Prepared for:

LCP SITE STEERING COMMITTEE

Revision 1

HEALTH AND SAFETY PLAN FOR OPERABLE UNIT 2: CELL BUILDING AREA CHARACTERIZATION

LCP CHEMICALS SITE BRUNSWICK, GEORGIA

Prepared by:

EPS

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July 2018

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400 Northridge Road, Suite 400
Sandy Springs, GA 30338
Tel: 404- 315-9113

Kirk Kessler, P.G.
Senior Principal

July 2018

HEALTH AND SAFETY PLAN

Each team member (EPS employees only) must review the Site health and safety plan and sign and date the Acknowledgment Agreement. The signed plan is to be kept in the field for the duration of the project and returned to the project file upon completion on field activities.

Site Health and Safety Plans may be revised, or rewritten for different phases of a project, if Site activities are distinctly different, if areas of differing hazard are involved, or as information about contamination and hazards changes. Changing conditions may justify either increasing or decreasing SHSP restrictions and action levels, depending upon the additional information generated.

Prepared by:	Alex Testoff, P.E. Site Supervisor	7/25/18 Date
Reviewed by:	Sofie Weber-Snapp Site Health and Safety Officer	7/25/18 Date
Approved by:	Kirk Kessler, P.G. Project Manager/Principal-In-Charge	7/25/18 Date

Brief Description of Amendment	**Amendment Date**
Updated emergency contact information (Appendix B)	4/22/2021
Updated Site Personnel (Section 2)	4/22/2021

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ACKNOWLEDGEMENT AGREEMENT

I acknowledge that I have read and understood the contents of the Site Health and Safety Plan and I agree to abide by all provisions as set forth. Only EPS employees should sign.

Signature	Date

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HEALTH AND SAFETY PLAN

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1 INTRODUCTION

1.1 Terms of Reference

This Site Health and Safety Plan ("SHSP") was prepared for the LCP Site Steering Committee.

1.2 Scope and Applicability

The SHSP describes the measures that will be taken to ensure the protection of Site workers during the work associated with the Operable Unit 2 ("OU2") characterization work at the former LCP Chemicals ("LCP") plant in Brunswick, Georgia ("Site"), and was prepared in coordination with the Site Characterization Work Plan ("Work Plan") and Field Sampling Plan ("Sampling Plan") for this action. The SHSP defines requirements and designates protocols for protecting personnel that will be performing the work by controlling the risk to health and safety during Site work activities. The SHSP complies with applicable Occupational Safety and Health Administration ("OSHA") regulations and with hazardous waste operations and emergency response ("HAZWOPER") requirements as specified in Title 29 Code of Federal Regulations, Part 1910 (29 CFR 1910).

1.3 Organization of the SHSP

The remainder of this SHSP is organized as described below:

- Section 2 lists the key personnel who will manage and conduct the work at the Site and identifies the personnel responsible for directing and administering the health and safety program.
- Section 3 describes the Site, its history, and scope of work to be performed.
- Section 4 presents the hazard assessment and analysis of the health and safety risks of the variety of tasks and operations to be performed.
- Section 5 describes the training requirements for on-Site personnel.
- Section 6 describes the medical surveillance requirements for on-Site personnel.
- Section 7 defines the level of protection and types of personal protective equipment ("PPE") for the various tasks and operations.
- Section 8 discusses the frequency and types of air monitoring that will be performed during activities at the Site.
- Section 9 describes Site control measures, including communications and definition of work zones.
- Section 10 includes the Site health and safety standard operating procedures ("SOPs"), including the availability of nearest medical assistance, and safe working practices.

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- Section 11 describes the decontamination plan including definition of levels of decontamination for personal protection, equipment decontamination, and decontamination waste disposal.
- Section 12 discusses procedures for managing investigative derived waste ("IDW") generated during the work.

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2 SITE PERSONNEL AND RESPONSIBILITIES

2.1 Overview

Section 2 describes the title and responsibilities of key health and safety project personnel. These personnel include project managers, Site supervisors, subcontractors, and the Site health and safety officer. Contact information for Site personnel is provided in Appendix B.

2.2 Project Manager/Principal-In-Charge: Kirk Kessler, P.G.

Mr. Kirk Kessler, P.G., Senior Principal with EPS in Atlanta, GA, will serve as the Project Manager ("PM") and Principal-in-charge. The PM has responsibility and authority to direct all work operations. The PM coordinates health and safety functions with the Site Health and Safety Officer ("SHSO"), has the authority to oversee and monitor the performance of the SHSO, and bears ultimate responsibility for the proper implementation of this SHSP. The specific duties of the PM are: (i) preparing and coordinating the Site work plan, (ii) providing Site supervisor(s) with work assignments and overseeing their performance, (iii) coordinating safety and health efforts with the SHSO, and (iv) serving as primary Site liaison with public agencies and officials and Site contractors.

2.3 Site Supervisor: Joe Terry

Mr. Joe Terry, Project Engineer with EPS, will serve as the Site Supervisor. The Site Supervisor is responsible for field operations and reports to the PM and SHSO. The Site Supervisor ensures the implementation of the SHSP requirements and procedures in the field and is responsible for decontamination procedures. The specific responsibilities of the Site Supervisor are: (i) executing the work plan and schedule as detailed by the PM, (ii) coordinating with the SHSO on safety and health, (iii) ensuring Site work compliance with the requirements of the SHSP, (iv) setting up work zones (Section 8.2 of the SHSP), (v) procuring the necessary PPE (Section 7 of the SHSP), (vi) setting up decontamination stations appropriate for the type of chemical contamination on Site, (vii) controlling the decontamination of all equipment, personnel and samples from the contaminated areas, (viii) assisting in disposal of contaminated clothing and materials, (ix) ensuring all required equipment is available and in working order, and (x) providing for collection, storage and disposal of waste.

2.4 Site Health and Safety Officer: Alex Testoff. P.E.

Alex Testoff, Environmental Engineer with EPS, will serve as the SHSO. The SHSO has full responsibility and authority to develop and implement this SHSP and to verify compliance. The

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SHSO reports to the PM and will provide daily health and safety updates to the PM. The SHSO is on Site or readily accessible to the Site during all work operations and has the authority to halt Site work if unsafe conditions are detected. The specific responsibilities of the SHSO are: (i) managing the safety and health functions on the Site, (ii) serving as the Site's point of contact for safety and health matters, (iii) ensuring Site monitoring, worker training, and effective selection and use of PPE, (iv) assessing the Site for unsafe acts and conditions and providing corrective action, (v) assisting in the preparation and review of the SHSP, (vi) maintaining effective safety training and medical monitoring records as described in Sections 5 and 6, respectively, of the SHSP, (vii) maintaining calibration logs for all health and safety monitoring equipment (Section 8), (viii) holding daily safety tailgate meetings (Section 5.4), and (ix) coordinating with the Site Supervisor, and others as necessary for safety and health efforts.

2.5 Subcontractors

All subcontractors will be provided with a copy of this SHSP to review and are required to comply with all applicable Federal, state, and local laws, standards, and regulations. Subcontractors are required to provide their own health and safety plan for work at the Site, or can adopt the EPS SHSP. The subcontractor SHSP must be at least as stringent as this SHSP and must be approved by the SHSO before the subcontractor may work on-Site.

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3 SITE DESCRIPTION, BACKGROUND, AND SCOPE OF WORK

3.1 Overview

This section of the SHSP provides a physical and historical overview of the work Site and provides an outline of the scope of work that will be performed during the investigation.

3.2 Location and Surroundings

The Site property occupies approximately 813 acres immediately northwest of the City of Brunswick, Glynn County, Georgia (Figure 3-1). Tidal marshland comprises about 670+ acres of the property. The primary upland site, where manufacturing operations at the LCP site occurred, is located on 133.5 acres of upland area, east of the marsh and bordered by a county land disposal facility and a pistol firing range on the north, Ross Road on the east, the Turtle River and associated marshes to the west, and Brunswick Cellulose to the south. The Arco refinery also utilized land to the east of Ross Road for product storage in four above ground storage tanks.

3.3 Site Background

Arco operated the Site as a petroleum refinery from 1919 to the early 1930s. At one time, over 100 process and storage tanks were present on Site. The refinery was fueled by coal until 1922, after which oil was used as fuel. The refinery ceased operations by 1935. Concrete tank supports and numerous buildings from this time period remain at the Site. Much of the steel was salvaged for scrap in World War II or moved to other locations (GAEPD, 1990).

Georgia Power purchased portions of the Site in 1937, 1942, and 1950. These purchases included two parcels of land and two 750 kilowatt ("kW") electric generators from Arco. Georgia Power subsequently added an additional 4.0 megawatts of electric generation capacity at the Site. Thus, power generation capacity increased at the Site from 1500 kW in 1937 to 5500 kW by 1941. Bunker C oil was used as the fuel source for the power plant (GAEPD, 1990).

The Dixie Paint and Varnish Company operated a paint and varnish manufacturing facility at the Site from 1941 to 1955 on a portion of the Site property south of the Georgia Power parcel. The Dixie Paint and Varnish Company became the Dixie O'Brien Corporation and eventually a wholly owned subsidiary of the O'Brien Corporation (GAEPD, 1990).

In 1955, after acquiring almost all the land constituting what is now known to be the Site, Allied Chemical and Dye Corporation established and operated a chlor-alkali facility at the Site, principally for the production of chlorine gas, hydrogen gas, and caustic solution. The plant operated using the mercury cell process, which involves passing a concentrated brine solution between stationary graphite or metal anode and a flowing mercury cathode to produce chlorine

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gas, sodium hydroxide (caustic) solution, and hydrogen gas, as a by-product. Sodium hypochlorite (bleach) was also produced in a secondary reaction. Linden Chemicals and Plastics ("LCP") purchased the facility in 1979 and continued the chlor-alkali manufacturing operations until 1994 when the facility ceased all operations

3.4 Work Areas and Field Support Areas

The general work scope involves intrusive investigation of the subsurface conditions beneath the former mercury cell building area ("CBA") and groundwater sampling in a portion of the Site monitoring well network within and downgradient of the CBA, as shown on Figure 3-1. Work hazards differ for these two work scope elements as described in further detail in Section 4, whereby the intrusive work in the CBA mandates a higher level of vapor monitoring and PPE compared to the well sampling.

Field support areas include a large, air-conditioned sampling support building and a separate Administrative Building in the front of the property.

3.5 Scope of Work

This SHSP addresses health and safety issues associated with the following field tasks:

- *Site Mobilization and Demobilization*. Equipment will be mobilized to the Site throughout Site characterization activities and demobilized after work activities are complete.
- *Separation of Exclusion, Contamination Reduction, and Support Zones.* A system for delineation of these three work zones will be installed and executed under the direction of the Site Supervisor.
- *Site Preparation Work*. Site preparation work will be completed in the CBA in advance of drilling activities. Drilling locations will be cleared of the soil and possibly block rubble overburden to expose the underlying concrete slab(s), and concrete will be cored.
- *Soil Sampling*. Deep borings will be completed in the CBA and soil samples will be collected from of each boring per the Work Plan.
- *Monitoring Well Installation*. Four monitoring wells will be installed in the CBA in accordance with the Work Plan.
- *Groundwater Sampling*. Groundwater monitoring from monitoring wells and vertical profiling direct-push groundwater sampling in the CBA will be performed per the Work Plan.
- *Personnel and Equipment Decontamination*. All personnel, equipment, and debris that comes into contact with contaminated materials will be decontaminated according to procedures outlined in Section 11 of the SHSP.
- *Handling and Disposal of Investigation Derived Waste ("IDW")*. IDW soil and water will be generated during the investigation (Section 12).

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4 HAZARD ASSESSMENT

4.1 Overview

The hazard assessment presents information on the potential chemical, physical, and biological hazards associated with the tasks that will be performed. The chemicals of concern and exposure information are presented in Section 4.2. A task-by-task hazard analysis is presented in Section 4.3. Methods of control for these hazards are discussed in Section 4.4.

4.2 Chemicals of Concern

4.2.1 Overview

The chemical constituents detected in soil beneath the CBA and in Site-wide groundwater are presented in Table 4-1A and 4-1B, respectively. Table 4-1A lists the maximum concentration of each chemical constituent detected in soil beneath the CBA since the first soil sampling event conducted by the EPA in 1994. Table 4-1B lists the maximum concentration of each chemical constituent detected in Site-wide groundwater during the September 2017 comprehensive Site-wide groundwater sampling event. The following chemical categories are represented in Tables 4-1A and 4-1B: (i) volatile organic compounds ("VOCs"), (ii) polycyclic aromatic hydrocarbons ("PAHs"), (iii) heavy metals, and (iv) polychlorinated biphenyls ("PCBs").

4.2.2 VOCs

VOCs are organic chemicals that have a high vapor pressure at ordinary room temperature and can be emitted as gases from contaminated soil or groundwater. The predominant route of exposure to VOCs is via inhalation. Health effects associated with exposure to specific VOCs are listed in Table 4-2A.

4.2.3 PAHs

PAHs are produced during the combustion of organics and commonly occur at industrial Sites. The primary routes of exposure to PAHs are direct contact and inhalation. Health effects associated with exposure to specific PAHs are listed in Table 4-2B.

4.2.4 Heavy Metals

Sources of heavy metals include reactants/products of the former manufacturing operations (*e.g.*, mercury from chlor-alkali process) and mobilization of naturally occurring metals (where caustic releases have impacted the groundwater (*e.g.*, chromium). The primary routes of exposure to heavy metals include direct contact (*i.e.*, absorbed through the skin), and in the case of elemental mercury, inhalation. Health effects resulting from exposure to specific metals are presented in Table 4-2C.

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4.2.5 PCBs

Aroclor is the common trade name for commercially produced PCBs. Aroclors 1254, 1260, and 1268 have been detected in soils within the CBA. The primary route of exposure to PCBs is via direct contact. Health effects associated with exposure to PCBs are listed in Table 4-2D.

4.2.6 Chemical and Physical Properties

Chemical and physical properties of chemical constituents detected in soil beneath the CBA and in Site-wide groundwater are presented in Table 4-3A through Table 4-3D, including flash point, upper and lower explosive limit, ionization potential, and specific gravity. This information will be used to assist in performing the task by task hazard analysis in Section 4.3.

4.2.7 Exposure Limits

Occupational exposure limits, including OSHA's Permissible Exposure Limits ("PELs"), the American Conference of Governmental Industrial Hygienists' ("ACGIH") Threshold Limit Values ("TLVs"), the National Institute for Occupational Safety and Health's ("NIOSH") Recommended Exposure Limits ("RELs"), and immediately dangerous to life and health ("IDLH") concentrations are presented in Table 4-4. This information will be utilized in the task by task hazard analysis in Section 4.3.

4.3 Task By Task Hazard Analysis and Mitigative Controls

4.3.1 Overview

A health and safety risk analysis has been performed for each task anticipated under the Work Plan. Each task has been evaluated for potential chemical, physical, and biological hazards. This analysis is provided in matrix form in Table 4-5. A discussion of the hazards listed in Table 4-5 and appropriate mitigative controls is included in Appendix A.

4.3.2 Site Mobilization/Demobilization

Heavy equipment will be transported to/from and operated around the Site. Large trucks will be used to off load equipment and skid steers and forklifts are commonly used to move supplies. Injury from this equipment can be minimized by ensuring that all personnel in the vicinity are aware and alert to activities of the machinery and using the proper PPE (see Section 7).

4.3.3 Separation of Work Zones

Site control will be established and maintained by the use of work zones, as described in Section 9 of the SHSP. The Site Supervisor will establish work zones prior to beginning work at the Site.

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4.3.4 CBA Site Preparation Work

Site preparation work will be completed in the CBA according to the Sampling Plan. This task requires the use of a small excavator to clear the soil overburden and power tools to core through the underlying concrete slab layer(s). Injury from this equipment can be minimized by ensuring that all personnel in the vicinity are aware and alert to activities of the machinery.

4.3.5 Soil Sampling

Soil sampling will be performed according to the Sampling Plan. This task requires the use of large drilling equipment to retrieve a soil core and requires workers to handle contaminated soil. It is the responsibility of the drilling equipment operator to ensure that equipment is used for the purpose for which it is intended, and that tolerances and limitations of the equipment not be exceeded. Site workers must respect work zones and use PPE according to Section 7 of this SHSP to minimize the potential for exposure to chemicals.

4.3.6 Monitoring Well Installation

Monitoring wells will be installed according to the Sampling Plan. This task requires the use of large drilling equipment and potentially exposes workers to contaminants. Site workers must respect work zones and abide by the PPE guidelines established in Section 7 of this SHSP to minimize the potential for exposure to chemicals.

4.3.7 Groundwater Sampling

Groundwater sampling will be conducted according to the Sampling Plan. This task requires workers to handle contaminated groundwater and may expose workers to chemicals. Site workers will use PPE according to Section 7 of this SHSP to minimize the potential for exposure to chemicals.

4.3.8 Personnel and Equipment Decontamination

Section 11 of this SHSP discusses the procedures for decontamination of personnel and equipment. Site workers may be exposed to chemicals during the decontamination process. Care must be taken to minimize potential exposure by following the procedures in Section 11.

4.3.9 Handling and Disposal of IDW

IDW will be managed according to Section 12 of this SHSP. This task requires workers handle contaminated soil, debris, and water and requires the use of PPE to minimize the potential for worker exposure to chemicals. The vessels (i.e., drums, tanks, etc.) used to containerize the IDW are heavy when full, and should always be moved with proper machinery.

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5 TRAINING REQUIREMENTS

5.1 Overview

This section provides an overview of the health and safety training required for each person working on-Site.

5.2 OSHA Training

All personnel who engage in field work must have completed 40 hours of OSHA health and safety training for HAZWOPER, as required under 29 CFR 1910.120(e). This is a one-time training requirement. Personnel must also complete an 8-hour refresher training each calendar year.

5.3 Site Supervisor Training

The Site Supervisor will have completed a one-time 8 hour OSHA Supervisor training.

5.4 Training and Briefing Topics

Prior to engaging in field work, Site workers will read this SHSP and acknowledge that he/she understands SHSP (EPS personnel will sign the acknowledgment agreement at the beginning of this SHSP). Site workers must also present the appropriate training, medical monitoring, and respirator fit test certificates. Each morning before work begins, the SHSO or designee will hold a tailgate safety briefing to reinforce relevant health and safety issues discussed in the SHSP and procedures used to mitigate the hazards. Site workers will sign a form to acknowledge that he/she understands the topics discussed during the tailgate safety briefing. The tailgate meeting forms will be maintained on-Site by the SHSO or designee.

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6 MEDICAL MONITORING

All personnel engaged in the work at the Site will be required to participate in a medical monitoring program that meets the minimum requirements of 29 CFR 1910.120(f). Certificates or letters (or copies thereof) documenting that each person is in a medical monitoring program and that each person is medically fit to work on hazardous waste Sites will be maintained on Site by the SHSO. Medical monitoring must include a spirometry test to ensure proper lung function for respirator use. If any Site worker is believed to have been overexposed to a hazardous substance (regardless if he/she has developed signs or symptoms related to the possible exposure), the SHSO will be notified immediately and the Site worker will be required to undergo a periodic exam to monitor his/her condition.

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7 PERSONAL PROTECTIVE EQUIPMENT

7.1 Overview

Section 7 describes the various levels of PPE required to execute the Work Plan. All equipment for each level of protection is mandatory.

7.2 Levels of Protection

7.2.1 Level C

Level C protection will be utilized by personnel during intrusive investigative work in the CBA. Level C protection includes full-face air purifying respirators ("APRs") with appropriate cartridges (Section 7.3), disposable coveralls (Saranex™ or Barricade™ for elemental mercury) with all joints taped, outer chemical-resistant gloves (neoprene), inner chemical resistant gloves (nitrile or equivalent), steel-toed boots, safety vest, boot covers, and hearing protection. Personnel will begin work with Level C protection with the ability to downgrade to Level D PPE (described in Section 7.2.2) based on air monitoring. Level D PPE is appropriate when mercury levels do not exceed 0.025 mg/m^3 and volatile organic levels do not exceed 10 ppm. Continuous air monitoring will be performed in the breathing space of the Site workers for mercury and volatile organic compounds according to Section 8 of this SHSP.

7.2.2 Level D

Level D protection is the minimum protection required and will be used at all times on-Site. Level D equipment includes chemical-resistant gloves, safety glasses, safety vest, hard hat, protective clothing (*i.e.*, long sleeves and jeans), and hearing protection.

7.3 Respirator Cartridge Selection

Full face APRs will be utilized when working in the exclusion zone during the characterization of the CBA due to the potential for exposure to mercury and organic vapors. Given that no cartridge exists that will provide protection from both mercury and organic vapors and that the cartridges are not stackable, cartridges will be selected based on air monitoring results. It is anticipated that airborne concentrations of mercury will exceed that of organic chemicals (based on the presence of elemental mercury in soils beneath the CBA). Thus, personnel will begin work using mercury cartridges and the exclusion zone will be ventilated with industrial fans to minimize potential exposure to organic vapors. Cartridges for protection against organic vapors will be used when airborne concentrations of volatile organic levels exceed 10 ppm and mercury do not exceed 0.025 mg/m^3. If airborne concentrations of both mercury and organics exceed the levels specified in 7.2.1, then the exclusion zone will be evacuated until levels fall below the thresholds.

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7.4 Air-Purifying Respirator Cartridge Change-Out

Field personnel must be aware of the limitations of APRs, particularly the service life of the cartridges. Table 7-1 posts the estimated service life of a standard organic vapor cartridge under different working conditions. Service life estimates were calculated using MultiVapor™ Version 2.2.4 software published by the National Institute for Occupational Safety and Health ("NIOSH"). The assessment conservatively estimates service life based on exposure to a toxic atmosphere containing exclusively benzene (10 ppm OSHA PEL). The estimated service life for cartridges for protection against mercury vapors toxic atmospheres is approximately 500 to 690 minutes.[1] EPS personnel will conservatively change-out mercury cartridges every 450 minutes. At minimum, all cartridges will be changed once daily under moderate physical working rates and every 4 hours under more rigorous working conditions. Cartridges will be changed immediately if breakthrough, a chemical warning, or cartridge end-of-service-life indicator activation (if applicable) occurs.

7.5 Work Break Requirements

All personnel should take work breaks according to the schedules below to minimize the potential for heat stress. The SHSO will collect ear temperature measurements during each work break to monitor the potential for heat-induced illnesses in Site workers and determine whether breaks should occur at a higher frequency.

[1] Results from NIOSH certification testing for the Mine Safety Appliance Company mercury vapor protection cartridges indicate no breakthrough (0.05 mg mg/m^3) after a period of 500 to 690 minutes when the cartridges were tested at a mercury vapor concentration of 21.5 mg/m^3 (210 times the OSHA permissible exposure limit for mercury of 0.1 mg/m^3). The actual service life would be much longer at lower atmospheric concentrations. (Mallinger, Stephen J. *Use of Chemical Cartridge Respirators for Protection Against Mercury Vapor*. Retrieved from: https://www.osha.gov/laws-regs/standardinterpretations/1985-11-15)

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Adjusted temperature (°F)[1]	Light work (minutes work/rest)	Moderate work (minutes work/rest)	Heavy work (minutes work/rest)
90	Normal	Normal	Normal
91	Normal	Normal	Normal
92	Normal	Normal	Normal
93	Normal	Normal	Normal
94	Normal	Normal	Normal
95	Normal	Normal	45/15
96	Normal	Normal	45/15
97	Normal	Normal	40/20
98	Normal	Normal	35/25
99	Normal	Normal	35/25
100	Normal	45/15	30/30
101	Normal	40/20	30/30
102	Normal	35/25	25/35
103	Normal	30/30	20/40
104	Normal	30/30	20/40
105	Normal	25/35	15/45
106	45/15	20/40	Caution[4]
107	40/20	15/45	Caution[4]
108	35/25	Caution[3]	Caution[4]
109	30/30	Caution[3]	Caution[4]
110	15/45	Caution[4]	Caution[4]
111	Caution[3]	Caution[3]	Caution[4]
112	Caution[3]	Caution[3]	Caution[4]

[1]With the assumption that workers are physically fit, well-rested, fully hydrated, under age 40, and have adequate water intake and that there is 30% RH and natural ventilation with perceptible air movement.

[2]Note: Adjust the temperature reading as follows before going to the temperature column in the table:
Full sun (no clouds): Add 13°
Partly cloudy/overcast: Add 7°
No shadows visible/work is in the shade or at night: no adjustment
Per relative humidity:
10%: Subtract 8°
20%: Subtract 4°
30%: No adjustment
40%: Add 3°
50%: Add 6°
60%: Add 9°

[3]High levels of heat stress; consider rescheduling activities.

Adapted from EPA [1993].

Work/rest schedules for workers wearing normal work clothing (Table 6-2. from *Criteria for a Recommended Standard: Occupational Exposure to Heath and Hot Environments* (NIOSH, 2016))

	Light work			Moderate work			Heavy work		
Air Temp (°F)	Full sun	Partly cloudy	No sun[1]	Full sun	Partly cloudy	No sun[1]	Full sun	Partly cloudy	No sun[1]
75	Normal	Normal	Normal	Normal	Normal	Normal	35/25[2]	Normal	Normal
80	30/30	Normal	Normal	20/40	Normal	Normal	10/50	40/20	Normal
85	15/45	40/20	Normal	10/50	25/35	Normal	Caution[4]	15/45	40/20
90	Caution[3]	15/45	40/20	Caution[4]	Caution[4]	25/35	Stop work	Caution[3]	15/45
95	Stop work	Stop work	15/45	Stop work	Stop work	Stop work	Stop work	Stop work	Stop work

[1]With the assumption that workers are heat-acclimatized, under the age of 40, physically fit, well-rested, fully hydrated, and wearing Tyvek coveralls, gloves, boots, and a respirator. Cooling vests may enable workers to work for longer periods. Adjustments must be made when additional protective gear is worn.

[2]No shadows are visible or work is in the shade or at night.

[3]35 minutes work and 25 minutes rest each hour.

[4]High levels of heat stress; consider rescheduling activities.

Adapted from EPA [1993].

Work/rest schedules for workers wearing chemical resistant clothing (Table 6-3 from *Criteria for a Recommended Standard: Occupational Exposure to Heath and Hot Environments* (NIOSH, 2016)).

7.6 PPE Inspection

The Site Supervisor will routinely inspect PPE and monitoring equipment to ensure that it is in good operating condition and evaluate any concerns regarding the condition. Monitoring equipment will be tested and calibrated daily. All calibration records will be kept on-Site and maintained by the Site Supervisor.

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8 AIR MONITORING

8.1 Overview

Continuous air monitoring will be performed in the breathing space of the Site workers for mercury and volatile organic compounds when working in the CBA. Air monitoring data will be used to evaluate immediate hazardous situations and determine the level of PPE required.

8.2 Mercury Vapor Monitoring

Mercury vapors will be monitored using a Jerome Gold Film Mercury Vapor Analyzer ("MVA") or equivalent. This technology quantifies the mass of mercury from a known volume of air as a change in electrical resistance across a thin gold foil. The change in electrical resistance is directly proportional to mercury accumulation on the gold foil. The gold foil must be regenerated as it approaches saturation. The regeneration feature bakes the foil at an increased temperature and the mercury deposits are vaporized and gathered in the scrubber. The MVA will be regenerated at the frequency recommended by the manufacturer. Instruction for the MVA will be maintained on Site by the Site Supervisor. The Site Supervisor must also ensure that all personnel who are required to operate the MVA are properly trained according to the procedures in the equipment instructions.

8.3 Organic Vapor Monitoring

8.3.1 Photoionization Detector

Organic vapors will primarily be monitored using a photoionization detector ("PID"). The PID quantifies airborne concentrations of organic vapors by bombarding the compounds with high-energy UV photons and measuring the electrical current generated from the formation of positively charged ions during the reaction. The electrical current generated by the reaction is directly proportional to the concentration of the organic compounds in the air stream. The PID will be calibrated each morning prior to use with isobutylene calibration gas. Instruction for the PID will be maintained on Site by the Site Supervisor. The Site Supervisor must also ensure that all personnel who are required to operate the PID are properly trained according to the procedures in the equipment instructions.

8.3.2 Draeger Air Sampling System

A Draeger chemical-specific air sampling system will be used to monitor airborne concentrations of benzene, toluene, ethyl benzene, and xylene[2] if PID detects VOC emissions. The system consists of glass vials filled with a chemical reagent that reacts to a specific chemical. An air sample is drawn through the vial with a pump and the reagent in the vial changes color if the target chemical

[2] Selected based on 2017 groundwater monitoring data in the CBA.

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is present. The length of the color change typically indicates the measured concentration. The vials are designed for one-time use; however, the pump will be calibrated prior to use to ensure a repeatable quantity of air sample is tested. Instruction for the Draeger air sampling system will be maintained on Site by the Site Supervisor.

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9 WORK ZONES

9.1 Overview

In order to effectively contain hazardous materials within the work Site, the Site Supervisor will establish work zones with specific policies to control entry into the work Site and allow decontamination of all personnel and equipment leaving the work Site. The work zones consist of the exclusion zone, the contamination reduction zone ("CRZ"), and the support zone. The location and extent of these zones will be determined in the field by the Site Supervisor.

9.1.1 Exclusion Zone

The exclusion zone is the area with actual or potential contamination and the highest potential for exposure to hazardous substances. The exclusion zone will include the active work area and a buffering zone sufficiently large to allow personnel and equipment to operate effectively and will be designated with red plastic tape.

Entry into the exclusion zone will be regulated by the SHSO and Site Supervisor. The SHSO and Site Supervisor will limit the number of workers in the exclusion zone to minimize the potential for worker exposure to chemical, physical and biological hazards. To work in the exclusion zone, Site workers must meet the training and medical requirements established in Section 5 and 6, respectively, and utilize the appropriate level of PPE established in Section 7.

9.1.2 Contamination Reduction Zone

The contamination reduction zone (or warm zone) is the transition area between the exclusion and support zones. This area is where workers enter and exit the exclusion zone and where decontamination activities take place (Section 11). The CRZ will be designated with yellow plastic tape. Entry into the CRZ is limited to personnel who are: (i) authorized to enter the exclusion zone, and (ii) assisting in decontamination activities.

9.1.3 Support Zone

The support zone is the area of the Site with minimal or zero potential for exposure to hazardous substances and that may be safely used as a planning, staging and/or equipment storage area. The support zone will be used for rest breaks and by personnel who wish to observe the work but do not meet the requirements for entering the exclusion zone.

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10 Site Health and Safety SOPs

10.1 Overview

This section discusses the standard safety guidelines to follow during all anticipated work tasks.

10.2 Buddy System

When participating in work activities at the Site, workers will use the buddy system. Each worker will be observed by one or more other workers for signs of chemical or heat exposure and provide assistance, as necessary. Workers utilizing the buddy system are also responsible for periodically inspecting the integrity of the buddy's PPE. To fulfill these duties, buddies should stay close together and must maintain visual contact.

10.3 Medical Assistance

The Site Supervisor will prepare for medical emergencies before beginning work on the Site by ensuring that there is an adequately supplied first-aid kit and fully operational fire extinguisher available, and ensuring that all personnel are adequately trained.

The Site Supervisor will inform Site workers of the nearest medical facility and maintain directions to this facility on-Site. The nearest hospital to the Site is the Southeast Georgia Regional Medical Center at 2415 Parkwood Drive, Brunswick, Georgia. This hospital is located approximately 2 miles from the Site at the intersection of Parkwood and Kemble streets. Below are directions from the Site to the Southeast Georgia Regional Medical Center:

- Take Ross Road south to 4th Street.
- Turn left on 4th and continue to Kemble Street.
- Turn right on Kemble and hospital is 3 blocks on the left.

Figure 10-1 shows the route to the hospital.

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11 DECONTAMINATION PLAN

11.1 Overview

Decontamination of personnel and equipment will take place during work performed in the CBA to prevent the spread of contamination beyond the CRZ. Decontamination areas are shown on Figure 11-1. The personnel and equipment areas for decontamination will be designated by green vinyl warning tape. This section of the SHSP presents the decontamination procedures to be used throughout the duration of the work.

11.2 Personnel Decontamination

All personnel working in the exclusion zone will be decontaminated. The decontamination process will be organized in the CRZ and will include tap water for washing, wash and rinse buckets, scrub brushes, kiddie pools to contain decontamination fluids, an area to stage decontaminated PPE, paper towels, and waste containers for disposable items. Personnel decontamination will consist of the following procedures:

1. Enter the decontamination area.
2. Wash boot covers and outer gloves with phosphate-free detergent (*i.e*, Alconox) and tap water.
3. Rinse and remove the outer gloves.
4. Remove disposable coveralls and guide the coveralls down to the boot cover. This may require assistance from a buddy.
5. Slide off the boot covers and coveralls and dispose.
6. Wash and rinse inner gloves.
7. Remove eye and/or respiratory protection.
8. Wash respirators in disinfectant solution and allow to air dry. Dispose of expired cartridges.
9. Remove inner gloves.
10. Wash face, hands, and other exposed body areas with tap water and soap.
11. Wash hard hat.

All contaminated, disposable PPE will be soaked in tap water and detergent, air-dried, and properly bagged for disposal as regular solid waste. All personnel will be instructed to wash hands, face, neck, and forearms when taking a work break that includes eating or drinking, and at the end of the work shift. All personnel will also be instructed to shower at the end of the workday.

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11.3 Equipment Decontamination

All equipment will be decontaminated when it is removed from the exclusion zone. Decontamination of equipment will take place in the CRZ at the decontamination pad. The decontamination pad will consist of an inflatable containment berm (as illustrated below) or equivalent system to contain decontamination fluids..

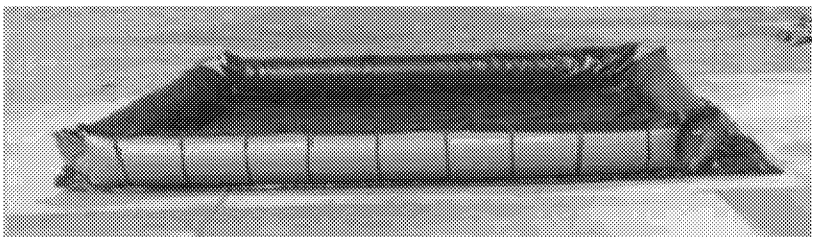

Illustration of the Fol-Da-Dam Model Type E from Eldred Environmental & Export Company, Ltd.

Larger equipment (i.e., drill rigs and supporting machinery) will be decontaminated first by tap water, low pressure rinse combined with brush scrubbing. If necessary, this will be followed by a high-pressure rinse. Monitoring equipment will generally be washed with water and detergent.

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12 IDW MANAGEMENT

12.1 Overview

Generation of the following IDW is anticipated: (i) soil cuttings, (ii) debris (*i.e.*, concrete, stone, demolition debris, etc.), and wastewater (i.e., purge water and decontamination fluids). These waste streams will be segregated and containerized at the point of generation according to the packaging requirements of the Department of Transportation ("DOT") and will be shipped off-Site for disposal.

12.2 Soil Cuttings

All soil cuttings will be containerized in 55-gallon steel drums at the point of generation. Composite sample(s) will be collected to generate a waste profile for the soil cutting. Soil cores containing visible quantities of elemental mercury will be assumed hazardous for mercury and segregated from the remaining soil IDW.

12.3 Debris

Debris will be containerized in 55-gallon steel drums at the point of generation. The soil analytical results collected during the characterization work will be used to generate a waste profile for the debris. Debris containing visible quantities of elemental mercury will be assumed hazardous for mercury and segregated from the remaining IDW (including soil cuttings containing elemental mercury).

12.4 Wastewater

All decontamination fluids will be transferred from the decontamination pad into an appropriate container (*i.e*, totes or drum) for off-Site disposal and a sample will be collected to generate a waste profile for the fluids. Purge water with pH greater than 9 generated during Site-wide groundwater monitoring will be containerized for off-Site disposal. Purge water with pH less than 9 will be poured onto the ground surface and allowed to infiltrate the soil.

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TABLES

Table 4-1A. Chemical Constituents Detected in Soil Beneath the CBA

Parameter	Max Result (ppm)
VOCs	
Acetone	0.35
PAHs	
2,4,5-Trichlorophenol	0.06
Anthracene	18.3
Benzo(a)anthracene	37.0
Benzo(a)pyrene	42.6
Benzo(b)fluoranthene	43.5
Benzo(b/k)fluoranthene	1.3
Benzo(g,h,i)perylene	35.2
Benzo(k)fluoranthene	49.6
Chrysene	53.9
Decahydropentamethylnaphthalene	8.0
Dimethylnaphthalene (unspecified)	0.40
Fluoranthene	73.9
Indeno(1,2,3-cd)pyrene	26.5
Isopropylbenzene	0.01
Naphthalene	47.8
Phenanthrene	60.9
Pyrene	60.4
Trimethylnaphthalene (unspecified)	0.20
PCBs	
Aroclor-1254	348
Aroclor-1260	1.3
Aroclor-1268	478
Metals	
Aluminum	130,000
Arsenic	3.1
Barium	1,870
Calcium	217,000
Chromium	261
Cobalt	174
Copper	696
Iron	261,000
Lead	3,040
Magnesium	30,400
Manganese	2,780
Mercury	70,100
Nickel	261
Potassium	5,650
Silver	87.0
Sodium	26,100
Strontium	250
Titanium	63.0
Vanadium	435
Zinc	3,000
Other	
Total Petroleum Hydrocarbon (TPH)	5,230

Table 4-1B. Chemical Constituents Detected in Site-Wide Groundwater (2017)

Parameter	Max Result (ppb)
VOCs	
1,1-Dichloroethane	4.6
1,1-Dichloroethene	4.8
1,1-Dichloropropene	0.70
1,2,3-Trichloropropane	1.2
1,2,4-Trichlorobenzene	58.0
1,2,4-Trimethylbenzene	570
1,2-Dibromoethane	0.11
1,2-Dichlorobenzene	730
1,2-Dichloroethane	0.10
1,2-Dichloropropane	0.80
1,3,5-Trimethylbenzene	160
1,3-Dichlorobenzene	220
1,4-Dichlorobenzene	200
2,2-Dichloropropane	0.08
2-Butanone (MEK)	4,000
2-Chlorotoluene	55.0
2-Hexanone	15.0
4-Chlorotoluene	0.54
Acetone	8,300
Benzene	54.0
Bromodichloromethane	0.44
Carbon disulfide	5.2
Chlorobenzene	1,100
Chloroethane	14.0
Chloroform	1.4
Chloromethane	5.3
cis-1,2-Dichloroethene	15.0
Dichloromethane (Methylene chloride)	30
Ethyl benzene	680
Isopropylbenzene	56.0
m&p-Xylene	1,700
n-Butylbenzene	21.0
n-Propylbenzene	90.0
o-Xylene	170
p-Isopropyltoluene	19.0
sec-Butylbenzene	29
tert-Butylbenzene	22.0
Tetrachloroethene	0.65
Toluene	430
trans-1,2-Dichloroethene	6.8
Trichloroethene	13
Vinyl chloride	2.7
PAHs	
1-Methyl Naphthalene	180
2-Methylnaphthalene	230
Acenaphthene	8.7
Acenaphthylene	1.4
Anthracene	1.4
Benzo(a)anthracene	1.7
Benzo(a)pyrene	1.3

Table 4-1B. Chemical Constituents Detected in Site-Wide Groundwater (2017)

Parameter	Max Result (ppb)
PAHs (cont.)	
Benzo(b)fluoranthene	0.99
Benzo(g,h,i)perylene	0.73
Benzo(k)fluoranthene	0.26
Chrysene	2.3
Dibenzo(a,h)anthracene	0.57
Dibenzofuran	3.0
Fluoranthene	1.0
Fluorene	5.3
Indeno(1,2,3-cd)pyrene	0.61
Naphthalene	420
Phenanthrene	7.4
Pyrene	5.4
Metal	
Aluminum	172,000
Antimony	4.1
Arsenic	336
Barium	2,950
Beryllium	67.4
Cadmium	2.4
Calcium	2,160,000
Chromium	1,090
Cobalt	12.1
Copper	210
Iron	52,100
Lead	231.0
Magnesium	613,000
Manganese	1,540
Mercury	528
Nickel	81.5
Potassium	180,000
Selenium	26
Silver	0.21
Sodium	31,100,000
Thallium	0.48
Vanadium	3,740
Zinc	1,390

Table 4-2A. Health Hazards Associated with VOCs

Chemical	Physical Description/Odor	Symptoms & Effects	Target Organs	Source
1,1-Dichloroethane	Colorless liquid, similar odor to ether at 120 ppm	Short-term exposure may effect on the central nervous system and cause unconsciousness. Long-term exposure health effects include damage to kidneys and liver.	Central nervous system, kidneys, liver	Centers for Disease Control and Prevention. *International Chemical Safety Card: 1,1-Dichloroehhane*. Reviewed July 2015.
1,1-Dichloroethene	Colorless liquid or gas, mild sweet odor at 190 ppm	Short-term exposure symptoms include: (i) irritation of eyes, skin and/or throat, (ii) dizziness and headaches, (iii) nausea, (iv) breathing difficulty, (v) kidney and liver disturbance, and (vi) pneumonitis. 1,1-Dichloroethene is considered a potential occupational carcinogen.	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Centers for Disease Control and Prevention. *NIOSH Pocket Guide to Chemical Hazards: Vinylidene chloride*. Reviewed April 2016.
1,1-Dichloropropene	Colorless liquid, sweet odor	Short-term exposure symptoms include irritation of the eyes and skin.	Skin, eyes	Centers for Disease Control and Prevention. *International Chemical Safety Card: 1,1-Dichloropropane*. Reviewed July 2015.
1,2,3-Trichloropropane	Colorless liquid, strong sweet odor at 10 ppm	Short-term exposure symptoms include irritation of the eyes and throat. Long-term effects include central nervous system depression.	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Centers for Disease Control and Prevention. *NIOSH Pocket Guide to Chemical Hazards: 1,2,3-Trichloropropane*. Reviewed April 2016.
1,2,4-Trichlorobenzene	Colorless liquid or crystalline solid below 63°F, aromatic odor at 3 ppm	Exposure effects include irritation of the eyes, skin, and mucous membrane.	Eyes, skin, respiratory system, liver, reproductive system	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *1,2,3-Trichlorobenzene*. Reviewed April 2016.
1,2,4-Trimethylbenzene	Colorless liquid, strong aromatic odor at 0.4 ppm	Exposure effects include irritation of the eyes, skin, and respiratory system. If swallowed, may result in chemical pneumonitis. Long-term repeated exposure defats skin, result in bronchitis, and may have effects on the central nervous system and blood.	Eyes, skin, respiratory system, liver, central nervous system, blood	Centers for Disease Control and Prevention. *International Chemical Safety Card: 1,2,4-Trimethylbenzene*. Reviewed July 2015.
1,2-Dibromoethane	Colorless liquid or solid below 53 °F, similar odor to chloroform, foul-smelling at 10 ppm	Exposure symptoms include: (i) irritation eyes, skin, respiratory system, (ii) dermatitis with vesiculation, (iii) liver, heart, spleen, and/or kidney damage. 1,2-Dibromoethane may also cause reproductive effects and is considered a potential occupational carcinogen.	Eyes, skin, respiratory system, liver, kidneys, reproductive system	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *1,2-Dibromoethane*. Reviewed April 2016.
1,2-Dichlorobenzene	Colorless to yellow liquid, pleasant odor at 0.70 ppm	Short-term exposure symptoms include irritation of the eyes, skin, and respiratory system and may cause effects on the central nervous system and liver. Long-term exposure may defat the skin and have effects on the kidneys and blood.	Eyes, skin, respiratory system, kidneys, blood	Centers for Disease Control and Prevention. *International Chemical Safety Card: 1,2-Dichlorobenzene*. Reviewed July 2015.
1,2-Dichloroethane	Colorless, viscous liquid, pleasant chloroform-lik odor 6-10 ppm	Potential short-term exposure symptoms include (i) rritation of the eyes, skin and respiratory system, (ii) lung oedema, and (iii) effects on the central nervous system, kidneys, and liver. Long-term exposure health effects include dermatitis and cancer.	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Centers for Disease Control and Prevention. *International Chemical Safety Card: 1,2-Dichloroethane*. Reviewed July 2015.
1,2-Dichloropropane	Colorless liquid, chloroform-like odor at 0.25 ppm	Short-term exposure symptoms include irritation of the eyes, skin, and respiratory system and may cause effects on the central nervous system. Long-term exposure health effects include defatting of the skin and effects on the liver and kidneys.	Eyes, skin, respiratory system, liver, kidneys	Centers for Disease Control and Prevention. *International Chemical Safety Card: 1,2-Dichloropropane*. Reviewed July 2015.

Table 4-2A. Health Hazards Associated with VOCs

Chemical	Physical Description/Odor	Symptoms & Effects	Target Organs	Source
1,3,5-Trimethylbenzene	Colorless liquid, distinctive aromatic odor at 10 ppm	Exposure effects include irritation of the eyes, skin, and respiratory system. If swallowed, may result in chemical pneumonitis. Long-term repeated exposure defats skin, result in bronchitis, and may have effects on the central nervous system and blood.	Eyes, skin, respiratory system, liver, central nervous system, blood	Centers for Disease Control and Prevention. *International Chemical Safety Card: 1,3,5-Trimethylbenzene*. Reviewed July 2015.
1,3-Dichlorobenzene	Colorless liquid	Exposure symptoms include irritation of the eyes and skin and possibly cause effects on the kidneys and liver.	Eyes, skin, kidneys, liver	Centers for Disease Control and Prevention. *International Chemical Safety Card: 1,3-Dichlorobenzene*. Reviewed July 2015.
1,4-Dichlorobenzene	Colorless to white crystalline solid, strong odor at 0.18 ppm	Health effects include anemia, irritation of the eyes and respiratory system. Long-term exposure may cause effects on the kidneys and liver.	Liver, kidneys, blood, eyes	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *1,4-Dichlorobenzene*. Reviewed April 2016.
2,2-Dichloropropane	Colorless liquid	Health of effects dizziness, headache, nausea, anemia, coma, and death. Long-term exposure may cause effects on the kidneys and liver.	Eyes, liver, kidneys, respiratory system, central nervous syestem	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *2,2-Dichloropropane*. Reviewed April 2016.
2-Butanone (MEK)	Colorless liquid, acetone-like odor at 5.4 ppm	Health effects include irritation of eyes, skin, and respiratory system, headaches, dizziness, and vomitting.	Eyes, skin, respiratory system central nervous system	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *2-Butanone*. Reviewed April 2016.
2-Chlorotoluene	Colorless liquid	Symptoms of exposure include irritation of eyes, skin, and respiratory system, drowziness, and cough.	Eyes, skin, respiratory system central nervous system, kidneys, liver	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *2-Chlorotoluene*. Reviewed April 2016.
2-Hexanone	Colorless liquid, sharp odor at 3 ppm	Health effects include weakness and tingling/numbness of extremeties.	Central nervous system, skin	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *2-Hexanone*. Reviewed April 2016.
4-Chlorotoluene	Colorless liquid	Health effects include irritation of eyes and skin, coughing, and drowziness.	Eyes, skin, respiratory system, nervous system	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *4-Chlorotoluene*. Reviewed April 2016.
Acetone	Colorless liquid, pungent or fruity odor at 13-20 ppm	Exposure symptoms include irritation of the eyes and respiratory system and may cause effects on the gastrointestinal tract.	Nervous system, liver, kidneys, gastrointestinal tract	Centers for Disease Control and Prevention. *International Chemical Safety Card: Acetone.* Reviewed July 2015.
Benzene	Colorless liquid, sweet odor at 1.5 ppm	Health effects include: (i) irritation of eyes, skin, and respiratory system, (ii) staggered gait, (iii) anorexia, (iv) lassitude, (v) dermatitis, (vi) bone marrow depression. Benzene is considered a potential occupational carcinogen.	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *Benzene*. Reviewed April 2016.

Table 4-2A. Health Hazards Associated with VOCs

Chemical	Physical Description/Odor	Symptoms & Effects	Target Organs	Source
Bromodichloromethane	Colorless liquid	Exposure effects include incoordination and sleepiness. Long-term exposure may cause effects on the kidneys and liver.	Kidneys, liver brain	Centers for Disease Control and Prevention. *International Chemical Safety Card: Bromodichloromethane*. Reviewed July 2015.
Carbon disulfide	Colorless liquid, foul rotten eggs odor at 0.05 mg/m^3	Health effects include chest pains, headache, and irritation of the eyes and skin.	Nervous system, cardiovascular system	Centers for Disease Control and Prevention. *International Chemical Safety Card: Carbon Disulfide*. Reviewed July 2015.
Chlorobenzene	Colorless liquid, aromatic almond-like odor 1-8 mg/m^3	Health effects include headaches, numbness, sleepiness, nausea, and vomitting. Long-term exposure may cause effects on the kidneys and liver.	Brain, liver, kidneys	ATSDR, 1990. *Public Health Statement for Chlorobenzene*.
Chloroethane	Colorless gas, etheral odor at 4.2 ppm	Health effects include drunkness, dizziness, stomach cramps, nausea, vomitting and irritation of the eyes. Chloroethane is considered a possible carcinogen.	Nervous system	ATSDR, 1998. *Public Health Statement for Chloroethane*
Chloroform	Colorless liquid, pleasant odor at 85 ppm	Health effects include fatigue, dizziness, and headache. Long-term exposure may cause effects on the kidneys and liver.	Liver, kidneys	ATSDR, 1997. *Public Health Statement for Chloroform*.
Chloromethane	Colorless gas, faint sweet small at 10 ppm	Health effects include blurred vision, dizziness, fatigue, and vomitting, nausea, increased heart rate and blood pressure. Chloromethane is considered a possible human carcinogen.	Liver, kidneys, central nervous system	ATSDR, 1998. *Public Health Statement for Chloromethane*.
cis-1,2-Dichloroethene	Colorless liquid	Health effects include irritation eyes and respiratory system, and central nervous system depression.	Eyes, respiratory system, central nervous system	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *1,2-Dibchloroethene*. Reviewed April 2016.
Dichloromethane (Methylene chloride)	Colorless liquid, sweetish odor at 250 ppm	Health effects include dizziness, nausea, and tingling sensation in the extremities. Dichloromethane is a known human carcinogen.	Liver, kidneys, eyes	ATSDR, 2000. *Public Health Statement for Dichloromethane*.
Ethylbenzene	Colorless liquid, gasoline odor at 2.3 ppm	Short term exposure symptoms include irritation of eyes and throat, vertigo, dizziness, and hearing loss. Ethylbenzene is a known human carcinogen.	Brain, kidneys, reproductive organs	ATSDR, 2010. *Public Health Statement for Ethylbenzene*.
Isopropylbenzene	Colorless liquid, sharp penetrating gasoline-like odor at 0.088 ppm	Health effects include irritation of eyes, skin, and mucous membrane, dermatitis, headache, narcosis, and coma.	Eyes, skin, respiratory system, central nervous system	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *Cumene*. Reviewed April 2016.

Table 4-2A. Health Hazards Associated with VOCs

Chemical	Physical Description/Odor	Symptoms & Effects	Target Organs	Source
m&p-Xylene	Colorless liquid, sweet odor at 1.1 ppm	Health effects includeirritation of skin, eyes, and nose, difficulty breathing, memory loss, and abdominal pain.	Stomach, liver, kidneys, lungs, heart, central nervous system	ATSDR, 2007. *Public Health Statement for Xylene*
n-Butylbenzene (butyl benzene)	Colorless liquid	May cause irritation of the skin and eyes, dizziness, and suffocation.	Eyes, skin, respiratory system	National Institute of Health. PubChem Chemistry Database: Butylbenzene
n-Propylbenzene	Colorless liquid	May cause irritation of the respiratory system.	respiratory system	National Institute of Health. PubChem Chemistry Database: Propylbenzene
o-Xylene	Colorless liquid, aromatic odor similar to benzene at 0.4 ppm	Health effects includeirritation of skin, eyes, and nose, difficulty breathing, memory loss, and abdominal pain.	Stomach, liver, kidneys, lungs, heart, central nervous system	ATSDR, 2007. *Public Health Statement for Xylene*
p-Isopropyltoluene	Colorless liquid	Short-term exposure symptoms include irriation of the eyes and skin. If swallowed, may cause chemical pneumonitis. Long-term expposure may cause defatting of the skin.	Skin	National Institute of Health. PubChem Chemistry Database: *p-Cymene*
sec-Butylbenzene (butyl benzene)	Colorless liquid	May cause irritation of the skin and eyes, dizziness, and suffocation.	Eyes, skin, respiratory system	National Institute of Health. PubChem Chemistry Database: Butylbenzene
tert-Butylbenzene (butyl benzene)	Colorless liquid	May cause irritation of the skin and eyes, dizziness, and suffocation.	Eyes, skin, respiratory system	National Institute of Health. PubChem Chemistry Database: Butylbenzene
Tetrachloroethene	Colorless liquid, sharp sweet odor at 1 ppm	Short-term exposure symptoms include dizziness, headaches, changes in mood, memory, and attention. Tetrachloroethene is a known human carcinogen.	Brain, kidneys, liver	ATSDR, 2014. *Public Health Statement for Tetrachloroethene.*
Toluene	Colorless liquid, sweet pungent odor at 2.9 ppm	Short-term exposure symptoms include headache, dizziness, ataxia, drowziness, euphoria, seizures, and coma.	Nervous system, immune system, kidneys, liver, reproductive organs	ATSDR, 2015. *Public Health Statement for Toluene.*
trans-1,2-Dichloroethene	Colorless liquid	Health effects include nausea, drowziness, and death.	Heart, red blood cells, liver	ATSDR, 1997. *Public Health Statement for Trans-1,2,-Dichloroethene.*

Table 4-2A. Health Hazards Associated with VOCs

Chemical	Physical Description/Odor	Symptoms & Effects	Target Organs	Source
Trichloroethene	Colorless liquid, sweet odor at 28 ppm	Short-term exposure symptoms include dizziness, headaches, sleepiness, scleroderma, and coma. Tetrachloroethene is a known human carcinogen.	Liver, kidneys, lungs, reproductive organs	ATSDR, 2014. Public Health Statement *for Trichloroethene.*
Vinyl chloride	Colorless gas, mild sweet odor at 3,000 ppm	Short-term exposure symptoms include dizziness and sleepiness. Vinyl chloride is a known human carcinogen.	Liver, lungs, kidneys, central nervous system, reproductive organs	ATSDR, 2006. Toxilogical Profile for Vinyl Chloride.

Table 4-2B. Health Hazards Associated with PAHs

Chemical	Physical Description	Symptoms & Effects	Target Organs	Source
1-Methylnaphthalene	Bluish-brown oil or a clear	Symptoms associated with exposure include fatigue, lack of appetite, restlessness, and a pale appearance to your skin. Several associated PAHs are suspected human carcinogens.	Red blood cells	ATSDR, 2005. *Toxological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene*. August.
2-Methylnaphthalene	White crystalline solid	Symptoms associated with exposure include fatigue, lack of appetite, restlessness, and a pale appearance to your skin. Several associated PAHs are suspected human carcinogens.	Red blood cells	ATSDR, 2005. *Toxological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene*. August.
Acenaphthene	Colorless crystalline solid	Short term exposure symptoms include irritation of the skin, eyes, nose, and throat. Long-term health effects include bronchitis, phlegm, and shortness of breath. Several associated PAHs are suspected carcinogens.	Lungs, liver, kidneys	New Jersey Department of Health and Senior Services, 1998. *Hazardous Substance Fact Sheet: Acenapthalene*. November.
Acenaphthylene	Colorless crystalline solid	Symptoms of short term exposure and long-term health effects not well understood. Assumed to be similar other PAHs. Several associated PAHs are suspected human carcinogens.	Skin	National Library of Medicine, 2017. *TOXNET: Acenaphthylene*. January.
Anthracene	White crystalline soild	Symptoms of short-term exposure include irritation of eyes and respiratory system. Several associated PAHs are suspected human carcinogens.	respiratory system	Centers for Disease Control and Prevention. *International Chemical Safety Card: Athracene*. Reviewed July 2015.
Benzo(a)anthracene	Colorless to yellow-brown fluorescent flakes	Benzo(a)anthracene is a suspected human carcinogenic	Cells	Centers for Disease Control and Prevention. *International Chemical Safety Card: Benzo(a)athracene*. Reviewed July 2015.
Benzo(a)pyrene	Pale-yellow crystals	Benzo(a)pyrene is a known human carcinogen and mutagen.	Cells	Centers for Disease Control and Prevention. *International Chemical Safety Card: Benzo(a)pyrene*. Reviewed July 2015.
Benzo(b)fluoranthene	Colorless cystals	Benzo(b)fluoranthene is a suspected human carcinogen.	Cells	New Jersey Department of Health and Senior Services, 2001. *Hazardous Substance Fact Sheet: Benzo(b)fluoranthene.* July.
Benzo(g,h,i)perylene	Pale, yellow-green crystals.	N/A	N/A	Centers for Disease Control and Prevention. *International Chemical Safety Card: Benzo(g,h,i)perylene*. Reviewed July 2015.
Benzo(k)fluoranthene	Yellow crystals	May cause skin and eye irritation. Benzo(k)fluoranthene is a suspected human carcinogen.	Cells	Centers for Disease Control and Prevention. *International Chemical Safety Card: Benzo(k)fluoranthene*. Reviewed July 2015.

Table 4-2B. Health Hazards Associated with PAHs

Chemical	Physical Description	Symptoms & Effects	Target Organs	Source
Chrysene	Colorless to beige crystals	Chrysene is a suspected human carcinogen.	Cells	Centers for Disease Control and Prevention. *International Chemical Safety Card: Chrysene*. Reviewed July 2015.
Dibenzo(a,h)anthracene	Colorless crystalline powder	Dibenzo(a,h)anthracene is a suspected human carcinogen and may have effects on skin (photosensitization).	Skin	Centers for Disease Control and Prevention. *International Chemical Safety Card: Dibenzo(a,h)anthracene*. Reviewed July 2015.
Dibenzofuran	Colorless white crystalline solid	May cause skin and eye irritations, darkened skin color, and swollen eyelids with discharge, vomiting and diarrhea, anemia (a blood disease), more frequent lung infections, numbness and other effects on the nervous system, and mild changes in the liver.	Skin, eyes, central nervous system, gastrointestinal tract	ATSDR, 1994. *Public Health Statement for Chlorodibenzofurans (CDFs)*. May.
Fluoranthene	Light yellow fine crystals	N/A	N/A	National Institute of Health. PubChem Chemistry Database: Fluoranthene
Fluorene	White leaflets	N/A	N/A	National Institute of Health. PubChem Chemistry Database: Fluoranthene
Indeno(1,2,3-cd)pyrene	Yellow solid	Indeno(1,2,3-cd)pyrene is a suspected human carcinogen.	Cells	New Jersey Department of Health and Senior Services, 2007. *Hazardous Substance Fact Sheet: Indeno(1,2,3-cd)pyrene.* March.
Naphthalene	White crystalline solid	Symptoms associated with exposure include fatigue, lack of appetite, restlessness, and a pale appearance to your skin. Several PAHs are suspected/known carcinogen.	Red blood cells	ATSDR, 2005. *Toxological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene*. August.
Phenanthrene	Colorless to white crystalline solid	Short-term exposure symptoms include irritation of the eyes, skin, nose, and throat. Long-term health effects are not known, although it is not classifiable as a human carcinogen.	Skin, eyes, respiratory system	New Jersey Department of Health and Senior Services, 2010. *Hazardous Substance Fact Sheet: Phenanthrene.* November.
Pyrene	Pale yellow or colorless solid	Exposure to sun may provoke an irritating effect of pyrene on skin and lead to chronic skin discoloration.	Skin	Centers for Disease Control and Prevention. *International Chemical Safety Card: Pyrene*. Reviewed July 2015.

Table 4-2C. Health Hazards Associated with Metals

Chemical	Physical Description	Symptoms & Effects	Target Organs	Source
Aluminum	Silvery-white, malleable, ductile metal	May cause irritation of eyes, skin, and respiratory system.	Eyes, skin, respiratory system	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *Aluminum*. Reviewed April 2016.
Arsenic	Silver-gray or tin-white, brittle, solid	Health effects include ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, irritation of respiratory system, and hyperpigmentation of the skin. Arsenic is considered a potential occupational carcinogen.	Liver, kidneys, skin, lungs, lymphatic system	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *Arsenic*. Reviewed April 2016.
Barium	White, odorless solid	May cause irritation of eyes, skin, and upper respiratory system; gastroenteritis; muscle spasms; extrasystoles; and hypokalemia	Eyes, respiratory system	ATSDR, 2007. *Toxological Profile for Barium*. August.
Calcium	Lustrous silver-white metal	May cause irritation of eyes.	Eyes	Centers for Disease Control and Prevention. *International Chemical Safety Card: Calcium.* Reviewed July 2015.
Chromium (symptoms/effects for CR(VI) exposure)	Silvery, metallic solid	Effects from acute exposure include abdominal pain, vomiting, hemorraging, skin burns, and coughing/wheezing. Chronic symptoms include ulcerations of the septum, bronchitis, decreased pulmonary function, pneumonia, asthma, ulceration of the skin, and damage to the liver/kidney and immune	Gastrointestinal tract, respiratory system, kidneys, immune system	USEPA, 2016. *Chromium Compound.* September.
Cobalt	Silver-gray to black solid	Health effects include cough, breathing difficulty, wheezing, decreased pulmonary function, weight loss, dermatitis, diffuse nodular fibrosis, respiratory hypersensitivity, and asthma.	Skin, respiratory system	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *Cobalt.* Reviewed April 2016.
Copper	Red powder, turns green on exposure to moist air	Inhalation of fumes may cause metal fume fever. Long-term exposure may cause skin sensitization.	Skin, respiratory system	Centers for Disease Control and Prevention. *International Chemical Safety Card: Copper.* Reviewed July 2015.
Iron (Iron pentacarbonyl)	Colorless to yellow to dark-red, oily liquid.	Health effects include: irritation eyes, mucous membrane, and respiratory system, headache, dizziness, nausea, vomiting, fever, cyanosis, cough, breathing difficulty, liver, kidney, lung injury, degenerative changes in central nervous system.	Eyes, respiratory system, central nervous system, liver, kidneys	Centers for Disease Control and Prevention. NIOSH Pocket Guide to Chemical Hazards: *Iron pentacarbonyl.* Reviewed April 2016.
Lead	Heavy, ductile, soft gray solid	Chronic exposure symptoms include weight loss, central and peripheral nervous system effects, anemia, and damage to kidneys. Effects from accute exposure include include pain, muscle waekness, numbness and tingling and, in rare cases, inflammation of the brain	Gastrointestinal tract, central nervous system, kidneys, blood	ATSDR, 2007. *Toxological Profile for Lead.* August.

Table 4-2C. Health Hazards Associated with Metals

Chemical	Physical Description	Symptoms & Effects	Target Organs	Source
Magnesium (Magnesium Oxide)	White powder	Irritation of eyes and noes and may cause metal fume fever.	Eyes, respiratory system	Centers for Disease Control and Prevention. *International Chemical Safety Card: Magnesium Oxide.* Reviewed July 2015.
Manganese	Silvery, metallic solid	May cause manganism with symptoms that include tremors, difficulty walking and facial muscle spasms	Brain	ATSDR, 2012. *Toxological Profile for Barium*. September.
Mercury (Elemental Mercury)	Silvery, metallic liquid	Short-term exposures ympptoms include breathing difficulty, acute chemical pneumonia, pulmonary edema, cardiac abnormalities, damage to the kidney, liver or nerves and effects on the brain may occur. Chronic exposure symptoms include anorexia, chills, fever, cardiac abnormalities, anemia, digestive problems, abdominal pains, diarrhea, peripheral neuropathy, tremors, alteration of tendon reflexes, slurred speech, and deafness.	Brain	USEPA Region 3, 2017. *Health and Safety Best Practives Guide: Elemental Mercury (hg) Response.* January.
Nickel	Silver metallic solid	Health effects include asthma, mechanical irritation, and is considered a possible human carcinogen.	Lungs	Centers for Disease Control and Prevention. *International Chemical Safety Card: Nickel.* Reviewed July 2015.
Potassium	White, gray solid	N/A	N/A	Centers for Disease Control and Prevention. *International Chemical Safety Card: Potassium.* Reviewed July 2015.
Silver	Lustrous white, metallic solid	Inhalation of silver dust may lead to breathing problems, lung and throat irritation, and stomach pains. Sensitive individuals may suffer allergic reaction (rash, swelling, and inflammation). Chronic exposure may result in a condition called arygria (blue-gray discoloration of the skin and other body tissues).	Skin, respiratory system	ATSDR, 1999. *Toxological Profile for Barium*. July.
Sodium	White crystalline solid	Ingestion of excess sodium causes high blood pressure and heart disease.	N/A	Division for Heart and Stroke Prevention, 2018. *Sodium Fact Sheet.* January.
Strontium	White solid	N/A	N/A	Centers for Disease Control and Prevention. *International Chemical Safety Card: Strontium*. Reviewed July 2015.
Titanium (Titanium Dioxide)	White powder	Causes lung fibrosis and is considered a possible human carcinogen.	respiratory system	Centers for Disease Control and Prevention. *International Chemical Safety Card: Titanium Dioxide.* Reviewed July 2015.

Table 4-2C. Health Hazards Associated with Metals

Chemical	Physical Description	Symptoms & Effects	Target Organs	Source
Vanadium (Vanadium Trioxide)	Black powder	May cause irritation of eyes, skin, and respiratory system. Vanadium is considered a possible carcinogen.	Skin, eyes, respiratory system	Centers for Disease Control and Prevention. *International Chemical Safety Card: Vanadium Trioxide.* Reviewed July 2015.
Zinc	Silvery, metallic solid	Acute exposure may cause nausea, vomiting, pain, cramps, diarrhea, and metal fume fever.	Respiratory system, gastrointestinal tract	ATSDR, 2005. *Toxological Profile for Barium*. August.

Table 4-2D. Health Hazards Associated with PCBs

Chemical	Physical Description	Symptoms & Effects	Target Organs	Source
Aroclor 1254	Light yellow, viscous liquid	May cause iriitation of eyes, nose, and throat, coughing/difficulty breathing, and may impair the function of the immune system. Aroclor 1254 is reasonably anticipated to be a human carcinogen.	Eyes, respiratory system, immune system	U.S. National Library of Medicine (2010). *Aroclor 1254*. September.
Aroclor 1260	Light yellow, viscous liquid	May cause iriitation of eyes, nose, and throat, coughing/difficulty breathing, and may impair the function of the immune system. Aroclor 1260 is reasonably anticipated to be a human carcinogen.	Eyes, respiratory system, immune system	U.S. National Library of Medicine (2010). *Aroclor 1260*. September.
Aroclor 1268	Light yellow, viscous liquid	May cause iriitation of eyes, nose, and throat, coughing/difficulty breathing, and may impair the function of the immune system. Aroclor 1268 is reasonably anticipated to be a human carcinogen.	Eyes, respiratory system, immune system	U.S. National Library of Medicine (2010). *Aroclor 1268*. September.

Table 4-3A. Chemical and Physical Properties of VOCs

Chemical	Flash Point (°F)	Lower Explosive Limit (%)	Upper Explosive Limit (%)	Ionization Potential (eV)	Specific Gravity
1,1-Dichloroethane	14	5.4	11.4	11.06	1.17
1,1-Dichloroethene	1.4	6.5	15.5	10	1.21
1,1-Dichloropropene	N/A	N/A	N/A	N/A	1.22
1,2,3-Trichloropropane	165	3	13	N/A	1.39
1,2,4-Trichlorobenzene	222	2.5	6.6	N/A	1.45
1,2,4-Trimethylbenzene	112	0.9	6.4	8.27	0.89
1,2-Dibromoethane	N/A	N/A	N/A	9.45	2.18
1,2-Dichlorobenzene	151	2.2	9.2	9.06	1.31
1,2-Dichloroethane	56	6.2	16.0	11.05	1.25
1,2-Dichloropropane	60	3.4	14.5	10.87	1.16
1,3,5-Trimethylbenzene	122	N/A	N/A	8.39	0.86
1,3-Dichlorobenzene	146	2.0	9.2	N/A	1.29
1,4-Dichlorobenzene	150	2.5	N/A	8.98	1.46
2,2-Dichloropropane	1.16	1.16	1.16	1.16	1.16
2-Butanone (MEK)	26	1.4	11.4	9.54	0.81
2-Chlorotoluene	96	N/A	N/A	8.83	1.08
2-Hexanone	77	1.2	8.0	9.34	0.81
4-Chlorotoluene	140	N/A	N/A	N/A	1.07
Acetone	1.42	2.6	12.8	9.69	0.79
Benzene	12.0	1.4	7.8	9.24	0.88
Bromodichloromethane	N/A	N/A	N/A	N/A	1.98
Carbon disulfide	-22	1.0	50.0	10.08	1.26
Chlorobenzene	82	1.3	9.6	9.07	1.11
Chloroethane	-58	3.8	15.4	10.97	0.91
Chloroform	N/A	N/A	N/A	11.42	1.48
Chloromethane	-50	8.1	17.4	11.28	1.00
cis-1,2-Dichloroethene	39	9.7	12.8	9.65	1.28
Dichloromethane (Methylene chloride)	N/A	N/A	N/A	11.32	1.32
Ethylbenzene	59	1.2	6.8	10	0.87
Isopropylbenzene	96	0.9	6.5	8.75	0.87
m&p-Xylene	85	1.1	7.0	8.56	0.86
n-Butylbenzene	160	N/A	N/A	N/A	0.86
n-Propylbenzene	118	0.8	6.0	N/A	0.86
o-Xylene	93	0.9	6.7	8.56	0.88
p-Isopropyltoluene	117	0.7	5.6	N/A	0.86
Pyrene	>392	N/A	N/A	N/A	1.27
sec-Butylbenzene	126	N/A	N/A	N/A	0.86
tert-Butylbenzene	140	0.7	5.7	N/A	0.87
Tetrachloroethene	N/A	N/A	N/A	9.32	1.63
Toluene	40	1.3	7.1	8.82	0.87
trans-1,2-Dichloroethene	43	5.6	12.8	9.65	1.27
Trichloroethene	>200	8.0	10.5	9.45	1.46
Vinyl chloride	-110	3.6	33.0	9.99	0.97

Source of Data: PubChem Chemistry Database (National Institute of Health)

Table 4-3B. Chemical and Physical Properties of PAHs

Chemical	Flash Point (°F)	Lower Explosive Limit (%)	Upper Explosive Limit (%)	Ionization Potential (eV)	Specific Gravity
1-Methyl Naphthalene	>200	N/A	N/A	N/A	1.02
2-Methylnaphthalene	208	N/A	N/A	N/A	1.00
Acenaphthene	257	0.6	N/A	N/A	1.02
Acenaphthylene	252	N/A	N/A	N/A	0.90
Anthracene	250	0.6	N/A	N/A	1.24
Benzo(a)anthracene	N/A	N/A	N/A	N/A	1.27
Benzo(a)pyrene	N/A	N/A	N/A	N/A	1.35
Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	1.29
Benzo(g,h,i)perylene	N/A	N/A	N/A	N/A	1.30
Benzo(k)fluoranthene	N/A	N/A	N/A	N/A	1.29
Chrysene	N/A	N/A	N/A	N/A	1.27
Dibenzo(a,h)anthracene	N/A	N/A	N/A	N/A	1.23
Fluoranthene	388.000	N/A	N/A	N/A	1.25
Fluorene	304	N/A	N/A	N/A	1.20
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	1.36
Naphthalene	190	0.9	5.9	8.12	1.16
Phenanthrene	340	N/A	N/A	N/A	1.03
Pyrene	>392	N/A	N/A	N/A	1.27

Source of Data: PubChem Chemistry Database (National Institute of Health)

Table 4-3C. Chemical and Physical Properties of Metals

Chemical	Flash Point (°F)	Lower Explosive Limit (%)	Upper Explosive Limit (%)	Ionization Potential (eV)	Specific Gravity
Aluminum	N/A	N/A	N/A	N/A	2.7
Antimony	N/A	N/A	N/A	N/A	6.68
Arsenic	N/A	N/A	N/A	N/A	5.7
Barium	N/A	N/A	N/A	N/A	3.62
Beryllium	N/A	N/A	N/A	N/A	1.85
Cadmium	N/A	N/A	N/A	N/A	8.7
Calcium	N/A	N/A	N/A	N/A	1.54
Chromium	N/A	N/A	N/A	N/A	7.19
Cobalt	N/A	N/A	N/A	N/A	8.86
Copper	N/A	N/A	N/A	N/A	8.96
Iron	N/A	N/A	N/A	N/A	7.87
Lead	N/A	N/A	N/A	N/A	11.34
Mercury	N/A	N/A	N/A	N/A	13.55

Source of Data: PubChem Chemistry Database (National Institute of Health)

Table 4-3D. Chemical and Physical Properties of PCBs

Chemical	Flash Point (°F)	Lower Explosive Limit (%)	Upper Explosive Limit (%)	Ionization Potential (eV)	Specific Gravity
Aroclor 1254	N/A	N/A	N/A	N/A	1.54
Aroclor 1260	N/A	N/A	N/A	N/A	1.62
Aroclor 1268	N/A	N/A	N/A	N/A	1.80

Source of Data: Agency for Toxic Substances and Disease Registry (2000). *Toxilogical Profile for Polychlorinated Biphenyls (PCBs)* . November.

Table 4-4. Occupational Exposure Limits

Chemical	ACGIH 8-hr TWA TLV[1] (ppm)	OSHA 8-hr TWA PEL[2] (ppm)	NIOSH TWA REL[3] (ppm)	IDLH[3] (ppm)
1,1-Dichloroethane	100	100	100	3,000
1,1-Dichloroethene	100	100	100	N/A
1,1-Dichloropropene	N/A	N/A	N/A	N/A
1,2,3-Trichloropropane	0.005	50	10	100
1,2,4-Trichlorobenzene	5	N/A	5	N/A
1,2,4-Trimethylbenzene	25	25	25	N/A
1,2-Dibromoethane	N/A	N/A	N/A	N/A
1,2-Dichlorobenzene	25	50	50	200
1,2-Dichloroethane	10	50	1	N/A
1,2-Dichloropropane	10	75	PC	N/A
1,3,5-Trimethylbenzene	25	25	25	N/A
1,3-Dichlorobenzene	N/A	N/A	N/A	N/A
1,4-Dichlorobenzene	10	75	N/A	N/A
1-Methyl Naphthalene	N/A	N/A	N/A	N/A
2,2-Dichloropropane	10	75	N/A	1.16
2-Butanone (MEK)	200	200	200	3,000
2-Chlorotoluene	50	N/A	50	N/A
2-Hexanone	5	100	1	1,600
2-Methylnaphthalene	N/A	N/A	N/A	N/A
4-Chlorotoluene	N/A	N/A	N/A	N/A
Acenaphthene	N/A	N/A	N/A	N/A
Acenaphthylene	N/A	N/A	N/A	N/A
Acetone	500	1,000	250	2,500
Anthracene (coal pitch tar volatiles)	0.2 mg/m^3	0.2 mg/m^3	0.2 mg/m^3	80 mg/m^3
Benzene	0.5	10	0.1	500
Benzo(a)anthracene	N/A	N/A	N/A	N/A
Benzo(a)pyrene (coal pitch tar volatiles)	0.2 mg/m^3	0.2 mg/m^3	0.2 mg/m^3	80 mg/m^3
Benzo(b)fluoranthene	N/A	N/A	N/A	N/A
Benzo(g,h,i)perylene	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	N/A	N/A	N/A	N/A
Bromodichloromethane	N/A	N/A	N/A	N/A
Carbon disulfide	1	20	1	500
Chlorobenzene	10	75	75	1,000
Chloroethane	100	1,000	N/A	3,800
Chloroform	10	50	N/A	500
Chloromethane	50	200	N/A	2,000
Chrysene (coal pitch tar volatiles)	0.2 mg/m^3	0.2 mg/m^3	0.2 mg/m^3	80 mg/m^3
cis-1,2-Dichloroethene	200	200	200	1,000
Dibenzo(a,h)anthracene	N/A	N/A	N/A	N/A
Dichloromethane (Methylene chloride)	50	N/A	N/A	2,300
Ethyl benzene	20	100	100	800
Fluoranthene (coal pitch tar volatiles)	0.2 mg/m^3	0.2 mg/m^3	0.2 mg/m^3	80 mg/m^3
Fluorene	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene (coal pitch tar volatiles)	0.2 mg/m^3	0.2 mg/m^3	0.2 mg/m^3	80 mg/m^3
Isopropylbenzene	50	50	50	900
Lead	0.05 mg/m^3	0.05 mg/m^3	0.05 mg/m^3	100 mg/m^3
m&p-Xylene	100	100	100	900

Notes:

*Aroclor 1254 is the most toxic PCB. Exposure limits for Aroclor 1254 will be followed for all PCBs.

[1] ACGIH Threshold Limit Values, 2017

[2] OSHA Permissible Exposure Limits, 29 CFR 1910.1000

[3] NIOSH Recommended Exposure Limits, 2016

Table 4-4. Occupational Exposure Limits

Chemical	ACGIH 8-hr TWA TLV[1] (ppm)	OSHA 8-hr TWA PEL[2] (ppm)	NIOSH TWA REL[3] (ppm)	IDLH[3] (ppm)
Mercury	0.025 mg/m^3	0.1 mg/m^3	0.05 mg/m^3	10 mg/m^3
Naphthalene	10	10	10	250
n-Butylbenzene	N/A	N/A	N/A	N/A
n-Propylbenzene	N/A	N/A	N/A	N/A
o-Xylene	100	100	100	900
Phenanthrene (coal pitch tar volatiles)	0.2 mg/m^3	0.2 mg/m^3	0.2 mg/m^3	80 mg/m^3
p-Isopropyltoluene	N/A	N/A	N/A	N/A
PCBs* (Aroclor 1254)	0.037 (skin)	0.037 (skin)	0.037 (skin)	N/A
Pyrene (coal pitch tar volatiles)	0.2 mg/m^3	0.2 mg/m^3	0.2 mg/m^3	80 mg/m^3
sec-Butylbenzene	N/A	N/A	N/A	N/A
tert-Butylbenzene	N/A	N/A	N/A	N/A
Tetrachloroethene	25	100	N/A	150
Toluene	20	200	100	500
trans-1,2-Dichloroethene	200	200	200	1,000
Trichloroethene	10	100	25	1,000
Vinyl chloride	1	1	N/A	N/A

Notes:

*Aroclor 1254 is the most toxic PCB. Exposure limits for Aroclor 1254 will be followed for all PCBs.

[1] ACGIH Threshold Limit Values, 2017

[2] OSHA Permissible Exposure Limits, 29 CFR 1910.1000

[3] NIOSH Recommended Exposure Limits, 2016

Table 4-5. Hazards Analysis

Task No.	Description	Hazards													
		Inhalation of Chemicals	Skin Absorption	Heavy Equipment Hazards	Drum Handling	Noise Exposure	Drilling	Eye Injury	Lifting Heavy Loads	Portable Hand Tools	Insect, Vermin, Snake Bites	Tick Bites	Poisonous Plants	Heat Stress	Slips, Trips, Falls
1	Site Mobilization & Demobilization			X							X	X	X	X	X
2	Separation of Exclusion, Contamination Reduction, and Support Zones										X	X	X	X	X
3	CBA Site Preparation Work	X	X	X		X		X		X	X	X	X	X	X
4	Soil Sampling	X	X	X	X	X	X	X	X		X	X	X	X	X
5	Monitoring Well Installation	X	X	X	X	X	X	X	X	X	X	X	X	X	X
6	Groundwater Sampling	X	X					X	X	X	X	X	X	X	X
7	Personnel and Equipment Decontamination	X	X	X	X			X			X	X	X	X	X
8	Handling and Disposal of IDW	X	X		X				X	X	X	X	X	X	X

Table 7-1. Organic Vapor Cartridge Estimated Service Life

Use Conditions				Average VOC Air Concentration			
Work Intensity	Temperature (°F)	Atmospheric Pressure (atm)	Relative Humidity (%)	20 ppm	100 ppm	500 ppm	1,000 ppm
Light (Avg. Breathing Air Flow 21 L/min)	70	1.0	50	9,335	2,867	805	453
	70	1.0	65	9,140	2,819	791	442
	80	1.0	50	8,359	2,649	766	436
	80	1.0	65	8,200	2,608	754	426
	90	1.0	50	7,457	2,439	725	417
	90	1.0	65	7,328	2,404	716	409
	100	1.0	50	6,614	2,235	684	398
	100	1.0	65	6,510	2,205	676	391
Moderate (Avg. Breathing Air Flow 30 L/min)	70	1.0	50	6,535	2,007	564	317
	70	1.0	65	6,398	1,973	549	308
	80	1.0	50	5,852	1,855	536	305
	80	1.0	65	5,740	1,826	524	296
	90	1.0	50	5,220	1,707	507	292
	90	1.0	65	5,129	1,683	498	284
	100	1.0	50	4,630	1,564	479	279
	100	1.0	65	4,557	1,544	471	272
Heavy (Avg. Breathing Air Flow 55 L/min)	70	1.0	50	3,564	1,095	307	172
	70	1.0	65	3,490	1,072	296	168
	80	1.0	50	3,192	1,012	292	166
	80	1.0	65	3,132	994	282	161
	90	1.0	50	2,847	931	276	159
	90	1.0	65	2,798	917	268	154
	100	1.0	50	2,525	853	261	152
	100	1.0	65	2,486	841	253	147

Notes:

* Breakthrough times estimated using MultiVapor™ Version 2.2.4 Application (NIOSH). Software utilizes Gerry O. Wood Mathematical Model

** Breakthrough calculations performed for benzene (OSHA TWA PEL 10 ppm)

*** Breakthrough calculation assumes two (2) typical organic vapor catridge: bed diameter- 8 cm, bed depth- 2.2 cm, carbon per catridge- 47.8 g, micropore volume- 0.533 cm3/g, preconditioned relative humidity- 20%, avg. carbon granule diameter- 0.11 cm, adsorption potential for benzene- 18.666 kJ/mol, affinity coefficient for water- 0.06

**** Breakthrough times are expressed in minutes

FIGURES

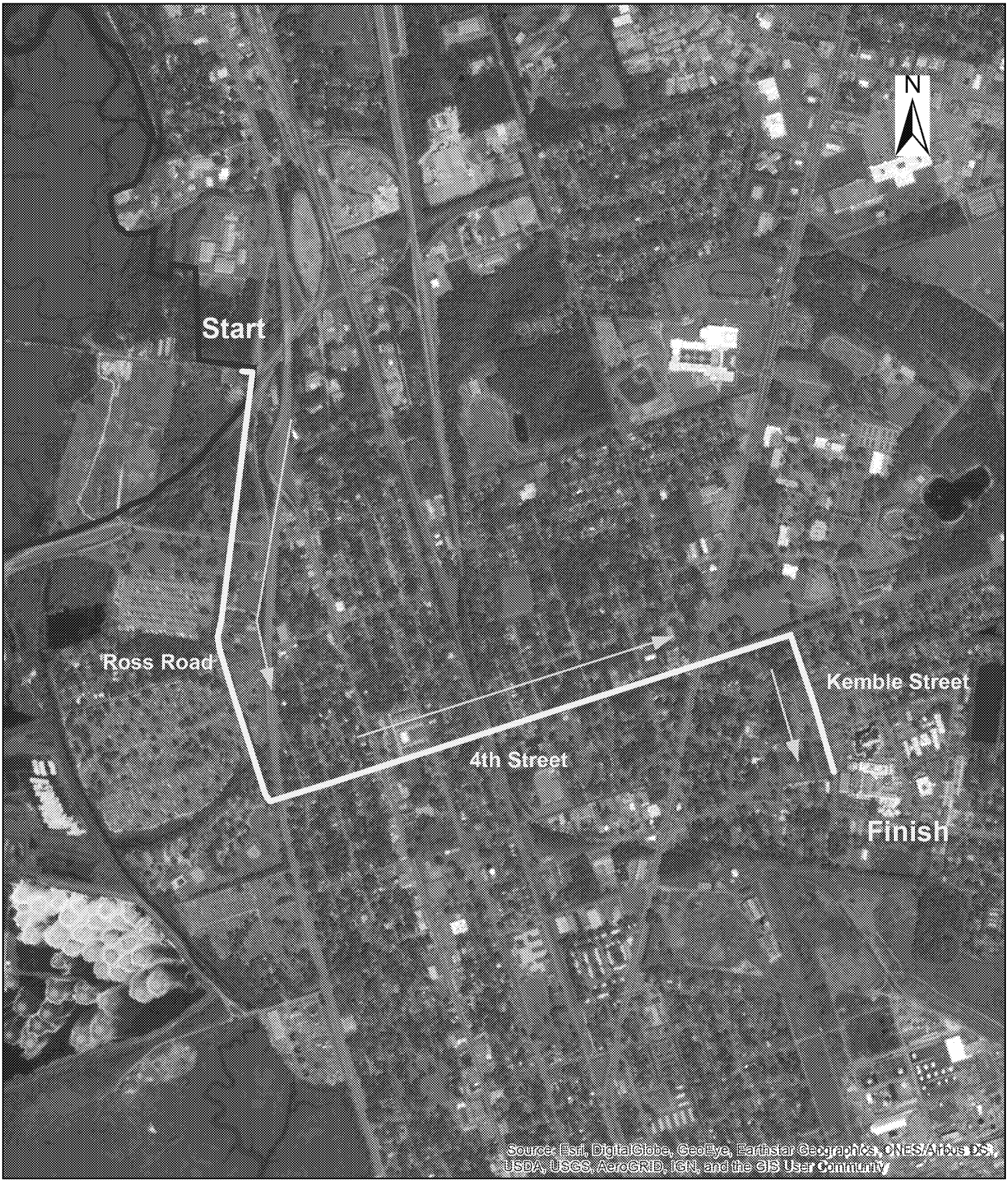
0 150 300
Feet

Cell Building Outlines
Cell Building Soil Cover
Administrative Building
Sampling Support Building
New Monitoring Well Locations
Monitoring Well Sampling Locations
Deep Soil Boring Locations

Site Map
LCP Chemicals
Brunswick, GA

EPS

Figure No. 3-1



0 0.125 0.25
Miles

Approximate Site Boundary

Route to Nearest Hospital

LCP Chemicals
Brunswick, GA

EPS

Figure No. 10-1

Decontamination Zones

Equipment

Personnel

Proposed MW Clusters

Existing Monitoring Well

Proposed Boring

CRZ

Soil Cover

Decontamination Zones

LCP Chemicals

Brunswick, GA

EPS

Figure No.11-1

APPENDIX A

Discussion of Hazards and Mitigative Controls

HAZARD MITIGATOR
DRILLING

Applies to Task: ☐ ① ☐ ② ☐ ③ ☒ ④ ☒ ⑤ ☐ ⑥ ☐ ⑦ ☐ ⑧

It is the responsibility of owners and operators to ensure that drilling equipment is used for the purpose for which it is intended, and that tolerances and limitations of the equipment not be exceeded. It is the responsibility of owners and operators of drilling equipment to stay in strict compliance with all local, state and federal regulations, governing any and all aspects of drilling operations or any related activities.

Drilling equipment is subjected to long hours of operation and many varied weather conditions. It is therefore imperative that proper preventative maintenance (PM) be performed on a daily basis. Servicing of drilling equipment must be performed following all manufacturer guidelines. Beyond these guidelines, owners and operators must constantly observe their equipment. They must be sure that more frequent servicing is taken care of if dictated by working conditions.

How to Protect Workers:

Daily, pre-shift inspection of the drilling equipment and operation is essential to maintaining productivity and the safety of workers. Pre-shift inspections are required by law and must be documented. Such inspections must be performed by the driller or operator who is knowledgeable of the equipment and work area.

- Are all employees wearing proper personal protective equipment?
  - Hard Hats
  - Steel-Toed Boots
  - Hearing Protection (when noise levels require it)
  - Safety Glasses with Side Shields
  - Clean Snug-fitting Clothing
  - Gloves (of the appropriate type for the work being performed or materials being handled)
- Have all employees received training as dictated by company policies and governmental regulations?
- Have all employees received current training in proper operating procedures?

- Have all employees received OSHA-required Hazard Communication Training?
- Are Material Safety Data Sheets (MSDS) available for all chemicals in use on the project?
- Are all containers or bags containing chemicals properly labeled and stored?
- Are employees aware of medical facilities and rescue personnel that could be summoned in the event of an emergency?
- Are fire extinguishers present? Are they of the appropriate size and type for the fire hazard involved? Are annual services current and have monthly inspections been performed? Are the extinguishers currently in good working condition?
- Are “no smoking” policies being observed where applicable?
- Are all “shut down” devices installed and in good working condition?
- Is the rig set up properly?
- Have employees been trained in first aid and CPR?
- Is there a properly stocked first aid kit available on the rig and in every vehicle?
- Have all underground utilities been identified?
- Is there a danger of being struck by other moving vehicles?

HAZARD MITIGATOR
DRUM HANDLING

Applies to Task: ☐ ① ☐ ② ☐ ③ ☒ ④ ☒ ⑤ ☐ ⑥ ☒ ⑦ ☒ ⑧

Heavy drums should always be moved with proper drum handling equipment. Use a drum truck, forklift attachment, below-hook drum lifter or other equipment specifically designed for drum handling.

A full 55-gallon steel drum can weigh over 2,000 pounds, with typical weights of 400 to 800 lb. When being moved, the contents of your drum may shift inside, making the drum difficult to control or even dangerous. There are also special considerations when handling a plastic drum or a fiber drum. Conditions such as restricted spaces and slippery or uneven floors can entail greater risks.

What Happens to the Body:

Mishandling a heavy drum can cause serious injury, damage the drum, waste valuable contents or contaminate the environment. Common injuries include a strained back, crushed fingers or hands, and foot trauma. Incidents of dropped drums, or drums rolling out of control, can also cause spills and damage.

What Should Be Done:

Drum handling safety requires a systematic approach to eliminate all possible causes of injury. Take proper precautions if the contents are hazardous or flammable. Refer to the MSDS for correct handling procedures. Environmental factors should be considered, such as adequate lighting and sufficient space to safely handle drums. Course, cluttered, sloped or slippery floor surfaces increase the risks. Eliminate these conditions as possible, and clean up any spills. Replace any missing bungs or lids.

Always use proper equipment designed for the task when handling heavy drums. Train all employees in proper drum handling safety procedures and use of drum handling equipment.

How to Protect Workers:

Always use protective clothing such as gloves, steel-toed shoes and eye protection.

Moving Empty Drums:

Support the leaning drum with your thigh and face the way you will travel. Then roll the drum on its lower rim by rotating the upper rim hand over hand. To lift an

empty drum, squat, then straighten your legs. Do NOT bend your back. Correct posture and placement of hands and feet is essential when handling drums. Specially designed drum trucks are a much safer alternative for moving drums. When rolling an empty drum on their sides control it all the way, using your gloved hands. Never roll a drum out of a truck or past a blind corner without posting a guard. Be alert for burred edges, lock rings and bungs that may catch your gloves or clothing and throw you off balance.

Moving Heavy Drums:

Many drum handlers are available to safely move heavy steel, fiber and plastic drums. A partially filled drum may not seem heavy, but shifting contents can make it difficult to handle. It may roll unpredictably and be difficult to control. Handle it carefully to avoid damage and accidents.

HAZARD MITIGATOR
EYE INJURY

Applies to Task: ☐ ① ☐ ② ☒ ③ ☒ ④ ☒ ⑤ ☒ ⑥ ☒ ⑦ ☐ ⑧

The typical eye injuries occur by rubbed or abraded foreign matter, such as metal chips, dirt particles, and splinters, or by striking the eye; surface wounds, such as abrasions, scratches, and foreign bodies (splinters and chips) are among the most common types of injuries to the eyes. Other hazards include, but are not limited to, chemicals, adhesives, radiation, tools, and equipment.

What Should Be Done:

Chemical Splash:

- Don't squeeze eyes shut. Hold them open with thumb and index finger.
- Flood eyes with cool, clean water for 15-20 minutes.
- Get medical help as soon as possible. If you can, have the chemical container and its label available for evaluation.
- Don't use another chemical to neutralize the spilled chemical.

Flying Particles:

- Don't try to remove anything embedded in the eye. You could cause further damage.
- Don't pull or squeeze the eye.
- Cover both eyes to prevent movement.
- Get medical help as soon as possible.

Blows to the Eyes:

- Apply ice packs to control swelling and relieve the pain.
- Cover both eyes to prevent movement.
- Get medical attention as soon as possible.

How to Protect Workers:

If you need prescription eyeglasses, make sure your goggles or spectacles have prescription eyeglass lenses or wear extra protection over your prescription eyeglasses. Contact lenses don't provide protection from on-the-job eye hazards. If you wear contact lenses, be extra cautious around gases, vapors, fumes, and dust. Possible reaction can occur. Wear eye protection equipment in addition to contact lenses.

- **Spectacles** -- Semi/flat-folded side shields. Provide primary protection against impact and optical radiation. Side shield spectacles are recommended.
- **Goggles** -- There are many different kinds of goggles that can vary in appearance and protection.
  - Flexible fitting, regular ventilation. Cushion the face, protect eyes at sides, top, and bottom.
  - Flexible fitting, hooded ventilation. Protect against impact, sparks, chemical splashes, and dust.
  - Cushioned fit, rigid body. Protect against impact, sparks, chemical splashes, irritating mists, and dust.
  - Welding goggles, eyecup type, filter lenses. Ideal for protection from glare and sparks.
  - Chipping goggles, eyecup type, clear safety lenses. Protect against hot sparks and nuisance dust.
- **Face Shield** -- Plastic or mesh window. Designed to protect the whole face; must be supplemented with safety glasses.
- **Welding Helmet** -- Stationary window or lift-front window. Protection from welding, soldering, and brazing. Must be supplemented with safety glasses.

HAZARD MITIGATOR
HEAT STRESS

Applies to Task: ☒ ① ☒ ② ☒ ③ ☒ ④ ☒ ⑤ ☒ ⑥ ☒ ⑦ ☒ ⑧

When the body is unable to cool itself by sweating, several heat-induced illnesses such as heat stress or heat exhaustion and the more severe heat stroke can occur, and can result in death.

Factors Leading to Heat Stress:

High temperature and humidity; direct sun or heat; limited air movement; physical exertion; poor physical condition; some medicines; and inadequate tolerance for hot workplaces.

Symptoms of Heat Exhaustion:

- Headaches, dizziness, lightheadedness, or fainting.
- Weakness and moist skin.
- Mood changes such as irritability or confusion.
- Upset stomach or vomiting.

Symptoms of Heat Stroke:

- Dry, hot skin with no sweating.
- Mental confusion or losing consciousness.
- Seizures or convulsions.

What Should Be Done:

- Call 911 (or local emergency number) at once.
- Move the worker to a cool, shaded area.
- Loosen or remove heavy clothing.
- Provide cool drinking water.
- Fan and mist the person with water.

How to Protect Workers:

- Recognize the environmental and workplace conditions that lead to potential heat-induced illnesses and injuries.
- Learn the signs and symptoms of heat-induced illnesses/injuries and what to do to help the worker.
- Train the workforce about heat-induced illnesses and injuries.

- Block out direct sun or other heat sources.
- Use cooling fans/air-conditioning; rest regularly.
- Perform work during the colder part of the day.
- Drink lots of water; about 1 cup every 15 minutes.
- Use the buddy system (work in pairs).
- Wear lightweight, light colored, loose-fitting clothes.
- Avoid alcohol, caffeinated drinks, or heavy meals.

HAZARD MITIGATOR
HEAVY EQUIPMENT

Applies to Task: ☒ ① ☐ ② ☒ ③ ☒ ④ ☒ ⑤ ☐ ⑥ ☐ ⑦ ☐ ⑧

It is the responsibility of owners and operators to ensure that heavy equipment is used for the purpose for which it is intended, and that tolerances and limitations of the equipment not be exceeded. It is the responsibility of owners and operators of heavy equipment to stay in strict compliance with all local, state and federal regulations, governing any and all aspects of equipment operations or any related activities.

Heavy equipment is subjected to long hours of operation and many varied weather conditions. It is therefore imperative that proper preventative maintenance (PM) be performed on a daily basis. Servicing of heavy equipment must be performed following all manufacturer guidelines. Beyond these guidelines, owners and operators must constantly observe their equipment. They must be sure that more frequent servicing is taken care of if dictated by working conditions.

How to Protect Workers:

Daily, pre-shift inspection of the heavy equipment and operation is essential to maintaining productivity and the safety of workers. Pre-shift inspections must be performed and documented. It's especially important that all glass, mirrors, horns, lights, backup alarms cables, steering, brakes, and hydraulics are operational. Caution: Hydraulic fluid escaping under pressure can penetrate skin and cause serious bodily harm. Check tires for cuts, bulges, irregularities, abnormal wear and proper inflation. Such inspections must be performed by the operator who is knowledgeable of the equipment and work area.

Proper personal protective equipment:

- Hard Hats
- Steel-Toed Boots
- Hearing Protection -- (When noise levels require it)
- Safety Glasses with Side Shields
- Clean Snug-fitting Clothing
- Gloves -- (of the appropriate type for the work being performed or materials being handled)

- OSHA compliant seat belts [29 CFR 1926.601(b)(9)], (exception for equipment that is designed only for standup operation, or that has no rollover protective structure)

Proper procedures:

Heavy equipment Heavy equipment/vehicle operators and workers that are near heavy equipment should follow these guidelines:

- Before operating:
  - Ensure the cab area is clean and free of debris and tools.
  - Clean windshield, mirrors and lights.
  - Remove all oil, grease or mud and snow from grab irons, hand rails, steps, pedals, and floor to prevent slips and falls.
  - Remove or secure any loose items such as tools, chains, or lunch boxes from the cab.
- Do not drive a vehicle in reverse gear with an obstructed rear view, unless it has an audible reverse alarm, or another worker signals that it is safe.
- Drive vehicles or equipment only on roadways or grades that are safely constructed and maintained.
- Make sure that you and all other personnel are in the clear before using dumping or lifting devices.
- Lower or block bulldozer and scraper blades, end-loader buckets, dump bodies, etc., when not in use, and leave all controls in neutral position.
- Set parking brakes when vehicles and equipment are parked, and chock the wheels if they are on an incline.
- All vehicles must have adequate braking systems and other safety devices.
- Haulage vehicles that are loaded by cranes, power shovels, loaders etc., must have a cab shield or canopy that protects the driver from falling materials.
- Do not exceed a vehicle's rated load or lift capacity.
- Use traffic signs, barricades or flaggers when heavy equipment operations take place near public roadways.
- Workers must be highly visible in all levels of light. Warning clothing, such as red or orange vests, are required; and if worn for night work, must be of reflective material.

- All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to areas where work is in progress, should have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of the equipment.
- A safety tire rack, cage, or equivalent protection should be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.
- All vehicles with cabs should be equipped with windshields and powered wipers. Cracked and broken glass shall be replaced. Vehicles operating in areas or under conditions that cause fogging or frosting of the windshields shall be equipped with operable defogging or defrosting devices.
- All haulage vehicles, whose pay load is loaded by means of cranes, power shovels, loaders, or similar equipment, should have a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.
- Always maintain the required distance between equipment and electrical power lines.
- Always shut off the engine before fueling or performing maintenance work.
- Never get under a raised blade, bucket, truck body, or other suspended load unless it is properly blocked.
- When working near heavy equipment always allow space for equipment failure or operator error. If you must work close to operating equipment, keep the operator informed of your location.
- Before starting engines, make sure no one is working on or near the machinery.
- Never get on or off a moving machine. Maintain a 3-point contact with the steps and hand rails while getting on/into the machine. Do not use the controls or steering wheel as a handhold.
- Do not operate the machine with wet, greasy, or muddy hands or shoes.
- Exhaust fumes are dangerous - always have a running machine in a well ventilated area.

General Guidelines:

- Have all employees received training as dictated by company policies and governmental regulations?
- Have all employees received current training in proper operating procedures?

- Have all employees received OSHA-required Hazard Communication Training?
- Are Material Safety Data Sheets (MSDS) available for all chemicals in use on the project?
- Are all containers or bags containing chemicals properly labeled and stored?
- Are employees aware of medical facilities and rescue personnel that could be summoned in the event of an emergency?
- Are fire extinguishers present? Are they of the appropriate size and type for the fire hazard involved? Are annual services current and have monthly inspections been performed? Are the extinguishers currently in good working condition?
- Are "no smoking" policies being observed where applicable?
- Are all "shut down" devices installed and in good working condition?
- Is the equipment set up properly?
- Have employees been trained in first aid and CPR?
- Is there a properly stocked first aid kit available on the rig and in every vehicle?
- Have all aboveground electrical power lines and underground utilities been identified?
- Is there a danger of being struck by other moving vehicles?

References

Existing Drilling Equipment hazard mitigator.

http://www.osha.gov/SLTC/etools/construction/struckby/vehicles.html

OSHA Regulation 1926 Subpart O, Sections 1926.600 and 1926.601.

http://www.workforcesafety.com/safety/sops/HeavyEquipment.pdf

http://www.workforcesafety.com/safety/sops/HeavyEquipmentSample2.pdf

HAZARD MITIGATOR

INHALATION OF CHEMICALS

Applies to Task: ☐ ① ☐ ② ☒ ③ ☒ ④ ☒ ⑤ ☒ ⑥ ☒ ⑦ ☒ ⑧

Most chemicals used or exposed to in the workplace may be dispersed into the air to form dust, mist, fumes, gas or vapor and can then be inhaled. In this way also workers who are not actually handling them but stay within the reach can be exposed to a mixture of chemicals from various sources. Inhalations of potentially hazardous chemicals may occur at any stage during field operations but especially in areas where there are known hazardous chemicals already present, being produced or applied such as alcohols, acids, solvents or hazardous waste project sites.

What Happens to the Body:

Common reported health effects include headaches, dizziness, and fatigue, irritation of the mucous membrane of the nose and in cases of inhalation of excessive concentrations, unconsciousness and loss of coordination.

What Should Be Done:

Know the odor and odor threshold of the chemicals of concern. Some toxic chemicals present in the atmosphere may not be detected by human senses (i.e., they may be odorless and colorless, and their toxic effects may not produce any immediate symptoms).

How to Protect Workers:

Use engineering controls to reduce vapor concentrations (e.g., ventilation) or dusty atmospheres. In cases it is not feasible to minimize vapor concentrations wear respiratory protection as indicated by air monitoring results and/or as required by the Health and Safety Plan.

HAZARD MITIGATOR
INSECT, VERMIN, AND SNAKE BITES

Applies to Task: ☒ ① ☒ ② ☒ ③ ☒ ④ ☒ ⑤ ☒ ⑥ ☒ ⑦ ☒ ⑧

Bites from animals and insects can be a mere nuisance - or life threatening. Taking precautions and knowing what to do when the worst happens will help keep you safe

GENERAL REQUIREMENTS

Insects, Spiders and Ticks

You're most likely to be bitten by bugs - the bites or stings of some insects cause unpleasant reactions. Medical attention should be sought if an insect bite causes swelling, bruising, or persistent pain.

- To protect yourself from biting and stinging insects, wear long pants, socks, and long-sleeved shirts.
- Use insect repellents that contain DEET or Picaridin.
- Treat bites and stings with over-the-counter products that relieve pain and prevent infection.
- Avoid fire ants; their bites are painful and cause blisters.
- Severe reactions to fire ant bites (chest pain, nausea, sweating, loss of breath, serious swelling or slurred speech) require immediate medical treatment.

Rodents and Wild or Stray Animals

Animal bites can set up infections which may be serious - sometimes even fatal. Animals in general tend to avoid human beings, but they can attack, particularly if they're with their young. In areas of endemic rabies, domestic dogs, cats or other animals should not be petted. Wild animals should be totally avoided.

- Dead and live animals can spread diseases such as Rat Bite Fever and Rabies.
- Avoid contact with wild or stray animals.
- Avoid contact with rats or rat-contaminated buildings. If you can't avoid contact, wear protective gloves and wash your hands regularly.

- Get rid of dead animals as soon as possible.
- If bitten/scratched, get medical attention immediately.

Snakes

Poisonous snakes are hazards around the world, although deaths from snake bites are relatively rare. People can be more affected by fright than by the venom! The Australian brown snake, carpet vipers in the Middle East, Russell's viper and cobras in southern Asia, and coral and rattlesnakes in North America are particularly dangerous.

- Watch where you place your hands and feet when removing debris. If possible, don't place your fingers under debris you are moving. Wear heavy gloves.
- If you see a snake, step back and allow it to proceed.
- Wear boots at least 10 inches high.
- Watch for snakes sunning on fallen trees, limbs or other debris.
- A snake's striking distance is about 1/2 the total length of the snake.
- If bitten, note the color and shape of the snake's head to help with treatment.
- Keep bite victims still and calm to slow the spread of venom in case the snake is poisonous. Seek medical attention as soon as possible.
- Do not cut the wound or attempt to suck out the venom. Apply first aid: lay the person down so that the bite is below the level of the heart, and cover the bite with a clean, dry dressing.

Source:

OSHA Quick Card™,
www.osha.gov/Publications/rodents_snake_insects.html

BBC Health,
http://www.bbc.co.uk/health/healthy_living/travel_health/illnessinjury_bites.shtml

HAZARD MITIGATOR
Lifting Heavy Loads

Applies to Task: ☐ ① ☐ ② ☐ ③ ☒ ④ ☒ ⑤ ☒ ⑥ ☐ ⑦ ☒ ⑧

Potential Hazards:

- Some loads, such as soil cuttings, purged groundwater, or heavy tools and machinery place great stress on muscles, discs, and vertebrae.
- Lifting heavy loads has been associated with increased risk of injury.

Don'ts:

- Don't lift things when your feet are too close together. If your feet are closer than shoulder width you'll have poor leverage, you'll be unstable, and you'll have a tendency to round your back.
- Don't lift with your knees and hips straight and your lower back rounded. This is the most common and stressful bad lifting move. Twisting the trunk during this bad move compounds the problem.
- Don't tense and arch the neck when lifting. This crams your neck joints together and causes pain especially if maintained for a long period of time.
- Don't lift and/or carry an unbalanced load.
- Don't lift and bend too much in a short period of time.
- Don't lift objects that are too heavy for you.
- Don't lift heavy objects directly following a sustained period of sitting, especially if you have been slouching.
- Don't lift things overhead with your neck and back arched, if possible.

Dos:

- Do place your feet and knees at least shoulder width apart or front to back in a wide-step position. This will help you bend at the hips, keeping your back relatively straight and stress free.
- Do lean over or squat with the chest and buttocks sticking out. If you do this correctly, your back will be flat and your neck will balance in a relaxed neutral position.
- Do take weight off one or both arms if possible. When you squat down or push back up, use your hand or elbow as support on your thigh or any

available structure. This takes some of the compression and strain off of the lower back.

- Do balance your load on either side if possible, or switch sides so that both sides are equally stressed.
- Do level the pelvis or tuck in your buttocks and suck in your abdomen, when reaching or lifting overhead. Keep your chest up and use a step stool to keep the low back and neck in neutral alignment.
- Do walk around and use backward-bending and/or stomach-lying positions before or after bending or heavy lifting, especially if you've been sitting for a while.

HAZARD MITIGATOR
HAZARDOUS NOISE EXPOSURE

Applies to Task: ☐ ① ☐ ② ☒ ③ ☒ ④ ☒ ⑤ ☐ ⑥ ☐ ⑦ ☐ ⑧

Work Related Hearing Loss

Occupational noise-induced hearing loss, as opposed to occupational acoustic trauma, is hearing loss that develops slowly over a long period of time as the result of exposure to continuous or intermittent loud noise. Occupational acoustic trauma is a sudden change in hearing as a result of a single exposure to a sudden burst of sound, such as an explosive blast. Noise-induced hearing loss is 100 percent preventable, but once acquired, hearing loss is permanent and irreversible.

Hazardous Noise Defined

When workers are subjected to sound levels exceeding those shown on the following table, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce the sound to acceptable levels, personal protective equipment shall be provided and used to reduce sound levels to acceptable levels.

Duration per day (hours)	Sound level (dBA slow response)
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

In addition, exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

Sound Measurement Devices

- **Sound Level Meters** can be used to spot-check noise dosimeter performance, determine an employee's noise dose whenever use of a noise dosimeter is unavailable or inappropriate, identify and evaluate individual noise sources for abatement purposes, aid in determining the feasibility of engineering controls for individual noise sources, and evaluate hearing protectors.
- **Dosimeters** can be used to make compliance measurements according to OSHA's noise standard and to measure the employee's exposure to noise and automatically compute the necessary noise dose calculations.
- **Octave-Band Analyzers** can be used to help determine the adequacy of various types of frequency-dependant noise controls, select hearing protectors because they can measure the amount of attenuation (how much a sound is weakened) offered by the protectors in the octave bands responsible for most of the sound energy in a given situation, and divide noise into its frequency components.

Personal Protective Equipment for Hearing Protection

- **Expandable ear plugs** are made of formable material designed to expand and conform to the shape of each person's ear canal.
- **Pre-molded, reusable plugs** are made from silicone, plastic, or rubber and are manufactured as either "one-size-fits-most" or are available in several sizes.
- **Canal caps** resemble earplugs on a flexible plastic or metal band.
- **Earmuffs** work to block out noise by completely covering the outer ear.

HAZARD MITIGATOR
POISONOUS PLANTS

Applies to Task: ☒ ① ☒ ② ☒ ③ ☒ ④ ☒ ⑤ ☒ ⑥ ☒ ⑦ ☒ ⑧

There are approximately 700 known poisonous plants on earth. Plants are either poisonous through ingestion or dermal (skin) contact. Most of these plants are poisonous through ingestion. The plants most commonly associated with allergic reactions due to dermal contact are Poison Ivy, Poison Oak and Poison Sumac. Poison Ivy, Poison Oak and Poison Sumac are the most likely poisonous plants an environmental worker may come into contact with.

Poison Ivy is one of the most frequent causes of skin rash among children and adults who spend time outdoors. The plant can be found throughout the United States, except in the Southwest, Alaska, and Hawaii. It has three shiny green leaves and a red stem. Poison ivy typically grows in the form of a vine, often along riverbanks.

Poison Oak is primarily found on the West Coast. It grows in the form of a shrub and has three leaves similar to poison ivy.

Poison Sumac grows abundantly along the Mississippi River. It grows as a woody shrub. Each stem contains 7-13 leaves arranged in pairs.

Approximately 60% of humans are allergic to the sap. Contact may be indirect, such as petting an animal that came in contact with the plant. The sap can also contaminate clothing and tools.

Small amounts of sap can remain under a person's fingernails for several days unless it is deliberately removed by meticulous cleaning. The droplets of sap can even be found in the ashes of burned plants.

<u>What Happens to the Body:</u>

Skin symptoms include:

- Itching
- Burning
- Redness
- Blisters
- Swelling

The early lesions consist of multiple small blisters, often in a line where the skin has brushed against the poison ivy plant. The rash is caused by skin contact with the oily sap (resin) of these plants. The oily resin usually enters the skin rapidly, and is seldom transferred from person to person. The rash is not caused by the fluid from the blisters. Thus, once the person has washed the oil off the skin, the rash is usually not contagious

What Should Be Done:

First Aid:

- Wash the skin thoroughly with soap and warm water. Because the resin enters skin quickly, try to wash it off within 30 minutes. A product called Tecnu, available in camping stores and some pharmacies, is very effective at removing the oils.
- Scrub under the fingernails with a brush to prevent the resin from spreading to other parts of the body.
- Wash clothing and shoes with soap and hot water. Resin can linger on them.
- Promptly bathe animals to remove the oils from their fur.
- Body heat and sweating can aggravate the itching. Stay cool and apply cool compresses to your skin.
- Calamine lotion and hydrocortisone cream can be applied to the skin to reduce itching and blistering. Bathing in lukewarm water with an oatmeal bath product, available in drugstores, may soothe itchy skin. Aluminum acetate (Domeboro solution) soaks can also help to dry the rash and reduce itching.
- If creams, lotions, or bathing do not stop the itching, antihistamines may be helpful.
- In severe cases, especially rash around the face or genitals, your physician may prescribe oral or injected steroids

Do Not:

- DO NOT touch skin or clothing that still have the resins.
- DO NOT burn poison ivy, oak, or sumac to get rid of it. The resins can be spread via smoke, and can cause severe reactions in people who are far downwind.

Call 911 or go to an emergency room if:

- Someone is suffering a severe allergic reaction, such as swelling or difficulty breathing, or has had a severe reaction in the past.
- Someone has been exposed to the smoke of a burning plant.
- Call your medical provider if:
- Itching is severe and cannot be controlled.
- The rash affects your face, lips, eyes, or genitals.
- The rash shows signs of infection, such as pus, yellow fluid leaking from blisters, odor, or increased tenderness.

Before calling emergency, determine the following:

- Patient's age, weight, and condition
- Name of the plant
- Amount swallowed (if applicable)

How to Protect Workers:

Prevention:

- Wear long sleeves, long pants, and socks when walking in areas where these plants may grow.
- Skin products such as Ivy Block lotion can be applied beforehand to reduce the risk of a rash.
- Learn to identify poison ivy, oak, and sumac.
- Remove these plants if they grow near your home (but never burn them).
- Be aware of resins carried by pets.
- Wash as soon as possible after a suspected exposure.

Recognition:

Recognition is important to avoid contact with these plants when possible. It also is important so that sap can be removed from the skin as quickly as possible after accidental contact with these plants has occurred.

Poison Ivy

Either a small shrub or a vine trailing along the ground or climbing on low plants, trees and poles. The leaves are alternate with three pointed and glossy leaflets. The edges of the leaflets may be smooth or toothed, but they are rarely lobed. They are reddish when they first emerge in the spring, are green during the

summer, and are various shades of yellow, orange, red, or bronze in the autumn. Greenish-white flowers and whitish-yellow fruit in hanging clusters.

Poison ivy is found throughout the U.S. except along the western coast. Most common in disturbed areas, edges of woods, flood plains, lake shores, stream banks, along fences and around buildings.

Poison Oak

Similar to poison ivy except its three leaflets are lobed or deeply toothed with rounded tips.

In the east, mostly restricted to sandy soil, dry barrens, sand hills, and oak-pine or pine woods. In the west, in low places, thickets and wooded slopes.

Poison Sumac

A tall shrub or small tree with alternate leaves with 7-11 leaflets arranged in pairs, and an additional single leaflet at the end of the midrib. Yellowish green flowers and whitish green fruits hang in loose clusters.

Poison sumac grows in standing water in bogs, swamps and river bottoms. Most common in the Great Lakes area, and eastern coastal plain.

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HAZARD MITIGATOR
PORTABLE POWER/HAND TOOL

Applies to Task: ☐ ① ☐ ② ☒ ③ ☐ ④ ☒ ⑤ ☒ ⑥ ☐ ⑦ ☒ ⑧

When using power equipment and portable power hand tools, hazards exists in two places.

1. Point of Operation Locations

By definition, this is the location where the processing tool comes into contact with the material being processed and shall be guarded.

Recognized hazards include blades, knives, cutters, etc.

2. Power Transmission Location

By definition, this would include such locations where there exists belts/pulleys, chains/sprockets, mashing gears, etc., all of which are recognized physical hazards.

General Requirement for Machine Guards:

Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard to itself.

How to Protect Workers:

- Before using equipment/tools that have guards, be sure they are attached correctly, secure, in good maintenance, and working according to design.
- **Note: Periodic maintenance is necessary.**
- When a guard is broken, do not use the machine, equipment, or tool; tag it out of use.
- There are some machine process applications that necessitate the removal of guards in order to do the machining but the stock must be safely secured during the process as well as the operator being safely protected at point of operation.
- Route cords, hoses, and cables supplying power to portable power tools to prevent tripping hazards or contact with equipment or machinery.
- Avoid abusing the power supply lines of portable equipment. Excessive scraping, kicking, stretching, and exposure to grease and oils will damage

lines or cause them to fail prematurely, and possibly injure the operator or fellow workers.

- Inspect cords, hoses, and cables for wear or deterioration. Defective power supply lines shall not be used.
- Do not use electrically powered tools near flammable materials or explosive atmosphere, unless they are of the explosion-proof type meeting the National Electrical Code for explosive area. Employees operating the equipment should be aware of sparks and or metal fragments when using this equipment.
- Ground-check portable electric power tools with metal cases initially and quarterly. At no time will electrical power equipment be operated without proper grounding. All electrical cords and cables, including extension cords, shall include a third wire ground.
- Prohibit operations of electric tools in wet or damp areas except in unusual emergency circumstances. When operation is required in wet or damp conditions, extreme care will be exercised to ensure effective grounding of equipment and proper use of protective gear.
- Size cords adequately for length and the electrical demand of the tool. Otherwise, they may cause a fire hazard.
- Limit use of tools to the purpose for which the tool is intended (e.g., wrenches will not be used as hammers). Defective tools (e.g., with mushroomed heads or split or defective handles) shall not be used.
- Protect tools from corrosion damage.
- Keep tools free of accumulated dirt and unnecessary oil or grease. Moving and adjustable parts shall be lubricated frequently to prevent wear and misalignment.

Proper personal protective equipment:

- Hard Hats
- Steel-Toed Boots
- Hearing Protection -- (When noise levels require it)
- Safety Glasses with Side Shields
- Clean Snug-fitting Clothing
- Gloves -- (of the appropriate type for the work being performed or materials being handled)

HAZARD MITIGATOR
SKIN ABSORPTION

Applies to Task: ☐ ① ☐ ② ☒ ③ ☒ ④ ☒ ⑤ ☒ ⑥ ☒ ⑦ ☒ ⑧

Absorption of chemicals through the skin depends on a number of factors, the most important of which are concentration, duration of contact, solubility, physical condition of the skin and part of the body exposed. Differences in skin structure and condition also affect the degree to which chemicals can be absorbed. In general, toxicants cross thin skin much more easily than thick skin. Roughly, the ease of absorption follows the following schedule: scrotum>>face>forearm>palm>foot.

What Happens to the Body:

What Should Be Done:

- Call 911 (or local emergency number) at once.
- Move the worker to a cool, shaded area.
- Loosen or remove heavy clothing.

How to Protect Workers:

- Are all employees wearing proper personal protective equipment?
  - Hard Hats
  - Steel-Toed Boots
  - Hearing Protection -- (When noise levels require it)
  - Safety Glasses with Side Shields
  - Clean Snug-fitting Clothing
  - Gloves -- (of the appropriate type for the work being performed or materials being handled)

HAZARD MITIGATOR
SLIP/TRIP/FALL

Applies to Task: ☒ ① ☒ ② ☒ ③ ☒ ④ ☒ ⑤ ☒ ⑥ ☒ ⑦ ☒ ⑧

The OSHA standards for walking and working surfaces apply to all permanent places of employment, except where domestic, mining, or agricultural work only is performed.

GENERAL REQUIREMENTS

Housekeeping

Some of the most frequently overlooked general requirements involve housekeeping:

- All places of employment, passageways, storerooms, and service rooms shall be kept clean and orderly and in a sanitary condition.
- The floor of every workroom shall be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained and gratings, mats, or raised platforms shall be provided.
- Every floor, working place and passageway shall be kept free from protruding nails, splinters, holes, or loose boards.

Aisles and Passageways

- Aisles and passageways shall be kept clear and in good repair with no obstruction across or in aisles that could create a hazard.
- Permanent aisles and passageways shall be appropriately marked.
- Where mechanical handling equipment is used, aisles shall be sufficiently wide. Improper aisle widths coupled with poor housekeeping and vehicle traffic can cause injury to employees, damage the equipment and material, and can limit egress in emergencies.

Covers and Guardrails

Covers and/or guardrails shall be provided to protect personnel from the hazards of open pits, tanks, vats, ditches, and the like.

Floor Loading Protection

Load rating limits shall be marked on plates and conspicuously posted. It shall be unlawful to place, or cause, or permit to be placed, on any floor or roof of a building or other structure, a load greater than that for which such floor or roof is approved.

GUARDING FLOOR AND WALL OPENINGS AND HOLES

Floor openings and holes, wall openings and holes, and the open sides of platforms may create hazards. People may fall through the openings or over the sides to the level below. Objects, such as tools or parts, may fall through the holes and strike people or damage machinery on lower levels.

OSHA standards for guarding openings and holes use the following definitions:

Floor hole. An opening measuring less than 12 inches but more than 1 inch in its least dimension, in any floor, platform, pavement or yard, through which materials but not persons may fall.

Floor opening. An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard, through which persons may fall.

Platform. A working space for persons, elevated above the surrounding floor or ground.

Wall hole. An opening less than 30 inches but more than 1 inch high, of unrestricted width, in any wall or partition.

Wall opening. An opening at least 30 inches high and 18 inches wide, in any wall or partition, through which persons may fall.

Protection for Floor Openings

Standard railings shall be provided on all exposed sides of a stairway opening, except at the stairway entrance. For infrequently used stairways, where traffic across the opening prevents the use of a fixed standard railing, the guard shall consist of a hinged floor opening cover of standard strength and construction along with removable standard railings on all exposed sides, except at the stairway entrance.

> A "standard railing" consists of top rail, mid rail, and posts, and shall have a vertical height of 42 inches nominal from the upper surface of top rail to floor, platform, runway, or ramp level. Nominal height of mid rail is 21 inches.
>
> A "standard toeboard" is 4 inches nominal in vertical height, with not more than ¼-inch clearance above floor level.

Floor openings may be covered rather than guarded with rails. When the floor opening cover is removed, a temporary guardrail shall be in place, or an attendant shall be stationed at the opening to warn personnel.

Every floor hole into which persons can accidentally walk shall be guarded by either:

- A standard railing with toeboard, or
- A floor hole cover of standard strength and construction.

While the cover is not in place, the floor hole shall be constantly attended by someone or shall be protected by a removable standard railing.

HAZARD MITIGATOR
TICKS

Applies to Task: ☒ ① ☒ ② ☒ ③ ☒ ④ ☒ ⑤ ☒ ⑥ ☒ ⑦ ☒ ⑧

Ticks Habitats and Habits

Ticks are common in the United States. They live outdoors in:

- grass
- trees
- shrubs
- leaf piles

Ticks prefer warm, moist areas of the body. Once a tick gets on your body, they're likely to migrate to your armpits, groin, or hair. When they're in a desirable spot, they bite into your skin and begin drawing blood.

Unlike most other bugs that bite, ticks typically remain attached to your body after they bite you. If one bites you, you'll likely know because you'll have found a tick on your skin. After a period of up to 10 days of drawing blood from your body, an engorged tick can detach itself and fall off.

Avoid Ticks

- Wear long sleeves and long pants when walking in the woods or grassy areas where ticks are common.
- Wear light-colored clothing so dark-colored ticks will stand out.
- Tape sleeves and pant legs to close gaps
- Walk in the center of trails.
- Use tick repellant that's at least 20 percent DEET.
- Treat clothing and gear with 0.5 percent permethrin.
- Take a shower or bath within 2 hours of being outdoors.
- Check skin closely after being in tick-prone areas, especially under arms, behind ears, groin area, behind knees, and in hair.
- It typically takes over 24 hours of feeding for a tick carrying disease to infect a person. So, the sooner a tick can be identified and removed, the better.

Tick Removal

It's important to remove a tick as soon as possible. Follow these steps:

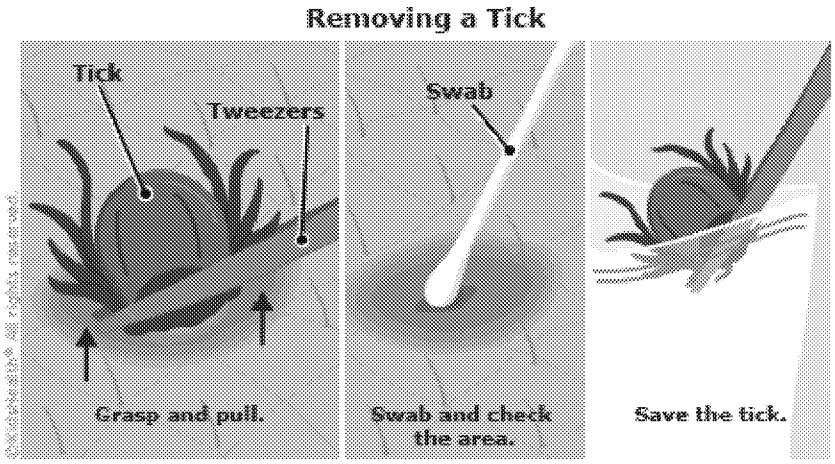
1. Use tweezers to grasp the tick firmly at its head or mouth, next to the skin.

2. Pull firmly and steadily until the tick let go of the skin. Do not twist the tick or rock it from side to side. If part of the tick stays in the skin, don't worry. It will eventually come out on its own.

3. Release the tick into a jar or zip-locked bag in case you want to have it identified later.

4. Wash your hands and the site of the bite with soap and water.

5. Swab the bite site with alcohol.



Never use petroleum jelly or a hot match to kill and remove a tick. These methods don't get the tick off the skin, and can cause it to burrow deeper and release more saliva (which increases the chances of disease transmission).

When do I contact a doctor?

You should be able to remove most embedded ticks before they can cause illness, because ticks usually don't transmit pathogens for at least 12 hours; for Lyme, it generally takes 36 hours.

Antibiotics are necessary if you experience a skin infection at the bite site or if you continually scratch and lacerate the skin.

Lyme disease is typically characterized by following symptoms:

- Facial paralysis
- Swollen and painful joints
- Chills and fever
- Muscle aches and pain
- Stiff neck
- General malaise

If these symptoms develop, do not hesitate to see your doctor immediately. Treatment usually includes a round of antibiotics which can ease the symptoms within 2-3 days.

APPENDIX B

Site Personnel Contact Information

Emergency Response Contacts

Name	*Telephone Numbers*	
	Office	*Cell*
Project Manager/Principal-In-Charge: Kirk Kessler, P.G.	(678) 336-8544	(404) 307-2677
Joe Terry: Alex Testoff, P.E.	(678) 336-8539	(813) 9438633
Site Health and Safety Officer: Alex Testoff, P.E.	(678) 336-8536	(443) 745-6247