animal bites by wild animals, ticks or other insect bites, bee and wasp stings and/or exposure to poisonous plants. The sections below discuss the various biological hazards.

4.3.1 Animals and Animal Wastes

Dangerous mammals that can be encountered while traversing the Site may potentially include black bears, grizzly bears, wolves, wolverines, bats, deer, elk, moose, bobcats, foxes, coyotes, and lynxes. These animals may be difficult to spot in highly wooded areas or at dawn/dusk. Precautions must be taken by field personnel to avoid potentially dangerous encounters.

Certain animals can represent significant sources (vectors) of disease transmission. Precautions to avoid or minimize potential contact with animals or animal waste and/or dead animals will be considered prior to all field activities.

4.3.2 Insect Stings

Stings from insects are often painful, may cause swelling, and can be fatal if a severe allergic reaction, such as anaphylactic shock, occurs. Precaution must also be taken by field personnel to prevent exposure to insects. Some insects are more active at certain times – for example, some mosquitoes are most active between dusk and dawn. Some insects, such as bees and wasps, may prefer bright colors and sweet drinks.

If an insect sting occurs, the stinger shall be scraped out of the skin, opposite of the sting direction. The area shall be washed with soap and water, followed by an ice pack. Personnel allergic to bee and/or wasp stings shall alert the SHSO and coworkers immediately, and

provide/self-administer medicine and antidotes to treat allergic reactions immediately as prescribed by their personal physician, or if the victim has a history of allergic reaction, he/she will be taken to the designated hospital.

4.3.3 Ticks

Precaution must be taken by field personnel to prevent exposure to ticks, as they may carry Lyme disease and/or Rocky Mountain spotted fever. Ticks thrive in wooded habitats and areas with brushy, overgrown grasses. Ticks are especially active in the spring and early summer months when nymphal-stage ticks feed. Ticks may be active at any time of day.

Tick prevention measures and procedures for treating tick bites are further discussed in Section 6.1.

4.3.4 Poisonous Plants

Plant-based biological hazards are also present across the site and may include poison ivy, poison oak, and poison sumac. Exposure to these plants could cause rashes on the skin and potentially infections. If exposed to these plants, personnel shall wash skin thoroughly with soap and water.

5.0 ZONES, PERSONAL PROTECTION, AND COMMUNICATIONS

This section describes the zoned approach to control the spread of contamination at the Site. This section also described the personal protection methods, procedures, and equipment which will be required and available for onsite personnel during Site activities to limit exposure to potential hazards.

5.1 Site Zones

It is not anticipated that Site zones will need to be established but, if the need occurs, a three-zone approach to control the potential spread of contamination will be employed. The three zones are:

- The Exclusion Zone;
- The Contamination Reduction Zone; and
- The Support Zone.

The establishment of work zones will ensure that: personnel are properly protected against the potential hazards in the area where they are working; work activities and potential contamination are limited to the specific areas; and personnel can be easily located and evacuated in an emergency.

The establishment of work zones and the levels of protection required within the zones will be determined on a case-by-case basis. The SHSO and the Project Manager will determine the need for work zones and, based upon Site-specific knowledge and data, determine the levels of protection within the established zones. The following sections provide general specifications for the three work zones.

5.1.1 Exclusion Zone

The area(s) which contain, or are suspected to contain, hazardous materials or activities will be considered the Exclusion Zone (EZ). The SHSO may establish more than one restricted area within the EZ when different levels of protection may be employed or different hazards exist. Signs will be posted in and around areas required to be posted by a specific health or safety standard. No personnel are allowed in the EZ without:

- The proper personal protective equipment;

- Medical authorization per Section 7.5;
- A need to be in the zone; and
- Training certification.

During excavation, drilling and sampling activities, the Exclusion Zone is defined as the excavation and a 10-foot radius around the excavation boundary, or drilling or sampling locations. For the purposes of this project, the Exclusion Zone(s) will be delineated once the work sites have been determined.

5.1.2 Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) will be established between the Exclusion Zone and the Support Zone. The CRZ will contain the contamination reduction corridor (CRC) and is designed to reduce the probability that the uncontaminated clean areas will become contaminated or affected by other site hazards. It is the area where decontamination of personnel and equipment takes place and serves to limit the physical transfer of hazardous substances into clean areas. Decontamination shall be performed in geographical areas that minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment. The CRZ is to be used for general site entry and egress including access for heavy equipment for investigation activities. The CRZ will also contain safety and emergency equipment (see Section 7.2.3). No personnel are allowed in the CRZ without:

- The proper personal protective equipment;
- Medical authorization per Section 7.5;
- A need to be in the zone; and
- Training certification.

5.1.3 Support Zone

The Support Zone (SZ) is considered the uncontaminated area and will be separated from the CRZ by the "Contamination Control Line". The SZ will contain the support facility that will provide for team communications and emergency response. Appropriate sanitary facilities and safety and support equipment will be located in this zone. The majority of site operations as well as site access of authorized persons will be controlled from this location. The support facility

will be located may be used as a potential evacuation point. No potentially contaminated personnel or materials are allowed in this zone.

5.2 Personal protective equipment (PPE)

Personal protective equipment (PPE) used during the performance of RI/FS activities will be commensurate with the potential level of exposure to toxic and/or other hazards. The nature of chemical contamination at the Site has been preliminarily characterized. Based on this characterization, the potential for chemical exposures during the performance of RI/FS activities is expected to be limited, provided that appropriate safe work practices are followed as prescribed in this HASP. Similarly, the potential for explosive or oxygen-deficient atmospheres is negligible. Therefore, all non-intrusive activities, which preclude contact with contaminated media, will be performed in Level D protection. The minimum PPE required for these activities include the following:

- Full-length work pants or coveralls
- Long sleeve shirt
- High-visibility clothing (e.g., fluorescent vest or fluorescent shirt)
- High-top leather, steel-toe boots
- Hard hat
- Safety glasses

Modified Level D PPE will be required under certain circumstances to protect against increased potential for chemical and physical hazards. The additional PPE and the circumstances under which it must be worn include:

- nitrile gloves, whenever samples are being collected;
- cut-resistant gloves, whenever hand tools or sharp instruments are being used, when handling glassware, or when handling waste (cut-resistant beneath nitrile);
- rubber boots when there is potential for entering surface water bodies or very wet areas;

- a U.S. Coast Guard (USCG)-approved personal flotation device (PFD),[1] whenever wading in water greater than two feet deep is required; and
- hearing protection, whenever ambient noise levels exceed 85 dBA (i.e., whenever one must raise their voice to be heard at close distances).

If atmospheric contaminants concentrations are present requiring air purifying respirators, or chemical-resistant clothing are needed to prevent against contact with chemical contaminants, then upgraded PPE would be required. The following criteria will be used to determine if upgraded PPE to Level C Protection would be required:

- Airborne hazards are known to be present but are unlikely to exceed protection factors provided by air-purifying respirators.
- Continuous total organic vapor readings for five minutes in the breathing zone register between 5 ppm and 25 ppm on a PID (such as the MiniRAE 3000 or other comparable instrument).
- Measured air concentrations of known organic vapors will be reduced by the respirator to, at, or below one-half the permissible exposure limits, and the individual and combined compound concentrations are within the service limit of the respirator cartridge.
- Atmospheric contaminant concentrations do not exceed Immediately Dangerous to Life and Health (IDLH) concentrations.
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect the small area of skin left unprotected by chemical-resistant clothing.
- Job functions have been determined not to require self-contained breathing apparatus

Field personnel shall make decisions on the need for upgraded PPE in consultation with the SHSO. If there is a need to upgrade to Level C PPE, the SHSO will consult with the Project Health and Safety Manager. It is not expected that upgraded PPE beyond level C protection would be required during this work. However, this HASP will be revised to include any additional PPE requirements, if needed throughout the duration of the work.

5.3 Safety Equipment

Basic emergency and first aid equipment will be available at the Site. Each work vehicle at the Site shall be equipped with a first aid kit, shovel, and fire extinguisher. Additional safety

[1] PFDs must be labeled Type 1 PFD, Type II PFD, Type III PFD, or shall be a USCG-approved Type V PFD that is marked or labeled for use as a work vest for commercial use or for use on vessels.

equipment will be located within the administrative building, including but not limited to, an emergency eyewash, fire extinguisher, and Automated External Defibrillator (AED).Field personnel will be notified of the locations of emergency and first aid equipment prior to commencing with field activities.

Additional safety equipment shall be considered on an as needed basis throughout the work. Personnel shall refer to the task-specific Job Safety Analysis (JSA) (See Section 6.7) for additional safety equipment that may be required for each task.

5.4 Communications

Cell phones will be utilized for communication with emergency support services/facilities. Roux Associates personnel will be equipped with a mobile telephone. The use of cell phones or other mobile communications devices while operating vehicles/equipment/tools or while working within defined work area exclusion zones is prohibited.

Prior to the commencement of RI/FS field activities, emergency signals (e.g., air horn, car horn, etc.) and/or hand signals and their meanings (e.g., stop work, evacuate) will be specified and communicated to all field team members.

5.5 Buddy System

Select field activities conducted in contaminated, hazardous, and remote areas of the Site require the use of the buddy system. Instances when the buddy system will be employed include, but are not limited to, activities performed in wetland areas (i.e., surface-water sampling, etc.), drilling activities and confined space entry (permit required and non-permit required). Prior to commencing with field tasks in a potentially hazardous area, the need for using the buddy system shall be evaluated. If it is determined that the buddy system is to be implemented, workers will coordinate working together as a single unit so that they are able to monitor and help each other. A buddy will be able to:

- Provide his/her partner with assistance;
- Observe his/her partner for signs of chemical or heat/cold exposure;
- Periodically check the integrity of his/her partner's protective clothing; and
- Notify the SHSO or others if emergency help is needed.

Individuals working in the buddy system will mobilize to and from remote Site locations as to never leave one individual alone. Individuals working in the buddy system shall communicate consistently throughout the task and discuss safety of the tasks when necessary. At the completion of the task, the individuals working in the buddy system shall verify that all workers are safely accounted for.

6.0 SAFE WORK PRACTICES AND SITE PROCEDURES

This section describes safe work practices to be utilized throughout the RI/FS activities to support the protection of personnel working on-site. Safe work practices are necessary to minimize or eliminate the potential chemical, physical, and biological hazards associated with activities to be performed during implementation of the RI/FS. This section also describes general safety procedures that will be followed throughout the duration of the work.

6.1 Safe Work Practices

The following safe work practices will be implemented to prevent injuries and unwanted exposures. In addition to following safe work practices, site specific JSAs will be utilized as described in Section 6.7.

6.1.1. Chemical Hazards

Potential chemical exposures will be controlled through the use of personal protective equipment (PPE) and minimization of exposure to chemical contaminants. Detailed information regarding PPE is described in Section 5.0 of the HASP.

Personnel working on-site shall be knowledgeable of the chemical hazards that might be encountered in environmental media associated with Site-related COPCs as described in Section 4.1. If an unknown substance is encountered in the field, the personnel shall stop work and contact the Project Health and Safety Officer to discuss the next course of action.

6.1.2 Physical Hazards

This section describes safe work practices to handle the various types on physical hazards presented in Section 4.0.

6.1.2.1 Heat and Cold Stress

As described in Section 4.2.1, extreme temperatures may be encountered at the Site during the peak summer and winter months. Personnel working at the Site shall be aware of temperatures and conditions during field work that suggest that heat or cold stress may be possible. The administrative building at the Site provides indoor cover from hazards such as heat and cold and an area to take breaks as needed.

An individual suffering from heat cramps shall initially be treated with first aid. Find the individual and area to rest in the shade and drink plenty of fluids. Typically, the individual will recover within one-half hour while being monitored constantly. If the individual has not improved substantially within 30 minutes and the body temperature has not decreased, the individual shall be transported to a hospital for medical attention.

An individual suffering from heat exhaustion can also be treated initially with first aid. Start by cooling the victim, elevating the feet, and replacing fluids. If the individual is not substantially improved within 30 minutes and the body temperature has not decreased, the individual shall be transported to the hospital for medical attention.

An individual suffering from heat stroke will be immediately transferred to a medical facility. Heat stroke can be avoided by noticing the symptoms of, and treating early, heat cramps and heat exhaustion.

First aid will be considered when treating an individual with cold stress. Remove the victim from the cold environment. In order to prevent further body heat loss, cover the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks and encourage activity such as walking, wrapped in a blanket. Seek medical attention immediately if conditions do not improve.

6.1.2.2 Noise

High noise operations (i.e., greater than 85 dBA) shall be evaluated by the SHSO. High noise situations may be experienced onsite around heavy equipment, potentially including drill rigs and demolition equipment. Noise exposure will be controlled through the use of hearing protection such as ear plugs or ear muffs or by maintaining set-backs from high noise equipment. Ear plugs are required in areas where noise exposure is in excess of 85 dBA. Double hearing protection (ear plugs and ear muffs) are required in areas where the noise exposure is in excess of 95 dBA. If noise levels may potentially exceed 105 dBA, or exposure times are exceeded, additional controls may be needed and will be considered in consultation with the Project Health and Safety Officer.

6.1.2.3 Open Water

As described in Section 4.2.1.4, multiple open water bodies are present within the Site boundaries and the water bodies vary in depth and flow depending on the season. To minimize the potential for drowning, personnel shall perform visual observations before entering any surface water bodies to assess the need for use of a personal flotation device (PFD). Under no circumstance shall any worker wade into a surface water body when depths are greater than two feet unless he or she is wearing a Coast Guard-approved PFD and is accompanied by a spotter onshore with a working cell phone. Moreover, all personnel entering surface water bodies less than two feet deep shall be accompanied by a spotter with a working cell phone.

6.1.2.4 Other Physical Hazards

When traversing the Site, personnel shall actively be aware and remember that "walking is considered working." Personnel shall always be on the lookout for sharp/rusty objects, broken glass, nails, and other objects. Steel toe work boots are required at all times in RI/FS work areas. Particular care must be taken when traversing uneven terrain and when wading due to the potential for uneven/slippery surfaces. An employee's travel path shall be selected ahead of time and good housekeeping must also be practiced to reduce slip, trip and fall hazards.

Drilling crews are responsible for good housekeeping around the rig to ensure that the rods, auger sections, rope and hand tools used in the operation do not cause any hazard to the Site workers. Maintenance is a constant requirement to ensure that equipment is in good working condition.

Electrical service from the former Rectifier Yards to within the Main Plant Area has been discontinued. The only active electric lines currently at the Site is the overhead lines that feed into the administrative building, which are maintained by the Flathead County electric utility company. Electrical hazards are not expected within the landfill area. Any potential work around overhead and former buried utilities will be noted during planning. Utility mark-outs and subsurface pre-clearance activities shall be completed if active lines are suspected to be present. If subsurface clearance activities are needed, personnel shall implement Roux Associates' Subsurface Utility Clearance Standard Operating Procedure (Appendix E).

6.1.3 Biological Hazards

Site personnel will develop a plan to limit exposure to biological hazards described in Section 4.3. Steps will be taken to prevent attacks from stray and potentially rabid wild animals. When Site workers enter vegetated areas, they shall make noise in an effort to alert animals. If animals are identified, care shall be taken not to confront wild animals, and workers shall make as much noise as possible in an attempt to scare away the animal. To prevent confrontations with bears specifically, Site personnel are encouraged to wear a bell or other noisemaker. Never approach a bear or bear cub, and stay away from a bear's food supply. Personnel shall carry bear spray or deterrent which will be utilized if a bear is in close range.

Personnel allergic to bee and/or wasp stings shall provide medicine and antidotes to treat allergic reactions, as prescribed by their personal physicians at all times and inform other field team members of their existence and location. Exposure to bees, wasps, and other insects will be minimized through the use of full-length pants, long-sleeved shirts, and gloves.

6.1.3.1 Tick Prevention and Care

Personnel shall take precautionary measures to prevent exposure to ticks. Tick prevention measures include the following:

- Using Permethrin on clothes to kill ticks on contact;
- Wearing light-colored clothing so that ticks can be more easily seen and removed before attachment occurs;
- Wearing long-sleeved shirts and tucking in (or taping) pant legs into socks or boots to prevent ticks from reaching the skin;
- Wearing high boots or closed shoes that cover the entire foot;
- Wearing a hat; and
- Spraying insect repellents containing n,n-diethylm-toluamide (DEET) on exposed skin, excluding the face, in accordance with USEPA guidelines.

Workers are to inspect themselves and co-workers frequently to see if any ticks are on their clothing and remove them as soon as they are identified. If an embedded tick is found, it shall be promptly removed with tweezers. This shall be done by grasping the tick firmly and as close to the skin as possible. Then, with a steady motion, pull the tick's body away from the skin.

Cleanse the area with an antiseptic. Do not use petroleum jelly, a hot match, nail polish or other products to remove the tick. Preserve the tick for analysis (i.e., by placing in a zip lock bag, envelope or jar). The tick will be analyzed to determine if it contains the bacteria capable of causing Lyme disease. After returning home, it is also important to do another thorough examination while showering as a further check that no ticks were missed in previous inspections. Also, it is recommended that any work clothes be washed and dried at high temperatures.

Any discovery of a tick embedded in the skin where the tick contact may have occurred at work will require immediate contact of the Project Manager and Project Health and Safety Officer.

Medical practitioners consulted by Roux Associates recommend not administering an antibiotic until after symptoms such as rash, flu-like symptoms, fever, joint or muscle aches, nausea or vomiting develop which could take a few days. Therefore, for tick bites determined to be work related, antibiotics will not be prescribed or administered until after the results of the tick testing are reviewed and until after any characteristic symptoms develop.

6.2 Automobile and Traffic Safety

Motor vehicle safety and awareness is a very important aspect in prevention of injuries. Before operating a vehicle, the vehicle shall be checked to ensure it is in acceptable operating condition. An automobile safety checklist is provided in Appendix C, which shall be completed periodically for each vehicle being used by workers onsite. If the vehicle is being used for an extended period of time, workers shall complete the checklist at a minimum frequency of once per month. Any deficiencies observed during vehicle inspection will be addressed promptly or the vehicle will be removed from service.

Deaths, injuries, and property damage can occur from careless and unsafe driving practices. The main rule for vehicle operation safety is being smart and driving defensively. Driving defensively means not only taking responsibility for yourself and your actions but also keeping an eye on other vehicles and pedestrians to avoid dangerous situations.

The following are guidelines to help reduce your risks on the road:

- Secure each passenger before starting engine. Lock all doors.
- Check your mirrors.
- Driving too fast or too slowly can increase the likelihood of collisions.
- Avoid impaired drivers by turning right at next corner or exiting roadway. If oncoming car appears to cross into your lane, pull over, sound horn, and flash lights.
- Don't contest the "right of way" or try to race another car during a merge.
- Be aware of sudden traffic slow-downs due to security checkpoints and third-party vehicular accidents.
- While driving, be cautious, aware, and responsible.
- Utilize the Five Keys® of the Smith Safe Driving System.
- Commercial vehicles often have additional restrictions. Always be aware of your surroundings and be responsible for your possessions and company equipment.

Active truck and heavy equipment traffic is a potential Site-specific hazard that may exist in the areas around the Main Plant. Additionally, active rail traffic will be expected on the main rail line that runs through the southern portion of the Site. High visibility clothing is required at all times in high-traffic areas and whenever working near the rail line to help prevent personnel contact with vehicular traffic. When setting up work zones in an area potentially exposed to vehicular traffic, vehicles shall be used to block traffic. Efforts shall be made to coordinate with ongoing demolition activities to prevent overlapping work zones. If work zones need to overlap with the ongoing demolition activities, cones, caution tape, and or snow fencing may be used to delineate work zones.

6.3 Heavy Equipment Safety

Roux Associates will be present onsite during all invasive operations associated with the RI/FS and will provide health and safety monitoring to ensure that appropriate levels of protection and safety procedures are followed by Roux Associates and Subcontractor personnel.

This Site may utilize many types of mechanical equipment used on any major construction site. Typical machinery could include pumps, compressors, generators, portable lighting systems,

pneumatic tools (drum openers), hydraulic drum crushers, forklifts, trucks, dozers, excavators, drill rigs, dump trucks, pay-loaders, and backhoes. From a safety standpoint, it is always important to be continually aware of the equipment around you. Heavy equipment poses a serious hazard if not operated properly, or if operators cannot see personnel near machinery. In particular, the following heavy equipment hazards are common at the Site and will be considered from a safety standpoint:

- Hazards associated with truck traffic – Be sure to observe and comply with posted traffic signs. Use caution when traveling within the facility limits, as well as when entering and exiting the demolition areas.

- Interaction/contact with heavy equipment contractors – Heavy equipment (i.e., backhoes, drill rigs, bulldozers, etc.) operators may not be aware of your presence. Isolate heavy equipment from personnel though the delineation of Heavy Equipment Exclusion Zones (HEEZ). Be sure that the operator is aware of your presence, places the equipment in a safe mode and displays a "show me your hands" off the equipment controls before approaching any heavy equipment. Inform operators of your planned activities in the area prior to them beginning their activities.

Each piece of equipment (i.e., power tools, machines, vehicles, etc.) shall be inspected for proper and safe operation prior to its use.

- Inspect all cables, sheaves, slings, chains, hooks, and eyes prior to use.
- Secure equipment firmly or be sure it is supported.
- Be sure all power lines are inactivated, removed, or at a safe distance.
- Always use proper loading for capacity at lifting radius.
- Keep all equipment lubricated and maintained.
- Employ signaling, spotting, and traffic control persons whenever needed.
- Make certain that signals are understood and observed.

Exclusion zones must be established and maintained during activities involving the movement/operation of heavy equipment. The purpose of the exclusion zone is to establish the minimum clearance and delineate the distance that must be maintained between workers and the heavy equipment while the equipment is in operation (i.e., engaged or moving) to protect all employees from the potential contact hazard associated with heavy equipment operations.

6.3.1 Excavation and Backfill Operations

The SHSO will be present onsite during all Roux Associates contracted excavation and backfill operations, if any, and will provide health and safety monitoring to ensure that appropriate levels of protection and safety procedures are utilized. The proximity of any subsurface utilities (e.g., chemical, water, sewer, and electrical lines) will be considered before any subsurface activity or sampling is attempted.

The following safe work practices will be followed during excavation or backfill operations:

- The proximity of chemical, water, sewer and electrical lines will be identified by a facility representative prior to any subsurface activity beginning.
- Roux's subsurface protocol or the Client's protocol will be used, whichever is more stringent.
- While excavating, stay out of the reach of the backhoe arm's swing by standing at the end of the excavation, not near the sides (sides have the potential to cave in).

Maximum Allowable Slopes

Soil or Rock Type	Maximum Allowable Slopes (H:V)[1] for Excavations less than 20 Feet Deep[3]
Stable Rock	Vertical (90°)
Type A[2]	¾ : 1 (53°)
Type B	1 : 1 (45°)
Type C	1½ : 1 (34°)

OSHA (29 CFR 1926.652, Subpart P, Appendices A and B)

Notes:

[1] Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

[2] A short term maximum allowable slope of 1/2H : 1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H : 1V (53°).

[3] Sloping or benching for excavations greater than 20 feet deep shall be designed by a Registered Professional Engineer.

Proper stockpiling, containment, and disposal practices in accordance with the project Investigation-Derived Waste Plan will be utilized in regard to the potential amount of waste generated during operations. The location of safety equipment and evacuation procedures according to this HASP will be discussed with the crews prior to initiation of operations. The use of hard hats, eye protection, ear protection, hand protection and steel-toed boots will be required during excavation or other heavy equipment operations.

6.4 Asbestos

Asbestos may be present at the Site within landfills. Asbestos shall be abated by a licensed abatement contractor according to all applicable laws and standards. Personnel shall be aware of the presence of asbestos and avoid contact with friable material. Asbestos can emit airborne fibers if the materials are cut or sawed, or if they are damaged during demolition operations. Handling of these non-friable materials shall be limited to activities that will not generate airborne fibers.

6.5 Contamination Prevention

One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention will minimize worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

Personnel

- Do not walk through areas of obvious or known contamination;
- Do not handle or touch contaminated materials directly;
- Make sure all personal protective equipment (PPE) has no cuts, tears or other signs of deterioration prior to donning;
- Fasten all closures on suits, covering with tape, if necessary;
- Take particular care to protect any skin injuries;
- Stay upwind of airborne contaminants; and
- Do not carry cigarettes, gum, cosmetics, etc., into contaminated areas.

Sampling/Monitoring

- When required by the SHSO, cover instruments with clear plastic, leaving opening for sampling and exhaust ports; and

- Bag sample containers prior to the placement of sample material.

Heavy Equipment

- Care shall be taken to limit the amount of contamination that comes in contact with heavy equipment;
- Excavated soils will be contained and kept away from workers; and
- Decontaminate equipment prior to moving to another work area.

6.6 Additional Safe Work Practices

Refer to the SHSO for specific concerns on each individual site task. The safety rules listed below must be strictly followed:

- Practice contamination avoidance, avoid any skin contact with potentially contaminated materials (i.e., surface or ground water, soil, etc.);
- Wash hands before handling food and drink and other activities that could cause hand-to-mouth transfer of contaminants;
- Appropriate foot, hearing, eye, head and hand protection will be worn by those directly involved in the work efforts when warranted;
- No facial hair that interferes with the face to face piece seal of respirators will be allowed;
- Personnel not required to be directly involved in the operations, excavating, or monitoring activities will remain a safe distance from the equipment;
- Do not climb over/under obstacles or barricades;
- Be alert to your own physical condition;
- Watch your buddy for signs of fatigue, exposure, heat or cold stress, etc.;
- No work will be conducted without adequate light; and
- Report all accidents, no matter how minor, immediately to the SHSO.

6.7 Hazard Safety Analysis

Under Roux Associates corporate health and safety program, Site personnel are required to perform three types of hazard safety analyses: Safe Performance Self Assessments (SPSAs), Job Safety Analyses (JSA), and Roux Prevention Observations (RPO).

The SPSA is a brief, general risk assessment made by employees prior to performing each task. The objective is to identify and eliminate potential workplace practices and hazard conditions that could lead to any type of loss. SPSA is designed to combat complacency associated with tasks performed on a routine basis by forcing one to consider changes in the job condition, weather, the task being performed, and the overall situation. SPSA is a three step process where personnel first "Assess" a task they are about to undertake and identify any potential health and safety hazards before continuing with the task. Personnel must anticipate what could go wrong, the worst thing that could happen if something goes wrong. The second step is "Analyze" how to mitigate the identified hazards, including deciding if he or she has the necessary training, knowledge, tools and PPE to successfully perform the task with minimal risk. The third step is to "Act", specifically take the appropriate actions to ensure safe operations so that nobody gets hurt.

The JSA is a tool used to carefully study and record each step of a job or task, identifying existing or potential hazards to safety, health, and the environment and determining the best procedures to follow in order to avoid the hazards. The JSA for a particular task must be completed before the task is undertaken. Personnel must determine the sequence of job steps and consider any potential health and safety hazards associated with each step. Proper procedures and PPE must be recommended within the JSA to mitigate any potential hazards. Applicable JSAs for the days' work shall be kept in the field for reference throughout the work. The JSAs applicable to the days' work shall be reviewed as part of the morning tailgate meeting and at other points in the day as appropriate.

The RPO is an activity where (1) an individual observes how a task is performed by another individual compared to company standards, (2) positive and questionable behaviors are identified, and (3) the supervisor provides proactive feedback and coaching. During an RPO, a peer or supervisor observes a field crew performing a work task. The observer is to use the RPO checklist and complete an appropriate RPO form. The most recent revisions of RPO forms for Field Activities, Driving, and Ergonomics are provided in Appendix D. The involved parties must then meet with the observee's supervisor to discuss the results of the RPO and verify safe practices for the particular task that was observed. The final RPO form shall be submitted to the Project Health and Safety Officer.

6.8 Near Loss Investigations

A "Near Loss" is a specific event, sequence of events, or extended conditions that could have had unwanted or unintended impacts on the safety or health of people, property, environment, or on legal/regulatory compliance (or when something almost happened).

An "Investigation" is a process to determine facts, root causes, and solutions and to develop lessons learned about the near loss. The investigation process is as follows:

- Assemble an investigation team and initiate the investigation;
- Gather facts;
- Draw conclusions;
- Determine root cause factor(s); and
- Develop solution(s) and lessons learned;

The SHSO will take the lead role in performing the investigation. The team may include Supervisors, Managers, subject matter experts, and involved employees. The investigation will be initiated as quickly as possible. Results of the investigation will be recorded on the Roux Lesson Learned Form (Appendix G).

When gathering facts during the investigation, the SHSO will speak to those persons directly involved in the incident one on one. The SHSO will ask questions such as "who, what, when, where, and how" so that the SHSO can develop a clear picture of what happened and why it happened. Following completion of the investigation, lessons learned will be share with the personnel working on the project.

7.0 TRAINING AND REPORTING REQUIREMENTS

The following section includes the training requirements for the Site.

7.1 Basic Training Requirements

All Site personnel who will perform work where there exists the potential for exposure to Site COPCs (i.e., soil sampling, groundwater sampling, surface water sampling, drilling, test pitting, etc.) are required to be health and safety trained prior to performing work onsite, per OSHA (29 CFR 1910.120(e)). This training includes HAZWOPER training to the 40-hour awareness level. In addition, there will be at least one person onsite who is First aid and CPR trained. Training records will be maintained onsite in the administrative building by the Project Health and Safety Officer and/or the SHSO.

Individuals involved in investigations at the asbestos landfills or other locations where asbestos is suspect must also have asbestos awareness training, as required by 29 CFR 1910.1001.

Any additional training that may be required will be determined by the Project Manager and the Project Health and Safety Officer.

7.2 Competent Safety Personnel

Any individuals that perform work on the Site related to the RI/FS are required to review and implement the procedures outlined in this HASP. Additionally, all personnel are required to review and implement the procedures outlined in a project orientation training held at the Site prior to conducting work.

A Competent Safety Person must be able to recognize hazards associated with a particular task, and have the ability to mitigate those hazards, including implementing a stop-work authority if necessary. In order to be considered a Competent Safety Person, individuals must have appropriate training as described in Section 7.1, must be capable of carrying out the safety procedures described within the HASP and the project orientation training, and must be knowledgeable about the Site-specific hazards associated with the task they are performing.

7.3 Safety Briefings

Prior to the start of Work, all personnel performing work at the Site will be required to review the HASP and sign the signature page, acknowledging an understanding of the Site-specific hazards (See Section 10). All personnel performing work at the Site will also be required to review a Site-specific orientation.

On a daily basis, project personnel will be given safety briefings by the Roux Associates SHSO. Additionally, safety briefings may be given by the RI/FS Manager, the RI Manager, and/or the CFAC Project Manager on an as-needed basis to further assist personnel in conducting their activities safely. Safety briefings will include a discussion of anticipated hazards, review Job Safety Analyses for tasks to be implemented, Peer Observation findings and lessons learned, and a review of any safety violations. In addition to morning safety briefings, additional safety talks will be provided when new operations are to be conducted, change in work practices must be implemented due to new information made available, and if work is occurring in a new area of the Site. Safety briefings will be documented daily on tailgate forms included as Appendix B and will be kept by the SHSO as part of the project records.

7.4 Record Keeping Requirements

All record keeping requirements mandated by OSHA (29 CFR 1910.120) will be strictly followed. Specifically, all current personnel training records, and medical fit for duty papers (and respiratory medical clearance and fit testing, if applicable) will be required before work can begin and maintained by Roux Associates. These records, along with injury/incident reports, medical examination records, and exposure monitoring records, will become a permanent part of the project records. Emergency medical records for all Roux Associates' personnel will reside with Roux Associates Human Resource Manager. Each subcontractor will maintain the above-mentioned records for his/her employees.

Medical and exposure records shall be made available upon request to employees, and to the Assistant Secretary or the Director (OSHA) for examination and copying. Medical records must have written consent of the employee before being released. Transfer of records will be in compliance with 29 CFR 1910.1020 (h).

7.5 Corporate Recordable Injury/illness

A work related injury or illnesses is defined as Corporate Recordable if they involve one or more of the following; Death, day(s) away from work, restricted work or transfer to another job, Medical Treatment beyond First Aid, loss of consciousness, and or a significant diagnosed injury or illness that has occurred based on a work function.

A reportable Lost Time Incident (LTI) is a result in which at least one lost workday occurs after the day of the incident based on the individual's being unable to work within his/her job description on the next calendar day (even if a weekend, holiday or vacation day). An LTI can also be determined by a Physician or Licensed Health Care Professional (LHCP) that states an individual is unable to work within their normal duties on the next calendar day.

A Restricted Work Incident (RWI) is a result in which an individual's work activities have been restricted because he or she is unable to perform one or more of the routine functions (work activities regularly performed at least once per week) of his/her job. It can also result from the inability to work a full workday that he or she would otherwise have been scheduled to work on any calendar day after the day of the injury or illness. It shall be noted that any work restrictions recommended by a physician or LHCP are recordable even if the employee does not follow the restrictions.

A Medical Treatment Incident (MTI) is a result in which a physician's or LHCP has rendered a significant diagnosed injury or illness that does not fall into the LTI or RWI categories even if no medical treatment was received (e.g., work related cases of cancer, chronic irreversible disease, hearing loss, a fractured or cracked bone or punctured ear drum) during his or her employment. A Medical Treatment Incident can also occur because a physician or LHCP has issued a prescription strength medication (whether individual fills prescription or not) during a prescribed office visitation. There are several additional provisions which can trigger a recordable Medical Treatment Incident and they are listed as follows; an incident that involves work-related needle-stick injuries or cuts from sharp objects that are contaminated with a potentially infectious material (e.g., blood) or exposure to anyone with a known case of active tuberculosis followed by a tuberculosis infection, incidences that required wound closing devices (e.g., sutures, staples, tapes/glues) (exception: butterfly bandages and Steri-Strips), results in using devices with rigid

means of support (e.g., stays) or systems designed to immobilize parts of body (exception: using temporary immobilization devices to transport an accident victim), results in using devices other than irrigation or a cotton swab to remove foreign material from eye, results in removing the outer layer of skin to remove foreign material from areas other than the eye, results in chiropractic treatment or physical/massage therapy associated with the management and care of a patient to combat disease or disorder.

The issuance of Prescription medication includes the following list of which will trigger a reportable:

- All antibiotics (exception: dermal applications such as Neosporin, Iodine or similar preparation),
- Diphenhydramine (Benadryl) greater than 50 milligrams (mg) in one application, all analgesic and non-steroidal anti-inflammatory medication including Ibuprofen (e.g., Advil) greater than 467 mg in single dose;
- Naproxen Sodium (e.g., Aleve) greater than 220 mg in single dose;
- Codeine analgesics greater than 16 mg in single dose;
- All dermally applied steroid applications (exception: hydrocortisone in strengths of 1% or less);
- All vaccinations for work-related exposure (exception: Tetanus);
- All narcotic analgesics (exception: Codeine as listed above);
- All bronchodilators (exception: Epinephrine aerosol 5.5 mg/ml or less);
- Any muscle relaxants; and
- All other medications that legally require a prescription for purchase or use in the state or country where the incident occurred.

It shall be noted that a Medical Treatment does not include visits to a physician or LHCP solely for observation or counseling, conducting diagnostic procedures such as x-rays and blood tests, including use of diagnostic medications (e.g., eye drops to dilate pupils) or First Aid treatment. The following First Aid treatments are exempt from any medical treatment reporting during diagnostic procedures:

- Use of nonprescription medication at nonprescription strength (e.g., dermal applications such as Neosporin, Iodine or similar preparation);

- Tetanus immunization;
- Cleaning, flushing or soaking wounds on the surface of the skin, wound covering devices (e.g., bandages, Band-Aids, gauze pads) or butterfly bandages or Steri-Strips;

Also included as non-reportable first aid would be the following:

- Hot or cold therapy (e.g., compresses, soaking , whirlpools);
- Any non-rigid means of support (e.g., elastic bandages, wraps, non-rigid back belts), temporary immobilization devices while transporting an injury victim (e.g., splints, slings, neck collard, back boards);
- Drilling of a finger or toenail to relieve pressure, or draining fluid from a blister;
- The use of eye patches, removing foreign material from the eye using only irrigation or a cotton swab, removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means;
- Use of a finger guard, massages not associated with the management and care of a patient to combat disease or disorder; and
- The drinking of fluids for relief of heat stress.

7.6 Medical Surveillance Requirements

Medical surveillance specifies any special medical monitoring and examination requirements as well as stipulates that all Roux Associates personnel and subcontractors contracted directly by Roux Associates are required to pass the medical surveillance examination or equivalent for hazardous waste work required by 29 CFR 1910.120.

The examination will be taken annually, at a minimum, and upon termination of employment with the company at no cost to employees. Additional medical testing may be required by the Project Health and Safety Officer in consultation with the company physician, if an overt exposure or accident occurs, or if other Site conditions warrant further medical surveillance.

8.0 DECONTAMINATION AND DISPOSAL PROCEDURES

The SHSO shall be responsible for determining appropriate decontamination methods for all Site activities. All decontamination will occur at the central decontamination location to be established at the Site. Typical decontamination procedures for project personnel in Levels D and C protection are provided in Appendix F.

All non-dedicated field sampling equipment will be decontaminated. Sampling equipment will be decontaminated through the following steps, as necessary:

- fresh water rinse;
- non-phosphate detergent wash;
- fresh water rinse; and
- distilled water rinse.

Decontamination water will be collected, handled, drummed, and/or containerized prior to determination of classification and appropriate disposal method in accordance with the IDW Plan.

Investigation-Derived Waste (IDW) will be generated throughout the RI/FS activities. All such IDW will be handled in accordance with the Site-specific IDW plan. The goal of the IDW plan is to prevent the potential for spreading contamination, creating a sanitary hazard, or causing waste to be inadvertently left on-site. All waste that leaves the Site will be sent to licensed facilities by licensed and approved waste haulers, and will be disposed of in accordance with applicable regulations as described in the IDW Plan. All waste storage containers, tanks, and drums will be labeled with the appropriate waste labels and/or placards as described in the IDW Plan.

9.0 EMERGENCY RESPONSE AND CONTINGENCY PLAN

Given the potential chemical, physical, and biological hazards associated with the performance of field activities during implementation of the RI/FS, the possibility of an emergency exists. This emergency plan has therefore been prepared in accordance with 29 CFR 1910.120. A copy of this plan shall be available in the Support zone at each work site.

9.1 Site Emergency Coordinator(s)

The Emergency Coordinator(s) are the CFAC Site Coordinator and the Roux SHSO. The Emergency Coordinators shall implement this emergency plan whenever conditions at the site warrant such action. The coordinator will be responsible for notification of emergency response units and assuring the evacuation, emergency treatment, and emergency transport of site personnel as necessary. The Emergency Coordinator(s) shall contact the appropriate management staff listed in the emergency contact table below, including the USEPA Project Manager.

When attending to an emergency, the Emergency Coordinator(s) will be responsible for meeting the emergency support vehicles and personnel at the Site parking lot, which is the designated rendezvous location at the Site. From the Site parking lot, the Emergency Coordinator(s) will lead the emergency personnel and vehicles to the location of the emergency. The Emergency Coordinator shall identify to the support personnel the nature of the emergency and any dangerous conditions that may exist in route to the emergency.

9.2 Evacuation

In the event of an emergency situation, such as fire, explosion, significant release of chemicals, significant injury, etc., all persons will evacuate and assemble near a pre-designated Support Zone or other safe area as identified by the SHSO, preferably upwind of the emergency conditions. The SHSO or his/her designee will secure the incident scene and once the safety of all personnel is confirmed, the Fire Department and other emergency response groups will be notified by telephone of the emergency. The SHSO shall take appropriate measures (e.g., first aid), and notify the Project Managers and Project Health and Safety Manager. The advisability and type of further response action will be coordinated and carried out by the SHSO in coordination with the Project Health and Safety Manager and the Project Manager.

9.3 Potential or Actual Fire or Explosion

If the potential for a fire exists or if an actual fire or explosion occurs, the following procedure will be implemented:

- Immediately evacuate the site as described above in Section 9.2;
- Notify the Project Manager and Project Health and Safety Officer; and
- Notify the fire and police departments by dialing 911.

9.4 Environmental Incident (Release or Spread of Contamination)

In the event of a minor chemical spill or release, the spread of contamination will be controlled or stopped to the extent possible. The Site Coordinator or SHSO shall contact police and fire authorities to inform them of the possible or immediate need for nearby evacuation. If a significant release has occurred, the National Response Center and other appropriate groups shall be contacted by the Emergency Coordinator or his designee. Those groups will alert National or Regional Response Teams as necessary. Following these emergency calls, the personnel listed in the emergency contact table below shall be notified.

9.5 Personal Injury

If on-site personnel require emergency medical treatment, the SHSO shall notify the Project Health and Safety Manager, the RI/FS Manager and/or other Roux Senior Management for Illness or Injury Case Management protocol to be initiated. First aid will be provided by on-site personnel trained in first aid, CPR, and blood borne pathogens, if available, or can be provided by emergency medical services (EMS).

If the incident is a non-life-threatening but nonetheless requires additional medical attention beyond first aid, the injured persons can be transported to the preferred occupational health clinic. The preferred occupational health clinic to the Site is Mednorth Urgent Care in Kalispell, Montana. A map with directions to the clinic is provided in Figure 2. Additionally, written directions to the clinic are provided below:

1. Head west on Aluminum Drive toward Dorothy Avenue ..... (0.7 mi)
2. Turn left onto State Hwy 486 (aka North Fork Road) ..... (1.3 mi)
3. Follow Railroad St., Truck Route and 12th Avenue W to US-2 W/9th St W ..... (1.2 mi)

4. Follow US-2 W/9th St and turn right at W Reserve Drive in Evergreen ..... (11.3 mi)
5. Take W Reserve Drive and turn left onto US-93 S ..... (0.4mi)

If the incident is life threatening or requires significant health and safety management, the injured person(s) will be transported to the closest hospital. The closest hospital to the Site is North Valley Hospital in Whitefish, Montana. A map with the directions to the Hospital is provided in Figure 5. Additionally, written directions to the hospital are provided below:

1. Head west on Aluminum Drive toward Dorothy Avenue ..... (0.7 mi)
2. Turn left onto State Hwy 486 (aka North Fork Road) ..... (1.3 mi)
3. Follow Railroad St., Truck Route and 12th Avenue W to US-2 W/9th St W ..... (1.2 mi)
4. Take MT-40 W to Hospital Way ..... (6.3 mi)
5. Drive to Hospital Way in Whitefish ..... (0.3 mi)

As described in Section 9.1, the Emergency Coordinator will ensure that access for emergency vehicles and equipment is provided, and will provide emergency responders with information regarding site hazards where applicable.

9.6 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO will determine if work can continue without sacrificing the health and safety of field workers. Some of the items to be considered prior to determining if work will continue are:

- Heavy rainfall;
- High wind;
- Potential for heat stress;
- Potential for cold stress and cold-related injuries;
- Limited visibility;
- Potential for electrical storms – stop work for a minimum of 15 minutes after observing a lightning strike and for at least 15 minutes after the storm has passed;
- Potential for malfunction of H&S monitoring equipment or gear; and
- Potential for accidents.

9.7 Emergency Contact Information

Below is a list of phone numbers for use in emergency situations which may develop during implementation of the RI/FS.

Responder	Telephone Number
Ambulance (EMS)	**911**
Columbia Falls Fire Department	**911** (406) 892-3911
Columbia Falls Police Department	**911** (406) 892-3234
National Response Center (Release or Spill)	(800) 424-8802
Montana State Poison Control Center	(800) 525-5042
Mednorth Urgent Care	(406) 755-5661
North Valley Hospital	(406) 863-3500

Project contact information is provided below.

Title	Company	Name	Phone Number
Project Manager	Glencore	John Stroiazzo	(647) 292-5767
Site Coordinator	CFAC	Steve Wright	(406) 892-8211
RI/FS Project Manager	Roux Associates	Andrew Baris	(631) 630-2404 (631) 921-1805 (cell)
Project Health and Safety Officer	Roux Associates	Joe Gentile	(856) 832-3768 (610) 844-6911 (cell)
RI Manager	Roux Associates	Michael Ritorto	(631) 630-2370 (631) 445-4576 (cell)
Remedial Project Manager	EPA	Mike Cirian	(406) 293-6194

10.0 FIELD TEAM REVIEW

Each Roux Associates field member, subcontractor, or authorized third-party personnel entering RI/FS work areas shall review this HASP and sign below to indicate that they have reviewed the HASP, understand the potential hazards associated with RI/FS activities, and understand the provisions of the HASP. Subcontractors are encouraged to have their own HASP, which must, at a minimum, comply with the requirements herein.

"I have read and understand this site-specific HASP and will comply with the provision contained herein. I have been provided with an opportunity to have questions and concerns addressed by the Site Health and Safety Manager, Project Health and Safety Manager, and /or Project Manager."

Site: Columbia Falls Aluminum Company facility, Columbia Falls, Montana

Name (Printed)	Signature	Date

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TABLE

1. Toxicological Table for Contaminants of Potential Concern

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present within the Site
Columbia Falls Aluminum Company, Columbia Falls, Montana

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Acenaphthene	83-32-9	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	White to beige crystals BP: 279 C
Aluminum (and Insoluble Compounds)	7429-90-5	TWA 1 mg/m^3	TWA 10 mg/m^3 (Total Dust) TWA 5 mg/m3 (Resp.)	TWA 15 mg/m^3 (Total Dust) TWA 5 mg/m3 (Resp.)	N.D.	Inhalation	Pneumoconiosis, neorotoxicity	Lungs	Silvery-white, malleable, ductile, odorless metal MW: 26.98, Varies BP: 4221°F
Anthracene (Coal Tar Pitch Volatile)	65996-93-2	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m^3 (benzene-soluble fraction)	Ca [80 mg/m^3]	inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
Antimony (and Compounds)	7440-36-0	TWA 0.5 mg/m^3	TWA 0.5 mg/m^3	TWA 0.5 mg/m^3	50 mg/m^3	Inhalation, inhalation, ingestion, skin and/or eye contact	MeHB-emia, irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Eyes, skin, respiratory system, cardiovascular system	Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder MW: 121.75
Arsenic (inorganic)	7440-38-2 (metal)	TWA 0.01 mg/m3	Ca C 0.002 mg/m3 [15-min]	TWA 0.010 mg/m3	Ca [5 mg/m3 (as As)]	Inhalation; ingestion; skin absorption; skin and/or eye contact	Ulceration of nasal septum, dermatitis, GI disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]	Liver, kidneys, skin, lungs, lymphatic sys	Metal: sliver-gray or tin-white, brittle, odorless solid MW: 74.9 BP: sublimes
Barium	7440-39-3	TWA 0.5 mg/m3	None established	TWA 0.5 mg/m3	None established	Inhalation, ingestion, skin contact	Irritation skin, respiratory system, digestive system	Skin, eyes, respiratory system	Yellow white powder BP: 1640 C
Benz[a]anthracene	56-55-3	None established	None established	None established	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	Irritation eyes, skin, respiratory system, CNS; skin cancer	Skin	Pale Yellow crystal, solid BP: 438 C
Benzo[a]pyrene	50-32-8	None established	TWA 0.1 mg/m3	TWA 0.2 mg/m3	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	POISON. This material is an experimental carcinogen, mutagen, tumorigen, neoplastigen and teratogen. It is a probable carcinogen in humans and a known human mutagen. IARC Group 2A carcinogen. It is believed to cause bladder, skin and lung cancer. Exposure to it may damage the developing fetus. May cause reproductive damage. Skin, respiratory and eye irritant or burns.	Skin, eye, bladder, lung, reproductive	Yellow crystals or powder [found in cigarette smoke, coal tar, fuel exhaust gas and in many other sources] BP: 495 C
Benzo[b]fluoranthene	205-99-2	None established	TWA 0.1 mg/m3	TWA 0.2 mg/m3	None established	Inhalation; ingestion; skin and/or eye contact	No data were identified on the toxicity of benzo[b]fluoranthene to humans. Based on results of studies in animals, IARC concluded that benzo[b]fluoranthene is possibly carcinogenic to humans	Respiratory system, skin, bladder, kidneys	Off-white to tan powder BP: 481 C
Benzo[k]fluoranthene	207-08-9	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory tract, gastrointestinal; fatal if swallowed, inhaled, absorbed through the skin; vomiting, nausea, diarrhea	Lungs, respiratory system	Yellow crystals BP: 480 C
Beryllium	7440-41-7 (metal)	TWA 0.00005 mg/m^3	Ca C 0.0005 mg/m^3	TWA 0.002 mg/m^3 C 0.005 mg/m^3 (30 minutes) with a maximum peak of 0.025 mg/m^3	Ca [4 mg/m^3 (as Be)]	inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	Metal: A hard, brittle, gray-white solid. BP: 4532°F
BHC (Lindane)	58-89-9	TWA 0.5 mg/m^3	TWA 0.5 mg/m^3 (Skin)	TWA 0.5 mg/m^3 (Skin)	50 mg/m^3	Dermal	irritation eyes, skin, nose, throat; headache; nausea; clonic convulsions; resp difficulty; cyanosis; aplastic anemia; muscle spasm	Skin	White to yellow, crystalline powder with a slight, musty odor. MW: 290.8 BP: 614 °F
Cadmium	7440-43-9 (metal)	TWA 0.01 mg/m^3	Ca	TWA 0.005 mg/m^3	Ca [9 mg/m^3 (as Cd)]	inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	respiratory system, kidneys, prostate, blood	Metal: Silver-white, blue-tinged lustrous, odorless solid. BP: 1409°F
Calcium oxide	1305-78-8	TWA 2 mg/m^3	TWA 2 mg/m^3	TWA 5 mg/m^3	25 mg/m^3	Inhalation	Irritation	URT	White or gray, odorless lumps or granular powder. Noncombustible Solid, but will support combustion by liberation of oxygen. MW: 56.08
Chlordane	57-74-9	TWA 0.5 mg/m^3	Ca TWA 0.5 mg/m^3 (Skin)	TWA 0.5 mg/m^3 (Skin)	100 mg/m^3	Dermal, inhalation	Organ damage, irritation	Skin and liver	Amber-colored, viscous liquid with a pungent, chlorine-like odor. MW: 409.80
Chromium	7440-47-3	TWA 0.5 mg/m^3 (metal and Cr III compounds) TWA 0.05 mg/m^3 (water-soluble Cr VI compounds) TWA 0.01 mg/m^3 (insoluble Cr IV compounds)	TWA 0.5 mg/m^3	TWA 1 mg/m^3	250 mg/m^3 (as Cr)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid. BP: 4788°F
Chrysene; Phenanthrene; Pyrene; Coal tar pitch volatiles	65996-93-2	TWA 0.2 mg/m3	Ca TWA 0.1 mg/m^3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m^3 (benzene-soluble fraction)	Ca [80 mg/m^3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
Coal Tar Pitch Volatiles; Chrysene; Phenanthrene; Pyrene	65996-93-2	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m^3 (benzene-soluble fraction)	Ca [80 mg/m^3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present within the Site
Columbia Falls Aluminum Company, Columbia Falls, Montana

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Cobalt (and Inorganic Compounds)	7440-48-4	TWA 0.02 mg/m^3	TWA 0.05 mg/m^3	TWA 0.1 mg/m^3	20 mg/m^3	Inhalation	Asthma, pulmonay function and myocardial effects	Heart and lungs	Silver-grey powder. Noncombustible Solid in bulk form, but finely divided dust will burn at high temperatures. MW: 58.93
Copper	7440-50-8	TWA 0.2mg/m^3 (fume) 1 mg/m^3 (dusts and mists)	TWA 1 mg/m^3	TWA 1 mg/m^3	100 mg/m^3 (as Cu)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing	Eyes, skin, respiratory system, liver, kidneys (increase(d) risk with Wilson's disease)	Reddish, lustrous, malleable, odorless solid. Noncombustible Solid in bulk form, but powdered form may ignite. BP: 4703°F
DDT	50-29-3	TWA 1 mg/m^3	Ca TWA 0.5 mg/m^3 (Skin)	TWA 1 mg/m^3 (Skin)	500 mg/m^3	Dermal, inhalation	Organ damage	Liver	Colorless crystals or off-white powder with a slight, aromatic odor. Combustible Solid. MW: 354.40
Dibenzo[a,h]anthracene	53-70-3	None established	None established	None established	None established	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin	Eyes, skin; skin photosensitization.	Colorless crystalline powder. Combustible. BP: 524°C
Dieldrin	60.57-1	TWA 0.1 mg/m^3	Ca TWA 0.25 mg/m^3	TWA 0.25 mg/m^3	Ca 50 mg/m^3	Dermal	Dermatitis	Skin	Colorless to light-tan crystals with a mild, chemical odor. Noncombustible Solid. MW: 380.93
Dimethyl phthalate	131-11-3	TWA 5 mg/m^3	TWA 5 mg/m^3	TWA 5 mg/m^3	2000 mg/m^3	Inhalation	Irritation	Eye and URT	Oily, colorless, liquid. Combustible. MW: 194.19
Endosulfan	115-29-7	TWA 0.1 mg/m^3	TWA 0.1 mg/m^3 (Skin)	None established	N.D.	Dermal, inhalation	Organ damage, irritation	Skin, liver and kidneys	Brown crystals with a slight, sulfur dioxide odor. Noncombustible Solid, but may be dissolved in flammable liquids. MW: 406.95
Endrin	72-20-8	TWA 0.1 mg/m^3	TWA 0.1 mg/m^3 (Skin)	TWA 0.1 mg/m^3 (Skin)	2 mg/m^3	Dermal, inhalation	Organ damage, irritation, headache	Skin, liver and CNS	Colorless to tan, crystalline solid with a mild, chemical odor. Noncombustible Solid, but may be dissolved in flammable liquids. MW: 380.13
Fluoranthene	206-44-0	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible burns; heart and liver injury, pulmonary edema, respiratory arrest, gastrointestinal disturbances.	Heart, liver, lungs.	Yellow needles.
Fluorides, as F	Varies	TWA 2.5 mg/m^3	None established	TWA 2.5 mg/m^3	N.D.	Inhalation	Bone damage, fluorosis	Skeletal system and lungs	Appearance Varies. MW: Varies
Heptachlor epoxide	1024-57-3	TWA 0.05 mg/m^3	None established	None established	N.D.	Dermal, inhalation	Organ damage, irritation	Skin and liver	White powder, mothball odor. MW: 389.40
Indeno[1,2,3-cd]pyrene	193-39-5	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye	Irritation eyes, skin; possible human carcinogen (skin); weakness; affect liver, lung tissue, renal tissue; impairment of blood forming tissue	Skin	Yellowish crystal solid BP: 536 C
Iron oxide	7439-92-1	TWA 5 mg/m^3	TWA 5 mg/m^3	TWA 10 mg/m^3 (as fume)	2500 mg/m^3	Inhalation	Pneumoconiosis	Lungs	Reddish-brown solid. Noncombustible Solid MW: 159.70
Lead	7439-92-1	TWA 0.05 mg/m^3	TWA (8-hour) 0.050 mg/m^3	TWA 0.050 mg/m^3	100 mg/m^3 (as Pb)	inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid. Noncombustible Solid in bulk form. BP: 3164°F
Magnesium oxide	1309-48-4	TWA 10 mg/m^3	None established	TWA 15 mg/m^3	750 mg/m^3	Inhalation	Metal fume fever	URT	Hygroscopic, fine, white powder. MW: 40.32
Manganese	7439-96-5 (metal)	TWA 0.2 mg/m^3	TWA 1 mg/m^3 STEL 3 mg/m^3	C 5 mg/m^3	500 mg/m^3 (as Mn)	inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	respiratory system, central nervous system, blood, kidneys	A lustrous, brittle, silvery solid. BP: 3564°F
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	TWA 0.1 mg/m^3	TWA 0.01 mg/m^3 STEL 0.03 mg/m^3 [skin]	TWA 0.01 mg/m^3 C 0.04 mg/m^3	2 mg/m^3 (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spasticity, jerking limbs; dizziness; salivation; lacrimation (discharge of tears); nausea, vomiting, diarrhea, constipation; skin burns; emotional disturbance; kidney injury; possible teratogenic effects	Eyes, skin, central nervous system, peripheral nervous system, kidneys	Appearance and odor vary depending upon the specific (organo) alkyl mercury compound
Mercury compounds [except (organo) alkyls] (as Hg) Mercury	7439-97-6	TWA 0.025 mg/m^3 (elemental and inorganic forms)	Hg Vapor: TWA 0.05 mg/m^3 [skin] Other: C 0.1 mg/m3 [skin]	TWA 0.1 mg/m^3	10 mg/m^3 (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty); bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eyes, skin, respiratory system, central nervous system, kidneys	Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.] BP: 674°F
Methoxychlor	72-43-5	TWA 10 mg/m^3	None established	TWA 15 mg/m^3	5000 mg/m^3	Dermal, Inhalation	Organ damage	Liver, CNS	Colorless to light-yellow crystals with a slight, fruity odor. MW: 345.65

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present within the Site
Columbia Falls Aluminum Company, Columbia Falls, Montana

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Nickel	7440-02-0 (Metal)	TWA 1.5 mg/m^3 (elemental) TWA 0.1 mg/m^3 (soluble inorganic compounds) TWA 0.2 mg/m^3 (insoluble inorganic compounds) TWA 0.1 mg/m^3 (Nickel subsulfide)	Ca TWA 0.015 mg/m^3	TWA 1 mg/m^3	Ca [10 mg/m^3 (as Ni)]	inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	Metal: Lustrous, silvery, odorless solid. BP: 5139°F
Petroleum hydrocarbons(Petroleum distillates)	8002-05-9	None established	TWA 350 mg/m^3 C 1800 mg/m^3 [15 min]	TWA 500 ppm (2000 mg/m^3)	1,100 [10% LEL]	Inhalation; ingestion; skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, drowsiness, headache, nausea; dried/cracked skin; chemical pneumonitis	CNS, eyes, respiratory system, skin	Colorless liquid with a gasoline or kerosene-like odor BP: 86-460°F Fl. Pt = -40 to -86°F UEL: 5.9% LEL: 1.1% Flammable liquid
Potassium hydroxide	1310-58-3	C 2 mg/m^3	C 2 mg/m^3	None established	N.D.	Dermal, Inhalation	Irritation	URT, eyes and skin	Odorless, white or slightly yellow lumps, rods, flakes, sticks, or pellets. Noncombustible Solid; however, may react with H2O & other substances and generate sufficient heat to ignite combustible materials. MW: 56.10
Selenium (and Compounds)	7782-49-2	TWA 0.2 mg/m^3	TWA 0.2 mg/m^3	TWA 0.2 mg/m^3	1 mg/m^3	Dermal, Inhalation	Irritation	Eyes and skin	Amorphous or crystalline, red to gray solid. Combustibile solid. MW: 78.96
Sodium hydroxide	1310-73-2	C 2 mg/m^3	C 2 mg/m^3	TWA 2 mg/m^3	10 mg/m^3	Dermal, Inhalation	Irritation	URT, eyes and skin	Colorless to white, odorless solid (flakes, beads, granular form). Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials. MW: 40.01
Thallium and Compounds	7440-28-0	TWA 0.02 mg/m^3	TWA 0.1 mg/m3 (Skin)	TWA 0.1 mg/m3 (Skin)	15 mg/m^3	Dermal, Inhalation	Organ damage, peripheral neuropathy	Skin, GI tract	Appearance and odor vary depending upon the specific soluble thallium compound. MW: Varies
Vanadium	7440-62-2	None established	TWA 1.0 mg/m^3	TWA 1 mg/m^3	None established	inhalation, ingestion, skin and/or eye contact	irritation eyes, respiratory system	Nose, throat, resiptory irritation	Yellow-orange powder or dark-gray, odorless flakes dispersed in air. MW: 181.9 BP: 3182°F
Zinc Oxide	1314-13-2	TWA 2 mg/m3 STEL 10 mg/m^3	None established	TWA 10 mg/m3 (for zinc oxide fume)	None established	skin and/or eye contact, inhalation, ingestion	Irritation eyes, skin, respiratory tract; gastrointestinal disturbances	Eyes, skin, respiratory system,	Bluish gray solid BP: 1664.6°F Flammable

References

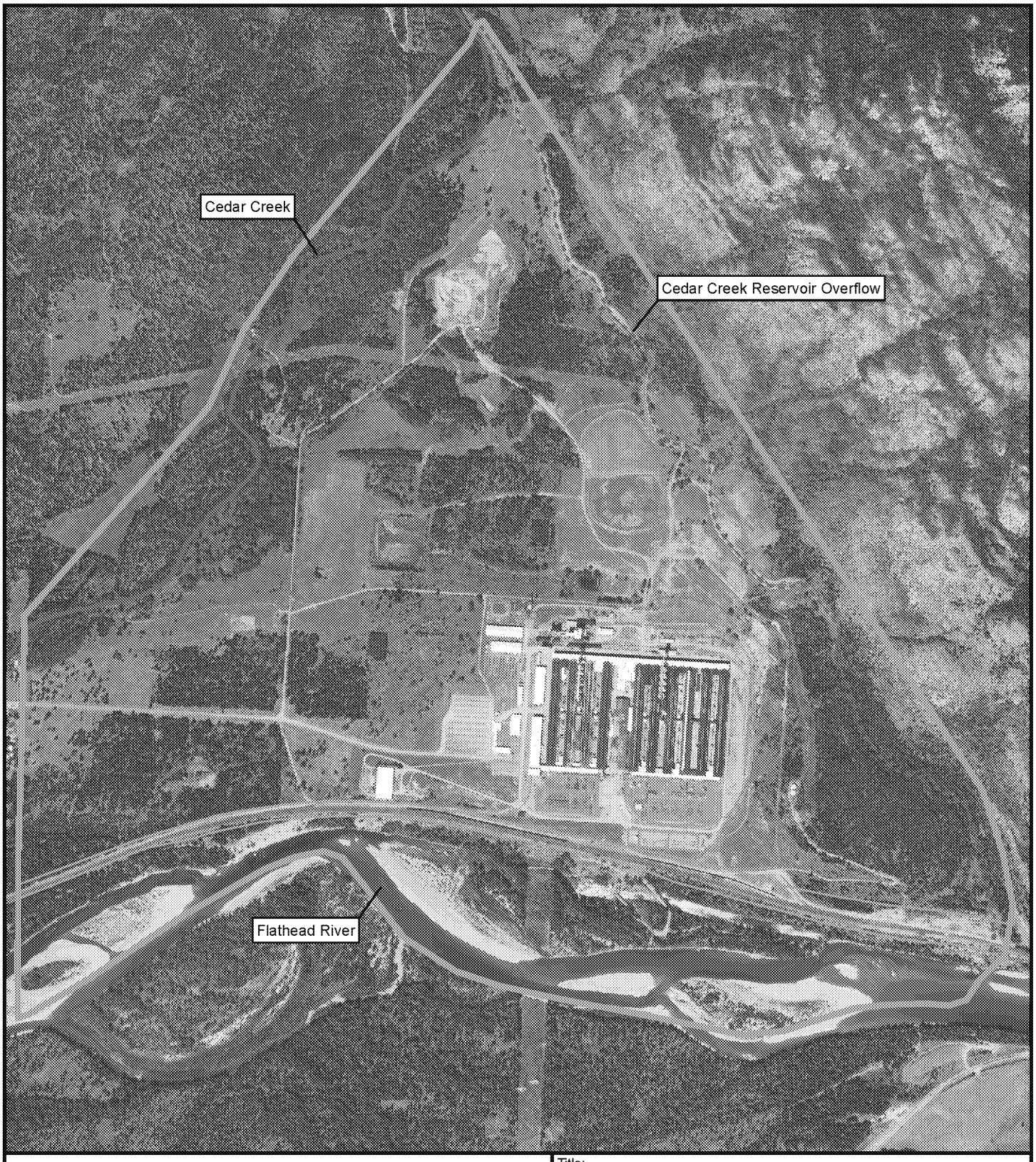
U.S. Department of Labor. 1990. OSHA Regulated Hazardous Substances, industrial Exposure and Control Technologies Government Institutes, Inc.
Hawley's Condensed Chemical Dictionary, Sax, N. Van Nostrand and Reinhold Company, 11th Edition, 1987.
Proctor, N.H., J.P. Hughes and M.L. Fischman, 1989. Chemical Hazards of the Workplace. Van Nostrand Reinhold. New York.
Sax, N.I. and R.J. Lewis. 1989. Dangerous Properties of Industrial Materials. 7th Edition. Van Nostrand Reinhold. New York.
2015 TLVs® and BEIs®... American Conference of Governmental Industrial Hygienists (ACGIH).

Abbreviations:

ACGIH – American Conference of Governmental Industrial Hygienists.
BP – boiling point at 1 atmosphere, °F
C – Ceiling, is a concentration that should not be exceeded during and part of the working exposure.
CAS# - Chemical Abstracts Service registry number which is unique for each chemical.
Ft Pt. – Flash point
IDLH - Immediately Dangerous to Life and Health concentrations represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
LEL – Lower explosive (flammable) limit in air, % by volume (at room temperature)
mg/m^3 – Milligrams of substance per cubic meter of air
NIOSH - National Institute for Occupational Safety and Health.
OSHA – Occupational Safety and Health Administration
PEL - OSHA Permissible Exposure Limit (usually) a time weighted average concentration that must not be exceeded during any 8 hour work shift of a 40 hr work week.
ppm – parts per million
REL – NIOSH Recommended Limit indicated a time weighted average concentration that must not be exceeded during any 10 hour work shift of a 40 hr work week
STEL – Short-term exposure limit (ST)
TLV - ACGIH Threshold Limit Values (usually 8 hour time weighted average concentrations).
TWA – 8-hour, time-weighted average
UEL – Upper explosive (flammable) limit in air, % by volume (at room temperature)

FIGURES

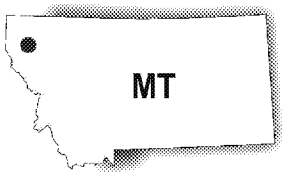
1. Location of Columbia Falls Aluminum Company Site
2. Route to Mednorth Urgent Care, Kalispell, Montana
3. Route to North Valley Hospital, Whitefish, Montana



Legend

Site Boundary

Approximate Third-Party Property Boundaries



N

1,000 0 1,000 Feet

Image Source: 2013 National Agriculture Imagery Program

Title:

RI/FS SITE BOUNDARY

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: A.M.	Date: 12/7/2015	FIGURE
Prepared by: A.M.	Scale: 1 inch = 1,370 feet	1
Project Mgr: A.B.	Office: Islandia, NY	
File No: 2476.0001Y100.101	Project: 2476.0001Y000	

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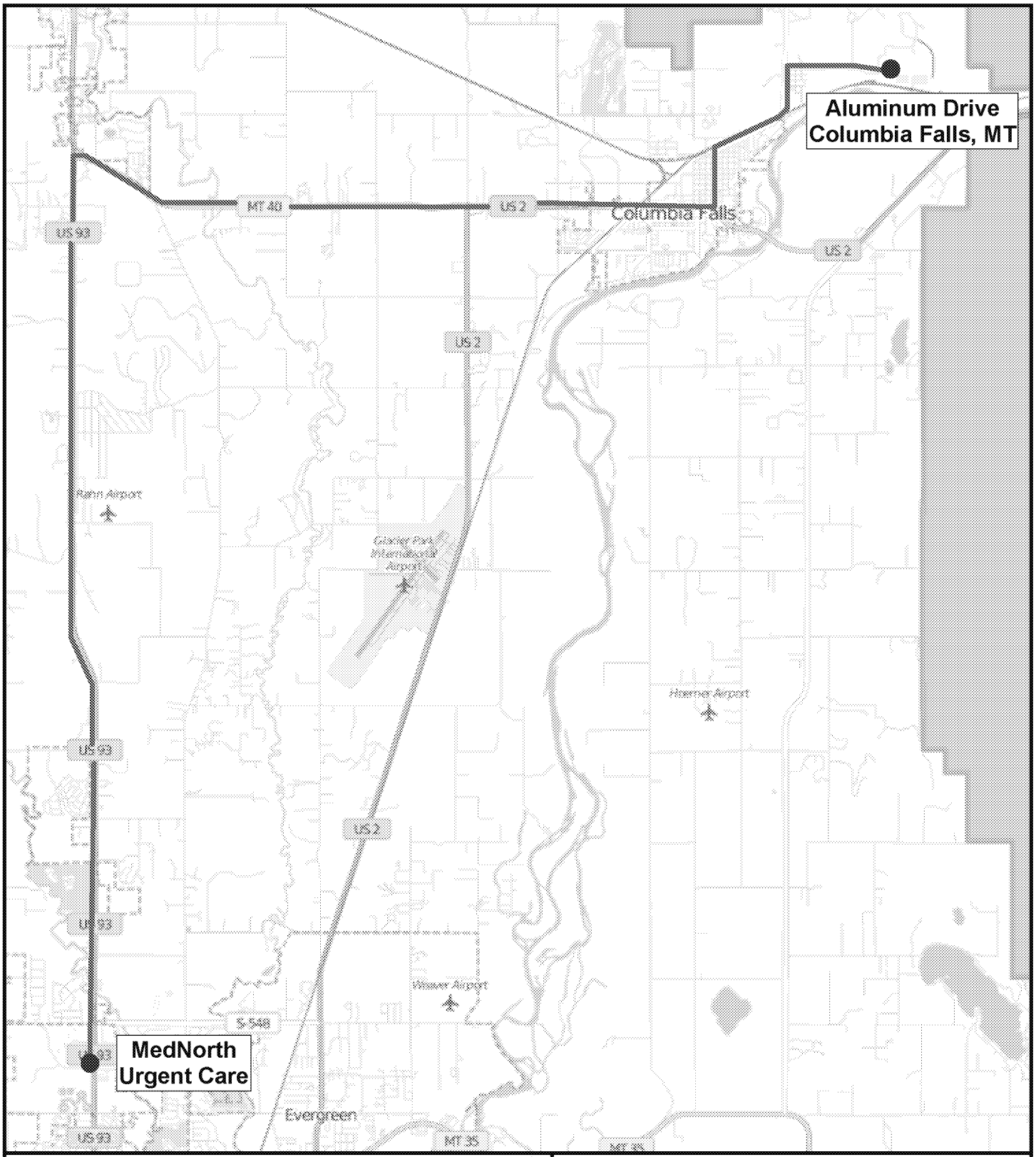

DIRECTIONS TO CLINIC

1. Depart Aluminum Dr toward Dehlbom Ln (1.2 mi)
2. Turn left onto MT-486 / North Fork Rd (1.3 mi)
3. Turn left to stay on MT-486 / N Nucleus Ave (0.6 mi)
4. Turn right onto US-2 / 9th St W (2.8 mi)
5. Keep straight onto MT-40 (4.5 mi)
6. Turn left onto US-93 / US Highway 93 S (10.0 mi)
7. Arrive at US-93

N

12,000 0 12,000 Feet

Title:

CLINIC ROUTE
MedNorth Urgent Care
2316 U.S. Hwy 93 North
Kalispell, MT, 59901

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: A.M.	Date: 12/11/2015	FIGURE
Prepared by: A.M.	Scale: 1 in= 12,000 ft	2
Project Mgr: A.B.	Office: NY	
File: 2476.0001Y000.117	Project: 2476.0001Y000	

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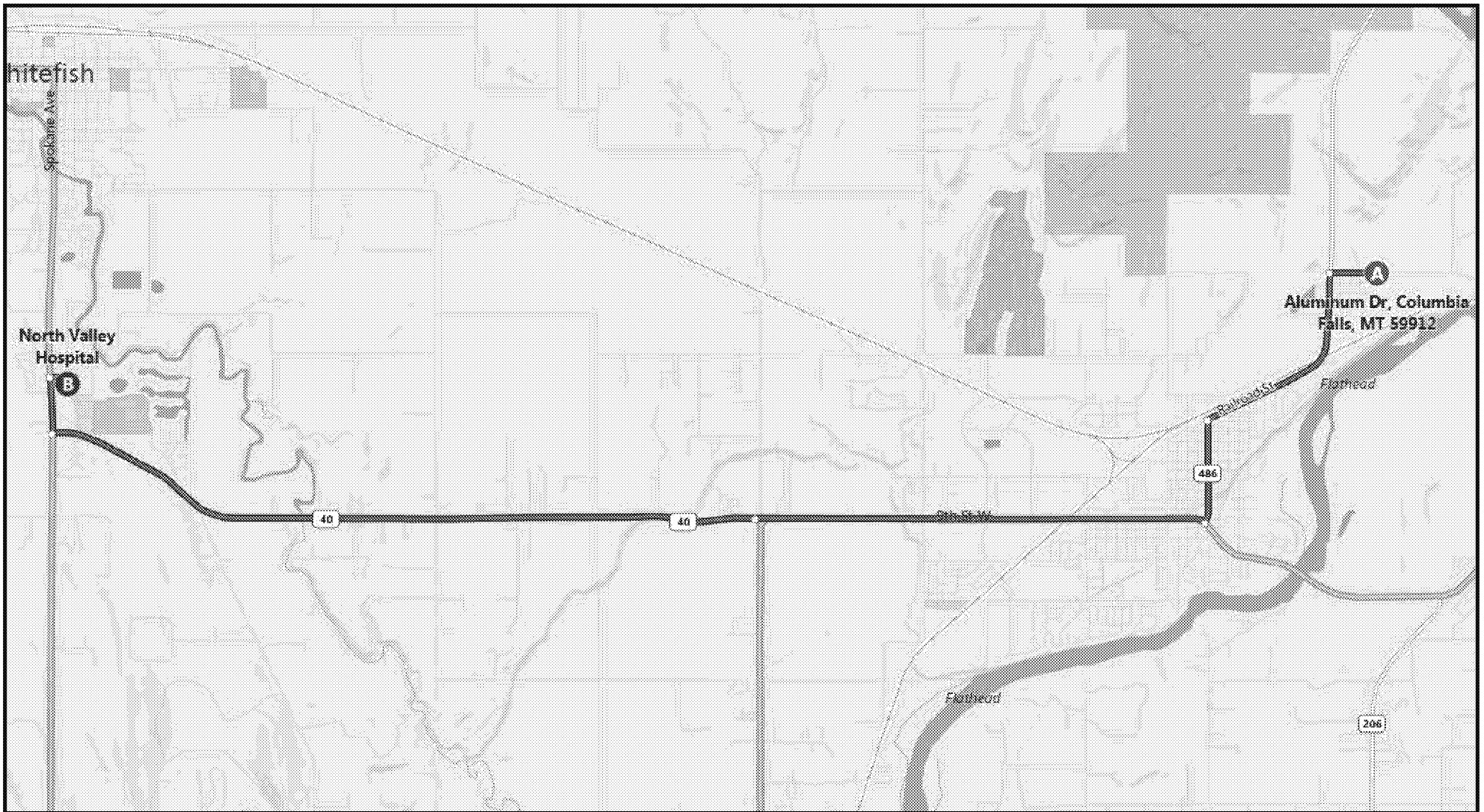
V:\GIS\Projects\2476Y\0001Y\100\2476.0001Y100.116\2476.0001Y000.116.mxd



DIRECTIONS TO HOSPITAL

1. Head west on Aluminum Dr toward Dorothy Ave (0.7 mi)
2. Turn left onto State Hwy 486 (1.3 mi)
3. Follow Railroad St, Truck Route and 12th Ave W to US-2 W/9th St W (1.2 mi)
4. Take MT-40 W to Hospital Way (6.3 mi)
5. Drive to Hospital Way in Whitefish (0.3 mi)

7,000 0 7,000 Feet

N

Title:

HOSPITAL ROUTE
North Valley Hospital
1600 Hospital Way, Whitefish, MT 59937

ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: A.M.	Date: 12/11/2015	FIGURE
Prepared by: A.M.	Scale: 1:7000 feet	3
Project Mgr: A.B.	Office: NY	
File No: 2476.0001Y000.116	Project: 2476.0001Y000	

APPENDICES

A Physical, Chemical, and Toxicological Information Regarding Contaminants of Potential Concern

B Daily Health and Safety Tailgate Meeting Form

C Automobile Safety Checklist

D Blank Roux Prevention Observations Forms

E Roux Associates' Subsurface Utility Clearance Procedure

F Typical Decontamination Procedures

G Blank Roux Lesson Learned Form

APPENDIX A

Physical, Chemical, and Toxicological Information Regarding Contaminants of Potential Concern

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CYANIDE

CAS# 74-90-8, 143-33-9, 151-50-8, 592-01-8, 544-92-3, 506-61-6, 460-19-5, 506-77-4

Division of Toxicology and Environmental Medicine ToxFAQs™ July 2006

This fact sheet answers the most frequently asked health questions (FAQs) about cyanide. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to high levels of cyanide harms the brain and heart, and may cause coma and death. Exposure to lower levels may result in breathing difficulties, heart pains, vomiting, blood changes, headaches, and enlargement of the thyroid gland. Cyanide has been found in at least 471 of the 1,662 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is cyanide?

Cyanide is usually found joined with other chemicals to form compounds. Examples of simple cyanide compounds are hydrogen cyanide, sodium cyanide and potassium cyanide. Certain bacteria, fungi, and algae can produce cyanide, and cyanide is found in a number of foods and plants. In certain plant foods, including almonds, millet sprouts, lima beans, soy, spinach, bamboo shoots, and cassava roots (which are a major source of food in tropical countries), cyanides occur naturally as part of sugars or other naturally-occurring compounds. However, the edible parts of plants that are eaten in the United States, including tapioca which is made from cassava roots, contain relatively low amounts of cyanide.

Hydrogen cyanide is a colorless gas with a faint, bitter, almond-like odor. Sodium cyanide and potassium cyanide are both white solids with a bitter, almond-like odor in damp air. Cyanide and hydrogen cyanide are used in electroplating, metallurgy, organic chemicals production, photographic developing, manufacture of plastics, fumigation of ships, and some mining processes.

What happens to cyanide when it enters the environment?

❑ Cyanide enters air, water, and soil from both natural processes and industrial activities.

❑ In air, cyanide is mainly found as gaseous hydrogen cyanide; a small amount is present as fine dust particles.

❑ The half-life (the time needed for half of the material to be removed) of hydrogen cyanide in the atmosphere is about 1–3 years.

❑ Most cyanide in surface water will form hydrogen cyanide and evaporate.

❑ Cyanide in water does not build up in the bodies of fish.

❑ Cyanides are fairly mobile in soil. Once in soil, cyanide can be removed through several processes. Some cyanide compounds in soil can form hydrogen cyanide and evaporate, whereas some cyanide compounds will be transformed into other chemical forms by microorganisms in soil. At the high concentrations, cyanide becomes toxic to soil microorganisms. Because these microorganisms can no longer change cyanide to other chemical forms, cyanide is able to passes through soil into underground water.

How might I be exposed to cyanide?

❑ Breathing air, drinking water, touching soil, or eating foods that contain cyanide.

❑ Smoking cigarettes and breathing smoke-filled air during fires are major sources of cyanide exposure.

❑ Breathing air near a hazardous waste site containing cyanide.

❑ Eating foods naturally containing cyanide compounds, such as tapioca (made from cassava roots), lima beans, and almonds. However, the portions of these plants that are eaten in the United States contain relatively low amounts of cyanide.

How can cyanide affect my health?

You are not likely to be exposed to large enough amounts of cyanide in the environment to cause adverse health effects. The severity of the harmful effects following cyanide exposure

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depends in part on the form of cyanide, such as hydrogen cyanide gas or cyanide salts. Exposure to high levels of cyanide for a short time harms the brain and heart and can even cause coma and death. Workers who inhaled low levels of hydrogen cyanide over a period of years had breathing difficulties, chest pain, vomiting, blood changes, headaches, and enlargement of the thyroid gland.

Some of the first indications of cyanide poisoning are rapid, deep breathing and shortness of breath, followed by convulsions (seizures) and loss of consciousness. These symptoms can occur rapidly, depending on the amount eaten. The health effects of large amounts of cyanide are similar, whether you eat, drink, or breathe it; cyanide uptake into the body through the skin is slower than these other means of exposure. Skin contact with hydrogen cyanide or cyanide salts can irritate and produce sores.

How likely is cyanide to cause cancer?

There are no reports that cyanide can cause cancer in people or animals. EPA has determined that cyanide is not classifiable as to its human carcinogenicity.

How can cyanide affect children?

Effects reported in exposed children are like those seen in exposed adults. Children who ate large quantities of apricot pits, which naturally contain cyanide as part of complex sugars, had rapid breathing, low blood pressure, headaches, and coma, and some died. Cyanide has not been reported to directly cause birth defects in people. However, among people in the tropics who eat cassava root, children have been born with thyroid disease because of the mothers' exposure to cyanide and thiocyanate during pregnancy. Birth defects occurred in rats that ate cassava root diets, and harmful effects on the reproductive system occurred in rats and mice that drank water containing sodium cyanide.

How can families reduce the risk of exposure to cyanide?

Families can reduce their exposure to cyanide by not breathing in tobacco smoke, which is the most common source of cyanide exposure for the general population. In the event of a building fire, families should evacuate the building immediately, because smoke from burning plastics contains cyanide (and carbon monoxide). Breathing this smoke can lead to unconsciousness or death. Cyanide in smoke can arise from the combustion of certain plastics (e.g., polyacrylamines, polyacrylics, polyurethane, etc.).

Compounds that release cyanide are naturally present in plants. The amounts are usually low in the edible portion but are higher in cassava. Pits and seeds of common fruits, such as apricots, apples, and peaches, may have substantial amounts of cyanide-releasing chemicals, so people should avoid eating these pits and seeds to prevent accidental cyanide poisoning.

Is there a medical test to show whether I've been exposed to cyanide?

There are medical tests to measure blood and urine levels of cyanide; however, small amounts of cyanide are always detectable in blood and urine. Tissue levels of cyanide can be measured if cyanide poisoning is suspected, but cyanide is rapidly cleared from the body, so the tests must be done soon after the exposure. An almond-like odor in the breath may alert a physician that a person was exposed to cyanide.

Has the federal government made recommendations to protect human health?

EPA regulates the levels of cyanide that are allowable in drinking water. The highest level of cyanide allowed in drinking water is 0.2 parts cyanide per 1 million parts of water (0.2 ppm).

The Occupational Safety and Health Administration (OSHA) has set a limit for hydrogen cyanide and most cyanide salts of 10 parts cyanide per 1 million parts of air (10 ppm) in the workplace.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Cyanide (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

FLUORIDES, HYDROGEN FLUORIDE, AND FLUORINE

CAS # 7681-49-4, 7664-39-3, 7782-41-4

Division of Toxicology ToxFAQs™ **September 2003**

This fact sheet answers the most frequently asked health questions (FAQs) about fluorides, hydrogen fluoride, and fluorine. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Fluorides are naturally occurring compounds. Low levels of fluorides can help prevent dental cavities. At high levels, fluorides can result in tooth and bone damage. Hydrogen fluoride and fluorine are naturally-occurring gases that are very irritating to the skin, eyes, and respiratory tract. These substances have been found in at least 188 of the 1,636 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are fluorides, hydrogen fluoride, and fluorine?

Fluorides, hydrogen fluoride, and fluorine are chemically related. Fluorine is a naturally-occurring, pale yellow-green gas with a sharp odor. It combines with metals to make fluorides such as sodium fluoride and calcium fluoride, both white solids. Sodium fluoride dissolves easily in water, but calcium fluoride does not. Fluorine also combines with hydrogen to make hydrogen fluoride, a colorless gas. Hydrogen fluoride dissolves in water to form hydrofluoric acid.

Fluorine and hydrogen fluoride are used to make certain chemical compounds. Hydrofluoric acid is used for etching glass. Other fluoride compounds are used in making steel, chemicals, ceramics, lubricants, dyes, plastics, and pesticides.

Fluorides are often added to drinking water supplies and to a variety of dental products, including toothpaste and mouth rinses, to prevent dental cavities.

What happens to fluorides, hydrogen fluoride, and fluorine when they enter the environment?

❑Fluorine cannot be destroyed in the environment; it can only change its form. Fluorine forms salts with minerals in soil.
❑Hydrogen fluoride gas will be absorbed by rain and into clouds and fog to form hydrofluoric acid, which will fall to the ground.
❑Fluorides released to the air from volcanoes and industry are carried by wind and rain to nearby water, soil, and food sources.
❑Fluorides in water and soil will form strong associations with sediment or soil particles.
❑Fluorides will accumulate in plants and animals. In animals, the fluoride accumulates primarily in the bones or shell rather than in soft tissues.

How might I be exposed to fluorides, hydrogen fluoride, and fluorine?

❑The general population can be exposed to fluorides in contaminated air, food, drinking water and soil.
❑People living in communities with fluoridated water or high levels of naturally-occurring fluoride may be exposed to higher levels.
❑People who work or live near industries where fluoride-containing substances are used may be exposed to higher levels.

How can fluorides, hydrogen fluoride, and fluorine affect my health?

Small amounts of fluoride help prevent tooth cavities, but high levels can harm your health. In adults, exposure to high levels of fluoride can result in denser bones. However, if exposure is high enough, these bones may be more fragile and brittle and there may be a greater risk of breaking the bone. In animals, exposure to extremely high doses of fluoride can result in decreased fertility and sperm and testes damage.

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Fluorine and hydrogen fluoride are very irritating to the skin, eyes, and respiratory tract. At high levels, such as may occur through exposure from an industrial accident, hydrogen fluoride may also damage the heart.

How likely are fluorides, hydrogen fluoride, and fluorine to cause cancer?

Most of the studies of people living in areas with fluoridated water or naturally high levels of fluoride in drinking water did not find an association between fluoride and cancer risk. Two animal cancer studies were inconclusive. The international Agency for Research on Cancer (IARC) has determined that the carcinogenicity of fluoride to humans is not classifiable.

How can fluorides, hydrogen fluoride, and fluorine affect children?

When used appropriately, fluoride is both safe and effective in preventing and controlling cavities. Drinking or eating excessive fluoride during the time teeth are being formed (before 8 years of age) can cause visible changes in teeth. This condition is called dental fluorosis. At very high concentrations of fluoride, the teeth can become more fragile and sometimes can break.

No studies have addressed whether low levels of fluoride will cause birth defects in humans. Birth defects have not been found in most studies of animals.

How can families reduce the risk of exposure to fluorides, hydrogen fluoride, and fluorine?

In the home, children may be exposed to high levels of fluorides if they swallow dental products containing fluoridated toothpaste, gels, or rinses. Parents should supervise brushing and place at most, a small pea size dab of toothpaste on the brush and teach children not to swallow dental products. People who live in areas with high levels of naturally-occurring fluoride in the water should use alternative sources of dinking water, such as bottled water.

Is there a medical test to show whether I've been exposed to fluoride, hydrogen fluoride, and fluorine?

Tests are available to measure fluoride levels in urine; these tests can determine if you have been exposed to higher-than-normal levels of fluorides. The urine test must be performed soon after exposure because fluoride that is not stored in bones leaves the body within a few days. The test cannot be performed in the doctor's office, but can be done at most laboratories that test for chemical exposure. The urine fluoride test cannot be used to predict the nature or severity of toxic effects. Bone sampling can be done in special cases to measure long-term exposure to fluorides.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum amount of fluoride allowable in drinking water of 4.0 milligrams per liter of water (4.0 mg/L). For the prevention of dental decay, the Public Health Service (PHS) has, since 1962, recommended that public water supplies contain between 0.7 and 1.2 milligrams of fluoride per liter of drinking water.

The Occupational Safety and Health Administration (OSHA) has set limits of 0.2 milligrams per cubic meter (0.2 mg/m^3) for fluorine, 2.0 mg/m^3 for hydrogen fluoride, and 2.5 mg/m^3 for fluoride in workroom air to protect workers during an 8-hour shift over a 40-hour work week.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2003. Toxicological Profile for Fluorides, Hydrogen Fluoride, and Fluorine. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Polycyclic Aromatic Hydrocarbons (PAHs) - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kär′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.
- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Polychlorinated Biphenyls - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over

several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. PCBs have been classified as probably carcinogenic, and carcinogenic to humans (group 1) by the Environmental Protection Agency (EPA) and International Agency for Research on Cancer (IARC), respectively.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risks of exposure to PCBs?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.
- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

APPENDIX B

Daily Health and Safety Tailgate Meeting Form

HEALTH & SAFETY BRIEFING / TAILGATE MEETING FORM

Site Name / Location _____

Date: _____ Weather Forecast: _____

Names of Personnel Attending Briefing

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

Planned Work _____

_____

_____

_____

_____

Hazards Discussed _____

_____

_____

_____

_____

_____

_____

JSAs Reviewed: _____

_____

_____

_____

Signatures of Attending Personnel

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

APPENDIX C

Automobile Safety Checklist

APPENDIX C

Vehicle Checklist

	YES	NO	COMMENTS
1. Registration and insurance are up to date			
2. Tires are inflated and have adequate tread			
3. Wipers are in good condition			
4. Body and overall vehicle appearance are adequate			
5. Mirrors are in good condition			
6. Windows are functional, no cracks, and clean			
7. Horn is operational			
8. Lights are working			
9. Signals are functional			
10. Lights on instrument panel are working			
11. Fluid levels are acceptable			
12. No fluid leaks are observed below vehicle			
13. Brakes are working and have been maintained in accordance with maintenance schedule			
14. Oil has been maintained in accordance with maintenance schedule			
15. Seat belts (lap and shoulder) are present and working			
16. First Aid Kit/Fire Exinguisher/Shovel present in vehicle			

APPENDIX D

Blank Roux Prevention Observations Forms

☐ **Roux Associates, Inc.** ☐ **Remedial Engineering, P.C.**
(Check applicable company name)

ROUX PEER OBSERVATION (RPO)
Ray Fitzpatrick, Office Health and Safety Manager
Cell: (631) 484-1168; **Office:** (631) 232-2600; **Fax:** (631) 232-9898; **Email:** rfitzpatrick@rouxinc.com

Date:		**Observer Name:**		
Project #:		**Observer Title:**		**SSE?** Y / N
Project Name:		**Observee Title:**		**SSE?** Y / N

Peer to Peer ☐	**Manager to Staff** ☐	**Staff to Manager** ☐

ACTIVITY TYPE (Check most appropriate one.)			
☐ Demolition	☐ O&M	☐ Trenching	☐ Rigging/Lifting
☐ Dewatering	☐ Excavation	☐ AST/UST Removal	☐ Other (describe below)
☐ Drilling / Geoprobe	☐ Sampling	☐ Gauging	
☐ Driving	☐ System Start-up	☐ Pump/Pilot Test	

Description of Site Conditions & Task(s):

Describe SPSA(s) Performed for Task:

ASSESS –

ANALYZE –

ACT –

**Complete checklist on back before completing the sections below.*

Cklst #	Observation(s)	Follow-up Action(s)	Person(s) Responsible	Target Date	Completion Date

Prepared By	Title(s)	Date
Observer:		

- Provide the completed RPO to the PM for review, then submit to **Ray Fitzpatrick** for review.
- Upon completion of follow-up action(s), notify **Ray Fitzpatrick** and re-submit RPO form with Completion Date(s).

Reviewed By	Title(s)	Date
PM:		
H&S Mgr:		

RPO # (*admin use only*):

- Check only one response (i.e., YES, NO, NA – Not Applicable) for each line item.
- Use the 'Comments' box for positive comments. Use the space at the bottom of the page for any additional comments.
- If there is a 'NO' response, describe the observation and determine follow-up action(s) with the PM.

I. Personal Protective Equipment	YES	NO	NA	Comments
(a) PPE req't met & rated for work?	☐	☐	☐	
(b) PPE worn as req'd by the JSA, SOP, facility, etc.?	☐	☐	☐	
(c) PPE appropriate for weather, environmental & traffic conditions?	☐	☐	☐	
(d) Respirator fit tested & medically cleared work?	☐	☐	☐	
(e) Other	☐	☐	☐	
(f) Tick Prevention Measures: (repellents, light clothing, tucked pants etc.)	☐	☐	☐	
II. Tool / Equipment	**YES**	**NO**	**NA**	**Comments**
(a) Correct tool for task(s)?	☐	☐	☐	
(b) Equipment inspected & meet calibration req't?	☐	☐	☐	
(c) Heavy equipment inspection performed & rated for work?	☐	☐	☐	
(d) Loads secured if mobilizing?	☐	☐	☐	
(e) Trailers registered (if applicable)?	☐	☐	☐	
(f) Other	☐	☐	☐	
III. Body Use & Positioning	**YES**	**NO**	**NA**	**Comments**
(a) Correct techniques when lifting, pulling, pushing?	☐	☐	☐	
(b) Manageable loads?	☐	☐	☐	
(c) Assistance with >45lbs when lifting?	☐	☐	☐	
(d) Avoids reaching, twisting, overextending?	☐	☐	☐	
(e) Secure footing?	☐	☐	☐	
(f) Maintains 3-pt-of-contact?	☐	☐	☐	
(g) Avoids being caught and out of line-of-fire?	☐	☐	☐	
(h) Clear of pinch points & overhead hazards?	☐	☐	☐	
(i) Facing traffic & upwind?	☐	☐	☐	
(j) Other	☐	☐	☐	
IV. Work Environment	**YES**	**NO**	**NA**	**Comments**
(a) S/T/F, piercing and toppling hazards cleared / identified in work areas?	☐	☐	☐	
(b) Work areas and designated pathways defined & marked?	☐	☐	☐	
(c) Good housekeeping (designated areas, storage & disposal)?	☐	☐	☐	
(d) Checked for overhead & biological hazards?	☐	☐	☐	
(e) Air monitoring req't met?	☐	☐	☐	
(f) Weather conditions safe to perform task(s)?	☐	☐	☐	
(g) Other	☐	☐	☐	
V. Operating Procedures	**YES**	**NO**	**NA**	**Comments**
(a) HASP / JSA / SOP available & reviewed?	☐	☐	☐	
(b) SSE policy req't met?	☐	☐	☐	
(c) Personnel qualified for task(s)?	☐	☐	☐	
(d) Energy sources LOTO / de-energized?	☐	☐	☐	
(e) Shutdown devices identified & working?	☐	☐	☐	
(f) Parties notified & POC established?	☐	☐	☐	
(g) Used spotter when backing?	☐	☐	☐	
(h) Containers (samples, drums, etc.) marked?	☐	☐	☐	
(i) Other	☐	☐	☐	
(j) SPSA(s) performed?	☐	☐	☐	

Additional comments:

RPO # (*admin use only*):

APPENDIX E

Roux Associates' Subsurface Utility Clearance Procedure

STANDARD OPERATING PROCEDURE 1.17

SUBSURFACE UTILITY CLEARANCE

CORPORATE HEALTH AND SAFETY MANAGER	:	Joseph W. Gentile
EFFECTIVE DATE	:	2/04/15
REVISION NUMBER	:	0

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- B. Roux Subsurface Utility Clearance Checklist and Utility Verification / Site Walkthrough Record

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1.0 PURPOSE

Roux Associates, Inc. (Roux Associates) has instituted the following Standard Operating Procedure (SOP) for completing proper utility mark-outs and for conducting subsurface clearance activities. The SOP establishes a method to ensure, to the greatest extent possible, that utilities have been identified and contact and/or damage to underground utilities and other subsurface structures will be avoided.

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2.0 SCOPE AND APPLICABILITY

This SOP applies to all Roux Associates employees, its contractors and subcontractors. Employees are expected to follow the SOP for all intrusive work involving Roux Associates or other personnel (e.g., contractors/subcontractors) working for Roux Associates unless the client's requirements are more stringent. Deviation from the SOP regardless of the specific work activity or work location must be pre-approved per Section 4.3 of this SOP.

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3.0 DEFINITIONS

Intrusive Work Activities	All activities such as digging or scraping the surface, including but not limited to, excavation, test pitting or trenching, soil vapor sampling or the installation of soil borings, soil vapor monitoring points and wells, or monitoring wells, and drilling within the basement slab of a recently demolished building.
Mark-out / Stake Out	The process of contracting with a competent and qualified company to confirm the presence or absence of underground utilities and structures. This process will clearly mark-out and delineate utilities that are identified so that intrusive work activities can be performed without causing disturbance or damage to the subsurface utilities and structures. After utility mark-outs are completed the soft digging will be completed prior to intrusive work.
Tolerance Zone	Defined as two feet on either side of the designated centerline of an identified utility, plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct backs and other non-cylindrical utilities) of that utility and two feet from the outside edge of any subsurface structure.
Structure	For the purpose of this SOP a structure is defined as any underground feature that may present potential source(s) of energy such as, but not limited to, utility vaults, bunkers, piping, electrical boxes, wires, conduits, culverts, utility lines, underground tanks and ducts.
Soft Digging	The safest way to remove material from unknown obstructions or services is by using tools such as a vactor or air knife, non-mechanical tools, or hand tools. The methods are clean and non-evasive and used for uncovering and exposing buried services and excavating and for providing a quick method of soil removal from sensitive areas.
Verification	Exploratory test-hole dug with hand tools within the Tolerance Zone to expose and verify the location, type, size, direction-of-run and depth of a utility or subsurface structure. Vacuum excavation (soft dig) methods can further facilitate exposure of a subsurface utility and accurately provide its location ad identification prior to intrusive work approaching the Tolerance Zone.

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4.0 RESPONSIBILITIES

It shall be the responsibility of all Roux Associates employees who oversee or perform intrusive field activities to ensure adequate mark-outs of underground utilities and structures have been provided, reviewed and discussed with the field team. This includes documenting that the mark-out was correctly performed by completing the Mark-out / Stake-out Request Information Sheet (Appendix A) and using the Roux Subsurface Clearance Checklist (Appendix B). Additionally the following personnel have specific responsibilities for implementing this SOP.

4.1 Corporate Health and Safety Manager (CHSM)

- The CHSM has the responsibility of ensuring that a program has been established and is in place to provide guidance for performing adequate utility mark-outs and subsurface utility clearance activities.
- The CHSM has the overall responsibility of implementing this SOP and communicating the contents of this SOP to Office Managers (OMs) and Office Health and Safety Managers (OHSMs).
- The CHSM will periodically, quarterly at a minimum, communicate learnings from mark-outs and subsurface utility clearance incidents and follow-up actions taken to all personnel via Clarity®.
- The CHSM will periodically review and evaluate the effectiveness of this SOP on a quarterly basis.

4.2 Office Manager (OM)

- Each OM will designate an individual to serve as the respective office's OHSM. The OHSM will be vested with the responsibility of assisting in implementation of this SOP's requirements.
- Each OM will ensure that their respective office's staff are made aware of and abide by the requirements of this SOP.

4.3 Project Principals (PPs)

- PPs are responsible for ensuring this SOP is followed for intrusive work performed at their sites. This SOP recognizes that Roux may only be in the position of suggesting, discussing and requesting that this SOP be implemented to our clients.
- PPs have the authority to consider exceptions to this SOP based on their client's site knowledge, site experience and the client's willingness for the use of this SOP. Any and all exceptions, however, will be documented and pre-approved by the OM.

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4.4 Project Manager (PM)

- It shall be the PM's responsibility to ensure this SOP is properly implemented. The PM has the responsibility for sharing all Lessons Learned from subsurface utility clearance incidents with the project team.
- The PM has the responsibility of reviewing and editing draft reports of subsurface utility clearance incidents and for filing the finalized reports in the appropriate project files.

4.5 Office Health and Safety Manager (OHSM)

- Each OHSM will ensure that their respective office's staff is trained in this SOP.
- It is the responsibility of the OHSM to review Lessons Learned and Accident Reporting Forms (existing Roux forms) for utility mark-outs and subsurface utility clearance incidents and to assist project teams in finalizing reports.
- The OHSM will review final draft incident reports of subsurface utility clearance incidents, ensure they are finalized and provide the finalized report to the CHSM, OM and the PM for inclusion in the project files as appropriate.
- The OHSM will track all subsurface utility clearance incidents until completed.
- The OHSM will provide the CHSM with all finalized reports of subsurface utility clearance incidents containing follow-up actions for sharing throughout the firm

4.6 All Personnel

- All personnel are responsible for ensuring Public Utility Mark-outs were requested by the subcontractor, performed for all known or suspected utility types and document the process by completion of Roux Subsurface Utility Clearance Checklist and Utility Verification / Site Walkthrough Record.

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5.0 PROCEDURES

5.1 Before Intrusive Activities

During the project kick-off meeting for intrusive activities the PM will review the Roux Subsurface Utility Clearance Checklist and Utility Verification / Site Walkthrough Record (Appendix B) and the below bullet points with the project field team:

(Please note that these are intended as general reminders only and should not be solely relied upon.)

- Ensure the Mark-out / Stake-out Request Information Sheet (or one-call report is complete and accurate for the site including address and cross streets) is completed and review for missing utilities (note utility mark-out organizations do not have contracts with all utilities and it is often necessary to contact certain utilities separately such as the local water and sewer authorities).

- Have written confirmation prior to mobilizing to the site that the firm or Roux personnel performing the intrusive activity has correctly completed the mark-out notification process including requesting mark-outs, waiting for mark-outs to be applied to ground surfaces at the site, and receiving written confirmation of findings (via fax or email) from utility operators for all known or suspected utilities in the proposed area of intrusive activity, and provided utility owner written confirmation to Roux Associates personnel for review and project files documentation.

- Do not begin any intrusive activity until any utilities mark-out has been completed (i.e., did all utilities mark-out the site?) and any unresolved mark-out issues are finalized. Perform a site walk to review the existing utilities and determine if said utilities have been located by the utility locators.
  - (Note: The Tolerance Zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside edge of any subsurface structure.)

- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or other soft digging techniques) for the first 5-ft below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-Clearance exploratory test holes should be defined in the SOW/proposal as being provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternative approaches will need to be pre-approved by the OM.

- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this SOP. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12" for first 5 feet) using a dedicated spotter.) For Tolerance Zone work, unless

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otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes performed to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.

- In addition, the following activities should be conducted:
  - Review the work scope to be performed with the site owner/tenant to determine if it may impact any utilities,
  - Attempt to procure any utility maps or historic drawings of subsurface conditions of the site,
  - **Determine the need for utility owner companies to be contacted or to have their representatives on site**,
  - Where mark-outs terminate at the property boundary, consider the use of private utility locating / GPR / Geophysical-type services which may be helpful in locating utilities. Use of private utility locating firms, however, does not eliminate the legal requirement for the Excavator firm to submit a request for Public Utility Mark-outs. Also, the information provided by the service may be inaccurate and unable to locate subsurface utilities and structures in urban areas, landfills, urban fill areas and below reinforced slabs, etc. They should not be relied upon as the only means of performing utility clearance.

5.2 During Intrusive Activities

The PM, field team lead or personnel performing oversight is to:

- Ensure the mark-out remains valid. (In certain states there are limits regarding the duration of time after the mark-out was applied to the ground surface work can be started or interrupted.) Additionally, the mark-outs must be maintained, documented, and in many cases refreshed periodically to be considered valid.
- Ensure intrusive activities are only performed within the safe boundaries of the mark-out as detailed in the One-Call Report.
- Halt all work if intrusive activities must take place outside of the safe boundaries of a mark-out and only proceed after new mark-outs are performed.
- Halt the intrusive activities and immediately consult with the PP if an unmarked utility is encountered.
- Completing any subsurface utility clearance incident reports that are necessary.

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6.0 APPENDICES

- Example Completed One-Call Report (Appendix A)
- Roux Subsurface Clearance Checklist and Utility Verification / Site Walkthrough Record (Appendix B)

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APPENDIX A

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Example Completed One-Call Report

New York 811

Send To: C_EMAIL Seq No: 744

Ticket No: 133451007 ROUTINE

Start Date: 12/16/13 Time: 7:00 AM Lead Time: 20

State: NY County: QUEENS Place: QUEENS
Dig Street: 46TH AVE Address:
Nearest Intersecting Street: VERNON BLVD
Second Intersecting Street: 11TH ST

Type of Work : SOIL BORINGS
Type of Equipment : GEOPROBE
Work Being Done For: ROUX

In Street: X On Sidewalk: X Private Property: Other:
On Property Location if Private: Front: Rear: Side:

Location of Work: MARK THE ENTIRE NORTH SIDE OF THE STREET AND SIDEWALK OF:
46TH AVE BETWEEN VERNON BLVD AND 11TH STREET

Remarks:

Nad: Lat: Lon: Zone:
ExCoord NW Lat: 40.7475399 Lon: -73.9534811 SE Lat: 40.7457406 Lon: -73.9493680

Company : ZEBRA ENVIROMENTAL Best Time: 6AM-5PM
Contact Name : DAVID VINES Phone: (516)596-6300
Field Contact : DAVID VINES Phone: (516)596-6300
Caller Address: 30 N PROSPECT AVE Fax Phone: (516)596-4422
LYNBROOK, NY 11563
Email Address : david@zebraenv.com

Additional Operators Notified:
ATTNY01 AT&T CORPORATION (903)753-3145
CEQ CONSOLIDATED EDISON CO. OF N.Y (800)778-9140
MCINY01 MCI (800)289-3427
PANYNJ01 PORT AUTHORITY OF NY & NJ (201)595-4841
VZQ VERIZON COMMUNICATIONS (516)297-1602

Link to Map for C_EMAIL: http://ny.itic.occinc.com/XGMZ-DF2-L23-YAY

Original Call Date: 12/11/13 Time: 1:15 PM Op: webusr
IMPORTANT NOTE: YOU MUST CONTACT ANY OTHER UTILITIES DIRECTLY.

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APPENDIX B

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Roux Subsurface Utility Clearance Checklist

Date of Revision – 12/3/14

Work site set-up and work execution

ACTIVITY	Yes	No	N/A	COMMENTS INCLUDING JUSTIFICATION IF RESPONSE IS NO OR NOT APPLICABLE
Daily site safety meeting conducted, SPSAs performed, JSAs reviewed, appropriate work permits obtained				
HASP is available and reviewed by site workers / visitors				
Subsurface Utility Clearance Procedure has been reviewed with all site workers				
Work area secured; traffic control established as needed. Emergency shut-off switch located. Fire extinguishers / other safety equipment available as needed				
Utility mark-outs (public / private) clear and visible. Provide Excavator's Stake-Out Reference Number / Request Date / Time				
Tolerance zone work identified				
Work execution plan reviewed and adhered to (ground disturbance methods, clearance depths, any special utility protection requirements, or any other execution requirements; especially for Tolerance Zone work)				
Verbal endorsement received from Roux PM for any required field deviations to work execution plan				

Key reminders for execution:

The Subsurface Utility Clearance Protocol should be referenced to determine all requirements while executing subsurface work. The bullet points below are intended as general reminders only and should not be solely relied upon.

- Tolerance zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside of any subsurface structure.
- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or vacuum excavation) must be performed for the first five feet below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole

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should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-clearance exploratory test holes should be defined in the SOW/proposal as being provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternate approaches will need to be pre-approved by the OM.

- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this SOP. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12" for first five feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.

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Utility Verification / Site Walkthrough Record

Employee Name:_____

Date: _____

Instructions: For each utility suspected at the job site, indicate location on the job site, approximate burial depth, and means of detecting the utility. Leave blank if that utility is not believed to be present.

Utility	Description of Utility Location Identified On-site	Approx. Depth (bls)	Method / Instrumentation used to determine Utility Location	Utility Owner Response (Date/Time)	Mark Out Indicates (Clear / Conflict)
Electrical Lines					
Gas Lines					
Pipelines					
Steam Lines					
Water Lines					
Sanitary & Storm-water Sewer lines					
Pressured Air-Lines					
Tank Vent Lines					
Fiber Optic Lines					
Underground Storage Tanks					
Phone Lines/ Other					

bls - Below land surface

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Site Sketch Showing Utilities:

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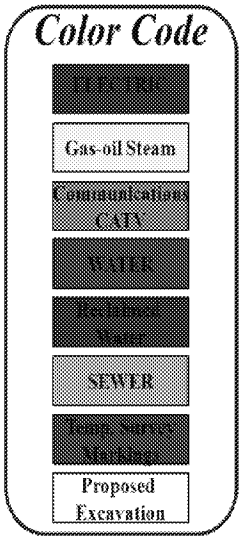


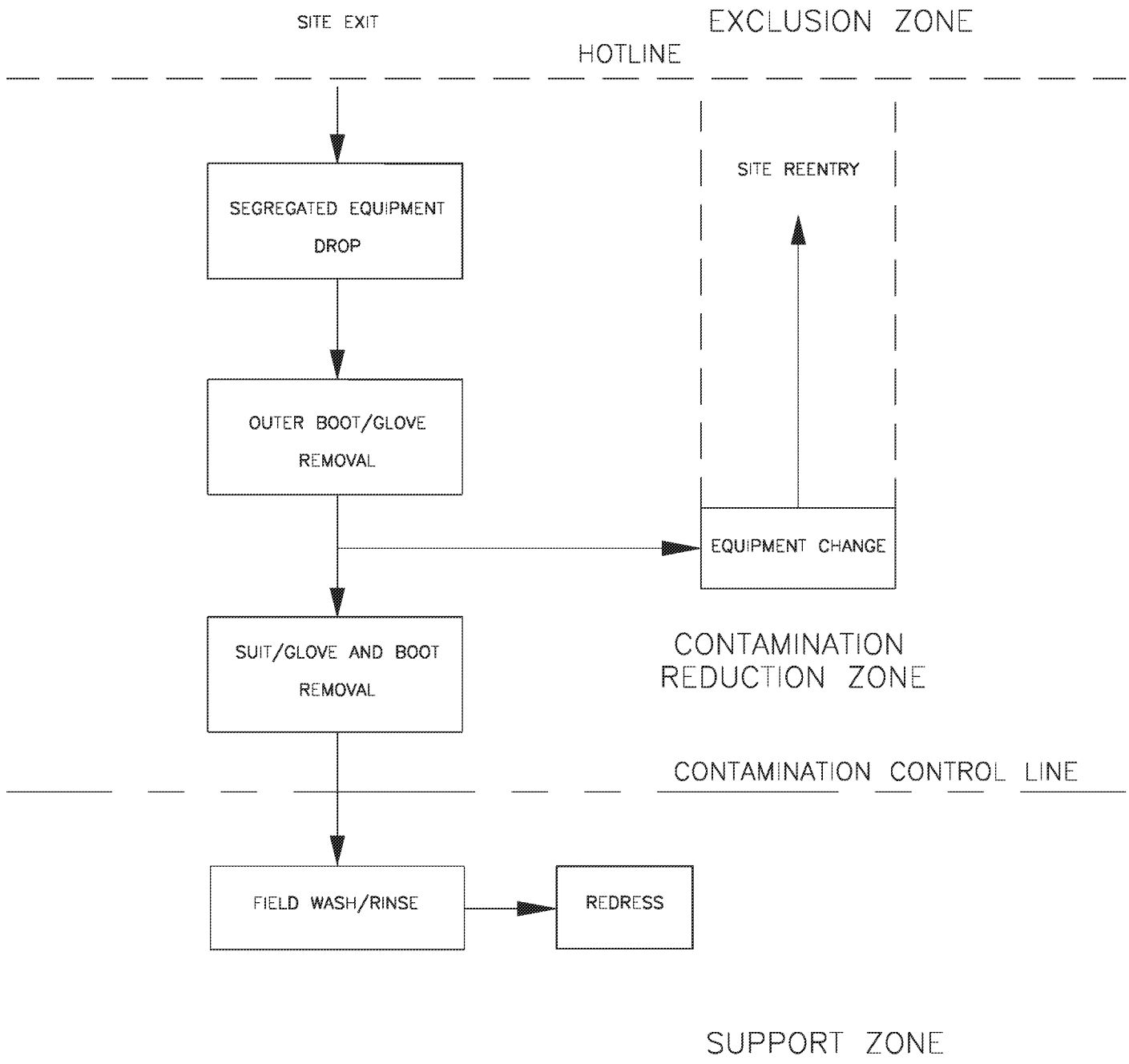
Other Comments / Findings:

Completed by: _____

Signature: _____ Date: _____

APPENDIX F

Typical Decontamination Procedures



Title.

TYPICAL DECONTAMINATION LAYOUT

LEVEL D PROTECTION

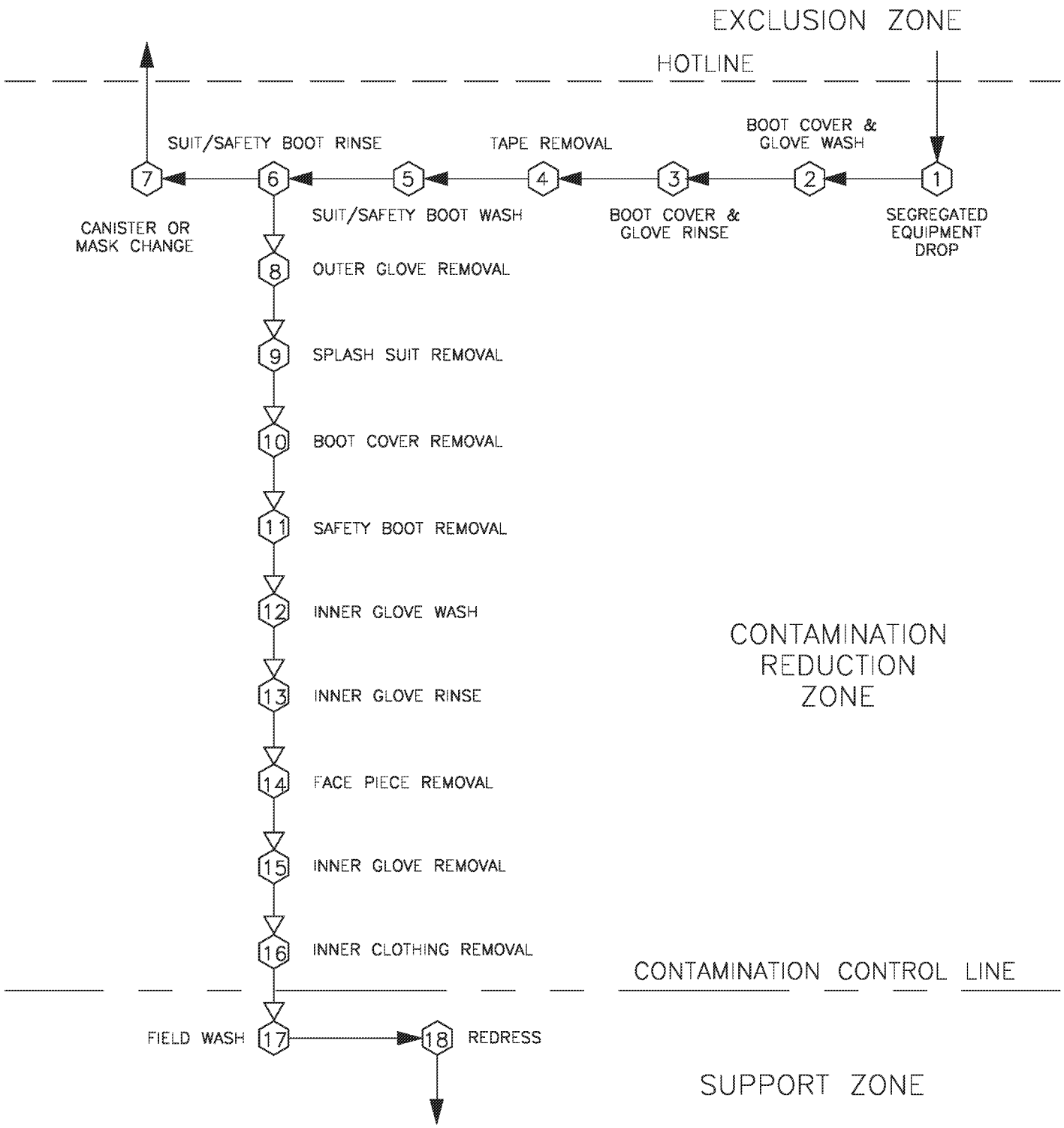
Prepared for:

COLUMBIA FALLS ALUMINUM COMPANY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: C.P.	Date: 08DEC15	FIGURE
Prepared by: J.A.D.	Scale: AS SHOWN	2
Project Mgr.: M.R.	Project No.: 2476.0001Y000	
File: 2476.0001Y104.01.cdr		

V:\CAD\PROJECTS\2476\Y000\1Y110\2476.0001Y104.01.CDR



Title.

TYPICAL DECONTAMINATION LAYOUT

LEVEL C PROTECTION

Prepared for:

COLUMBIA FALLS ALUMINUM COMPANY

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: C.P.	Date: 08DEC15	FIGURE
Prepared by: J.A.D.	Scale: AS SHOWN	3
Project Mgr.: M.R.	Project No.: 2476.0001Y000	
File: 2476.0001Y104.01.cdr		

V:\CAD\PROJECTS\2476\Y000\1Y110\2476.0001Y104.01.CDR

APPENDIX G

Blank Roux Lessons Learned Form

HEALTH & SAFETY LESSONS LEARNED
ROUX REPORT FORM

☐ **Roux Associates, Inc.** ☐ **Remedial Engineering, P.C.**
(Check applicable company name)

PART 1: ADMINISTRATIVE INFORMATION

Office: ☐ New York ☐ Massachusetts ☐ New Jersey ☐ Illinois ☐ CA - Los Angeles ☐ CA - Oakland

Project Manager:	**Project Principal:**
Project Name:	**Project Location:**

PART 2: LESSONS LEARNED INCIDENT DETAILS

Date\Time Occurred (MM/DD/YYYY HH:MM):	**Date\Time Submitted** (MM/DD/YYYY HH:MM):

LESSONS LEARNED INCIDENT TYPE - What could have happened? - Select all that apply (1-7)

1. ☐ Fire / Explosion
2. ☐ Injury / Illness
3. ☐ Security (e.g, theft, trespassing, vandalism)
4. ☐ Environmental (spill, permit exceedance, etc.)
5. ☐ Transportation of personnel (vehicle accident)
6. ☐ Property/Equipment Damage
7. ☐ Business Interruption

Event Leading to Potential Injury/Illness:

Job Task*:	**Equipment Involved*:**

WHAT HAPPENED? Do not include individuals' names. Ensure photos, sketches, etc. are not personally identifiable unless written consent has been obtained.

Summary (1-2 sentences. Provide brief description of the incident. Provide facts only, no speculation or opinion):

Incident Details (Brief factual details of what, where, when; include photos, sketches, etc. as attachments):

Immediate Corrective Actions Taken:

SERIOUS INJURY OR FATALITY (SIF): IF AN ACTUAL SIF, USE EXISTING ROUX ACCIDENT REPORTING FORM

Could this have resulted in a SIF? ☐ **Yes** ☐ **No**

A potential SIF is defined as likely to have caused an injury resulting in significant physical body damage with probable long term and/or life altering complications.

INCIDENT INVOLVED:

Roux Employee: ☐ **Yes** ☐ **No** **Subcontractor Company Name:**

INVESTIGATION TEAM

NAME	JOB TITLE	NAME	JOB TITLE

PART 3: INCIDENT INVESTIGATION FINDINGS AND REPORT QUALITY REVIEW

Date Investigation Team Assigned (mm/dd/yyyy):

INVESTIGATION SUMMARY: Determine from list below what behaviors and/or conditions may have contributed to the H&S Lessons Learned Incident. Then, use the "Multiple-Why Technique" for each of these behaviors/conditions; provide a narrative for each that explains how the associated Root Cause(s) was determined. Do not include individuals' names.

ROOT CAUSES: HOW TO REDUCE POSSIBILITY OF INCIDENT RECURRING

Selection of RCs and solutions reflects the analysis of investigation team. It is not meant as a legally binding conclusion as to causal factors and/or solutions.

PERSONAL FACTORS:

A. LACK OF SKILL OR KNOWLEDGE

B. DOING THE JOB ACCORDING TO PROCEDURES OR ACCEPTABLE PRACTICES TAKES MORE TIME OR EFFORT

C. SHORT-CUTTING PROCEDURES OR ACCEPTABLE PRACTICES IS POSITIVELY REINFORCED OR TOLERATED

D. IN PAST, DID NOT FOLLOW PROCEDURES OR ACCEPTABLE PRACTICES AND NO INCIDENT OCCURRED

JOB FACTORS:

E. LACK OF OR INADEQUATE PROCEDURES

F. INADEQUATE COMMUNICATION OF EXPECTATIONS REGARDING PROCEDURES OR ACCEPTABLE STANDARDS

G. INADEQUATE TOOLS OR EQUIPMENT (available, maintained, etc.)

Behavior / Condition	Root Cause	Solution(s) (Must Match Root Cause)	Person Responsible for	Completion Target Date	Completion Actual Date

			Completion		

QUALITY REVIEW Correct root cause(s) identified? Do root cause(s) and solution(s) match? Are solution(s) feasible / maintainable?

Name: **Job Title:**

PART 4: Date Solutions were Implemented & Validated (Were Solutions Effective?)

Date	Solution	Verifier / Validator Name and Job Title	Details (of I & V performed)

JOB TASK - Select the most appropriate one (primary job associated with incident-related work activity, avoid "Other" if possible)

1. Carbon Change
2. Construction
3. Demolition
4. Dewatering
5. Drilling (well install)
6. Excavation / Trenching
7. Gauging
8. Geoprobe / Direct Push
9. Mobil Remediation (includes vacuum event and chemical injection)
10. NAPL Recovery
11. O&M (remediation system)
12. Pavement Cutting
13. Pump Test
14. Sampling
15. Site Visit / Survey
16. Subsurface Clearance
17. System Install
18. System Startup
19. UST Removal (includes exposure and backfill)
20. Waste Management
21. Well Abandonment
22. Other:

EQUIPMENT INVOLVED THAT CONTRIBUTED TO H&S LESSONS LEARNED - Select all that apply

1. Air Stripper
2. API Separator
3. Automobile
4. Boom Material
5. Bulldozer
6. Cable
7. Carbon Drum / Vessel
8. Chain Block
9. Compressor, Air
10. Control Panel (local)
11. Crane (mobile)
12. Drill Rig
13. Drilling Equipment, Vacuum
14. Drum, Vertical
15. Dump Truck
16. Electric Heater
17. Electrical Power Supply
18. Engine, Combustion
19. Equipment Safety Grounding
20. Excavator / Power Shovel
21. Exclusion Zone Equipment
22 Fan / Blower
23 Fencing
24 Filter
25. Fire Extinguisher
26. Forklift
27. Front End Loader
28. Grader
29. Hammer
30. Knife
31. Non-Powered Equipment
32. Powered Equipment
33. Drill
34. Grinder
35. Hydraulic Torque Wrench
36. Powered Saw
37. Impact Wrench
38. Saw
39. Screwdriver
40. Shears
41. Shovel
42. Snip
43. Wrench
44. Hoist
45, Hook/Clamp/Buckle, etc.
46. Jack
47. Ladder, Extension
48. Ladder, Platform
49. Ladder, Step
50. Lock Out / Tag Out
51. Maintenance Tool, General
52. Manifold
53, Manlift/Basket/Cherry Picker
54. Motor, Electric
55. Oxidizer
56. Pallet
57. Piping
58. Piping, Hose
59. Piping, Injection/Mixing Point
60. Hydrojet
61. Centrifugal Pump
62. Diaphragm Pump
63. Reciprocating Pump
64. Regenerative Pump
65. Rotary Pump
66. Transfer Pump
67. Submersible Pump
68. Face Shield
69. Fall Protection
70. Gloves
71. Hard Hat / Helmet
72. Hearing Protection
73. Respiratory PPE (Chemical)
74. Respiratory PPE (Particulate)
75. Safety Glasses
76. Safety Goggles
77. Safety Shoes / Boots
78. Safety Vest / Clothing
79. Rope
80. Bailer
81. Geoprobe
82. Hand Auger
83. PID
84. Multi-Gas Meter
85. Sample Container
86. Split-Spoon Sampler
87. Sling
88. Snow Blower
89. Snow Plow
90. Space Heater
91. Air Sparging System
92. Carbon Treatment System
93. Chemical Oxidation System
94. Dual Phase Product Recovery System
95. Groundwater Pump and Treat System
96. POET System
97. Shed or Trailer
98. Vapor Extraction System
99. Vapor-Phase Treatment System
100. Other System, Type:_____
101. Surge Tank
102. Underground Tank
103. Telemetry System
104. Testing Devices
105. Tractor Trailer
106. Truck, Flatbed
107. Truck, Pickup
108. Truck, Tank Truck
109. Truck, Vacuum
110. Safety Valve
111. Block Valve
112. Extraction Well
113. Monitoring Well
114. Recovery Well
115. Winch
116. Wire Rope
117. No Equipment Involved
118. MPT – Traffic Control Devices
118. Not in List (describe):_____